INOVANCE

FORWARD, ALWAYS PROGRESSING



SV680-INT Series Servo Drive

User Guide

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code PS00018929A01

Preface

Introduction

The SV680-INT series servo drive is a high-end servo drive designed based on global-leading standards and high-end application needs. It is featured with high speed, high precision, high performance, and tuning-free function. Compliant with CE, UL, KC, EAC, UKCA and TUV certification requirements and top international quality standards, it is specially suitable for high-end applications.

Its power ranges from 0.05 kW to 7.5 kW. It supports Modbus, CANopen and EtherCAT communication protocols and carries necessary communication interfaces to work with the host controller for implementing a networked operation of multiple servo drives. The servo drive supports adaptive stiffness level setting, inertia auto-tuning, and vibration suppression for easy use. The drive, together with an MS1 series high-response servo motor (with ultra-low, low or medium inertia) equipped with a 23- or 26-bit single-turn/multi-turn absolute encoder, any third party servo motor, linear motor or DDR motor, serves to deliver a quiet and stable operation and accurate process control through features like fully closed-loop, internal process segment and gantry synchronization.

The drive also comes with features like safe torque off, dynamic braking, and brake output (external relay not needed) as standard and supports extension of seven kinds of functional safety and bus functional safety FSoE (the PINT version further offers 24V backup power) for continuous safe production. The drive aims to achieve quick and accurate position control, speed control, and torque control through high-performance solutions for automation equipment in such industries as electronic manufacturing, lithium batteries, manipulators, packaging, and machine tools.

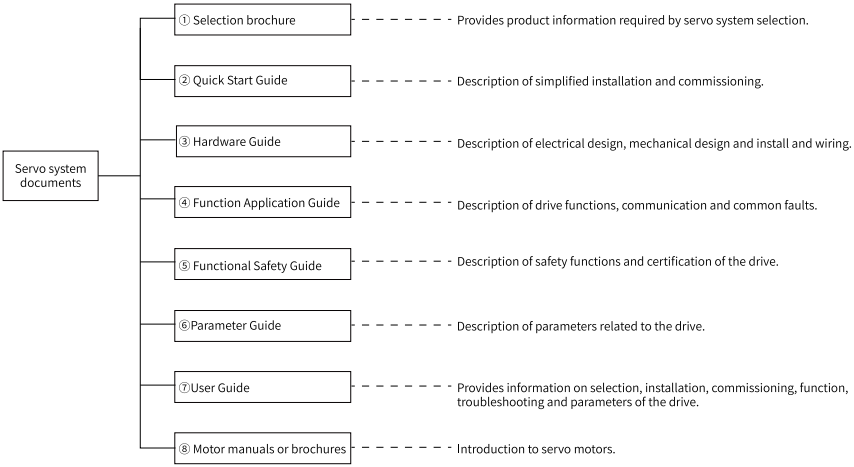
This manual provides information on selection, installation, commissioning, function, troubleshooting and parameters of the equipment.

Note

- The speed of a servo motor and DDR motor is in RPM and DDL motor is in mm/s. RPM is used throughout the manual. Unless otherwise specified, an RPM value is equivalent to the mm/s one.
- The drawings in the manual are shown for description only and may not match the product you purchased.
- The instructions are subject to change due to product upgrade, specification modification as well as efforts to increase the accuracy and convenience of the manual.

More documents

The documents related to the drive are shown in the following figure and table.



No.	Name	Data Code	Description
①	SV680-INT series flagship servo drive	19120347	Provides instructions on product selection, including the list of supporting components, technical data on the drive, and the selection guide of cables.
②	SV680-INT Series Servo Drive Quick Start Guide	PS00015536	Describes the model number, installation, terminals and quick commissioning and operation of the drive.
③	SV680-INT Series Servo Drive Hardware Guide	PS00015494	Describes technical data, installation, terminals, required certificates and standards and solutions to common EMC problems of the drive.
④	SV680-INT Series Servo Drive Function Application Guide	PS00015554	Introduces the functions and faults of the drive, including function overview, adjustment, communication, basic servo functions and fault handling.
⑤	SV680P-INT Series Servo Drive Functional Safety Guide	PS00009740	Describes the safety function and related certifications and standards, wiring, commissioning process, troubleshooting and parameters of the drive.
	SV680N-INT Series Servo Drive Functional Safety Guide	PS00009768	
⑥	SV680-INT Series Servo Drive Parameter Guide	PS00015555	Introduces the parameters of the drive, including a parameter list and description of parameters.
⑦	SV680-INT Series Servo Drive User Guide	PS00018006	Provides information on selection, installation, commissioning, function, troubleshooting and parameters of the equipment.
⑧	MS1-R Series Servo Motor Selection Guide	PS00004605	Introduces the product information, general specifications, motor selection, cable selection, and required certificates and standards of the servo motor.
	MS1-R Series Servo Motor Installation Guide	PS00005407	Describes installation of the motor, including an installation flowchart, unpacking and transportation, mechanical installation, and electrical installation.

No.	Name	Data Code	Description
	Direct drive motor module platform and drive	19120011	Introduces the product information, general specifications, motor selection, cable selection, and required standards of the motor.

Revision History

Date	Version	Description
2024–12	A01	**Added new contents:** Added Section "FSoE Conformance". **Updated contents:** • Updated the communication cabling diagram. • Updated the electrical wiring diagram [P] and electrical wiring diagram [N]. • Updated the table of recommended main circuit cables in Section "Cable Specifications".
2024–11	A00	First release.

Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version in the following way:

- Visit *www.inovance.com*, go to Support > Download, search by keyword, and then download the PDF file.
- Scan the QR code on the product with your mobile phone.
- Scan the QR code below to install the app, where you can search for and download manuals.

Scope of standard functions

This guide describes function applications. The function scope described in the guide may be different from those of the delivered system.

The system may run functions not described in the guide. If necessary, contact the sales personnel.

The guide does not provide all details on all product models. It does not describe all problems that may be present during device installation, operation and maintenance and their countermeasures. The equipment manufacturer shall provide instructions of the functions added or modified by it.

Warranty

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. You will be charged for any repair work after the warranty period expires.

Within the warranty period,maintenance fee will be charged for the following damage:

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or abnormal voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance fee is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see the Product Warranty Card.

Table of Contents

Preface 1
Safety Instructions 22
1 SV680-INT Series Drive 28
1.1 Product Information 28
1.1.1 Model Number and Nameplate 28
1.1.2 Components [Standard P] 30
1.1.3 Components [Standard N] 31
1.1.4 Components - Standby Power Supply Type [Standard P] 33
1.1.5 Components - Standby Power Supply Type [Standard N] 35
1.1.6 Components [Functional safety P] 37
1.1.6.1 Servo Drives in Size A and Size C (Rated Power 0.2 kW to 1.5 kW) 37
1.1.6.2 Servo Drives in Size D (Rated Power 1.5 kW to 3.0 kW) 39
1.1.6.3 Servo Drives in Size E (Rated Power 2.0 kW to 7.5 kW) 43
1.1.7 Components [Functional safety model N] 46
1.1.7.1 Servo Drives in Size A and Size C (Rated Power 0.2 kW to 1.5 kW) 46
1.1.7.2 Servo Drives in Size D (Rated Power 1.5 kW to 3.0 kW) 49
1.1.7.3 Servo Drives in Size E (Rated Power 2.0 kW to 7.5 kW) 52
1.1.8 Product Dimensions 55
1.2 Specifications 55
1.2.1 Electrical Specifications 55
1.2.2 Technical Specifications [P] 59
1.2.3 Technical Specifications [N] 62
1.2.4 Communication Technical Data 64
1.2.5 Dynamic Brake Characteristics 66
1.2.6 Load Moment of Inertia 67
2 Selection 69
2.1 Nameplate and Model Number of the Servo Motor 69
2.2 Selection List [Standard] 70
2.3 Selection List [Functional Safety] 73
2.4 Terminals on the Motor Side 77
2.5 Cables 78
2.5.1 Power cable 78
2.5.2 Encoder cable 81
2.5.3 Communication Cable 82
2.6 Options 83
2.6.1 Peripheral Electrical Components 83
2.6.1.1 List of Peripheral Electrical Components 83
2.6.1.2 Fuse 84
2.6.1.3 Electromagnetic Contactor 85
2.6.1.4 Breaker 86

2.6.1.5 AC Input Reactor 87
2.6.1.6 EMC filter 90
2.6.1.7 Magnetic Ring and Ferrite Clamp 93
2.6.2 Shield Bracket 95
2.6.3 Absolute Encoder Batteries 96
2.6.4 Braking resistor 97
2.7 Connector Kit 110
2.8 Selection of Terminal Accessory Kit 112
3 Installation 114
3.1 Unpacking Inspection 114
3.2 Precautions 118
3.3 Installation of the Servo Drive 121
3.3.1 Installation Environment Requirements 121
3.3.2 Installation Clearance 122
3.3.3 Installation Dimensions [Standard P] 124
3.3.4 Installation Dimensions [Standard N] 126
3.3.5 Standby Power Supply Type - Installation Dimensions [Standard P] 128
3.3.6 Standby Power Supply Type - Installation Dimensions [Standard N] 130
3.3.7 Installation Dimensions [Functional Safety P] 132
3.3.8 Installation Dimensions [Functional Safety N] 134
3.3.9 Pre-installation Check 136
3.3.10 Installing the Drive 136
3.3.11 Post-Inspection 138
3.4 Installation of Optional Parts 138
3.4.1 Instructions for Installing the Fuse and Circuit Breaker 138
3.4.2 Instructions for Installing the AC Input Reactor 138
3.4.3 Instructions for Installing the EMC Filter 139
3.4.4 Instructions for Installing the Magnetic Ring and Ferrite Clamp 140
3.4.5 Instructions for Installing the Shield Bracket 141
4 system Connection 143
4.1 System Composition 143
4.2 System Wiring Diagram [P] 144
4.3 System Wiring Diagram [N] 145
5 Electrical Wiring Diagram 147
5.1 Electrical Wiring Diagram [P] 147
5.2 Electrical Wiring Diagram [N] 149
6 Wiring Terminals 151
6.1 Main Circuit Terminals 151
6.1.1 Terminal Arrangement 151
6.1.2 Wiring Precautions and Requirements 153
6.1.3 Wiring Examples 157

6.1.3.1 Wiring of the Power Supply 157
6.1.3.2 Wiring of the Grounding Cable 159
6.1.4 Cable Requirements 163
6.1.5 Cable Length 164
6.2 Description of Control Terminal (CN1) 167
6.2.1 Terminals [P] 167
6.2.2 Terminals [N] 170
6.2.3 Wiring Precautions and Requirements 171
6.2.4 Wiring Examples 172
6.2.4.1 DI/DO Signals 172
6.2.4.2 Encoder Frequency-Division Output Signals 176
6.2.4.3 AI/AO Signals 178
6.2.4.4 Position Reference Input Signal [P] 180
6.2.5 Cable Requirements 189
6.3 CN2 Encoder Terminal 190
6.3.1 Terminal Arrangement 190
6.3.2 Wiring Precautions and Requirements 191
6.3.3 Wiring Examples 191
6.3.3.1 Communication with the First Encoder 191
6.3.3.2 Communication with the Second Encoder 193
6.3.4 Cable Requirements 195
6.3.5 Adapters of Power Cables and Encoder Cables 195
6.4 Communication Terminals CN3 and CN4 [P] 196
6.4.1 Terminal Arrangement 196
6.4.2 Wiring Precautions and Requirements 196
6.4.3 Wiring Examples 202
6.4.3.1 CAN Communication Connection Example 202
6.4.3.2 RS485 Communication Connection Example 204
6.5 Communication Terminals CN3 and CN4 [N] 206
6.5.1 Terminal Arrangement 206
6.5.2 EtherCAT Communication Connection Example 207
6.5.3 FSoE Connection and Enabling [Functional Safety P] 210
6.5.3.1 FSoE Connection and Setting 210
6.5.3.2 Knob Operating Method 211
6.5.4 Cable Requirements 211
6.6 Description of Communication Terminal (CN5) 214
6.7 CN6 STO Safety Terminal 216
6.7.1 CN6 STO Safety Terminal 216
6.7.2 Wiring Precautions and Requirements 219
6.8 CN7 Encoder Terminal 219
6.8.1 Terminal Arrangement 219
6.8.2 Wiring Examples 220
6.8.2.1 Communication with the First Encoder 220
6.8.2.2 Communication with the Second Encoder 222

6.8.2.3 Connection with the Hall Sensor 224
6.9 Description of Brake and PTC Input Terminal (CN8) 225
6.9.1 Terminal Arrangement 225
6.9.2 Wiring Precautions and Requirements 225
6.9.3 Wiring Examples 226
6.9.3.1 PTC Wiring Example 226
6.9.3.2 Brake Wiring Examples 226
6.10 CN11 24V Terminal 228
6.11 Wiring and Setting of the Braking Resistor 229
7 Terminals [functional safety] 231
7.1 Expansion Safety Function Terminals CN9&CN10 231
7.2 CN11 24V Terminal 241
8 Commissioning Tool 243
8.1 Keypad 243
8.1.1 Components 243
8.1.2 Panel Display 245
8.1.3 Parameter Settings 254
8.2 Commissioning Software 261
8.2.1 Overview 261
8.2.2 Installation 261
8.2.3 Connection 266
8.2.4 Common Functions 269
9 Commissioning and Operation 275
9.1 Commissioning Objects 275
9.2 Commissioning Flowchart 277
9.3 Pre-operation Inspection 277
9.4 Power-on 278
9.5 Installation of Motor management library 279
9.6 Auto-tuning of Magnetic Pole 288
9.6.1 Auto-tuning Steps 292
9.6.2 Pre-positioning Auto-tuning 293
9.6.3 Inching Auto-tuning 294
9.6.4 Closed-loop Pre-positioning Auto-tuning 296
9.6.5 Position Locking Auto-tuning 298
9.6.6 Hall Auto-tuning 301
9.7 Jog 303
9.8 Setting Parameters [P] 306
9.9 Setting Parameters [N] 324
9.10 Drive Operation 334

9.11 Drive stops . . . 343
9.12 Quick Transfer of Motor Parameters . . . 352
10 List of Parameters . . . 353
11 Adjustment . . . 357
11.1 Overview . . . 357
11.2 Current Loop Adjustment . . . 358
11.3 Inertia Auto-tuning . . . 362
11.3.1 Offline Inertia Auto-tuning . . . 363
11.3.2 Online Inertia Auto-tuning . . . 365
11.4 Auto Gain Tuning . . . 367
11.4.1 STune . . . 367
11.4.2 ETune . . . 374
11.5 Manual Gain Tuning . . . 382
11.5.1 Basic Parameters . . . 382
11.5.2 Gain Switchover . . . 385
11.5.3 Position Reference Filter . . . 391
11.5.4 Feedforward gain . . . 391
11.5.5 PDFF Control . . . 394
11.5.6 Torque disturbance observer . . . 396
11.5.7 Speed Observer . . . 397
11.5.8 Model Tracking . . . 399
11.5.9 Friction Compensation . . . 402
11.5.10 Encoder Scale Ripple Suppression . . . 403
11.5.11 Motor Cogging Torque Ripple Compensation . . . 406
11.6 Parameter Adjustment in Different Control Modes . . . 408
11.6.1 Parameter Adjustment in the Speed Control Mode . . . 408
11.6.2 Parameter Adjustment in the Position Control Mode . . . 408
11.6.3 Parameter Adjustment in the Torque Control Mode . . . 410
11.7 Vibration suppression . . . 411
11.7.1 Mechanical Resonance Suppression . . . 412
11.7.2 Low-Frequency Resonance Suppression at the Mechanical End . . . 418
11.8 Mechanical Characteristic Analysis . . . 421
11.9 High-performance Tuning . . . 422
12 Control mode . . . 427
12.1 Setting and Display of the Operation Modes . . . 428
12.2 Conversion Factor . . . 428
12.3 Servo State . . . 431
12.3.1 Control Word 6040h . . . 434
12.3.2 Status Word 6041h . . . 435
12.4 Process Segment Mode . . . 436

12.4.1 Mode Triggering 437
12.4.2 Related Parameters 440
12.4.3 operation mode 443
12.4.4 DO and Sequence 455
12.5 Profile Position Mode (PP) 456
12.5.1 Function Block Diagram 457
12.5.2 Configuration Block Diagram 457
12.5.3 Recommended Configuration 460
12.5.4 Related Parameters 460
12.5.5 Related Functions 463
12.6 Profile Velocity Mode (PV) 466
12.6.1 Function Block Diagram 466
12.6.2 Configuration Block Diagram 466
12.6.3 Recommended Configuration 466
12.6.4 Related Parameters 467
12.6.5 Related Functions 469
12.7 Profile Torque Mode (PT) 471
12.7.1 Function Block Diagram 471
12.7.2 Configuration Block Diagram 471
12.7.3 Recommended Configuration 472
12.7.4 Related Parameters 472
12.7.5 Related Functions 475
12.8 Homing Mode (HM) 478
12.8.1 Function Block Diagram 479
12.8.2 Configuration Block Diagram 479
12.8.3 Recommended Configuration 479
12.8.4 Related Parameters 480
12.8.5 Related Functions 483
12.8.6 Homing Operation 485
12.9 Position Control Mode 508
12.9.1 Function Block Diagram 509
12.9.2 Position Reference Input 509
12.9.3 Reference Frequency Division/Multiplication (Electronic Gear Ratio) 532
12.9.4 Position reference filter 539
12.9.5 Position Deviation Clearance 540
12.9.6 Frequency-division Output 541
12.9.7 Motion Control Completed, Internal Command Completed, Positioning Completed, Proximity 544
12.10 Speed Control Mode 552
12.10.1 Function Block Diagram 553
12.10.2 Speed Reference Input 553
12.10.3 Ramp Function 569
12.10.4 Zero Clamp 570
12.10.5 Speed Reference Limit 572

12.10.6 Speed-Related DO 573
12.11 Torque Control Mode 578
12.11.1 Function Block Diagram 580
12.11.2 Torque Reference 581
12.11.3 Torque Reference Filter 589
12.11.4 Torque Reference Limit 590
12.11.5 Speed Limit in Torque Control Mode 598
12.11.6 Torque Reach Output [P] 603
13 Control Mode [P] 606
13.1 Mixed Control Mode 606
13.2 Interpolation Mode (IP) 607
13.2.1 Function Block Diagram 609
13.2.2 Configuration Block Diagram 609
13.2.3 Recommended Configuration 609
13.2.4 Related Parameters 610
13.2.5 Related Functions 612
13.3 Homing 613
13.4 Interrupt Positioning 631
14 Control Mode [N] 635
14.1 Cyclic Synchronous Position Mode (CSP) 635
14.1.1 Function Block Diagram 635
14.1.2 Configuration Block Diagram 635
14.1.3 Recommended Configuration 636
14.1.4 Related Parameters 636
14.1.5 Related Functions 639
14.2 Cyclic Synchronous Velocity Mode (CSV) 639
14.2.1 Function Block Diagram 639
14.2.2 Configuration Block Diagram 640
14.2.3 Recommended Configuration 640
14.2.4 Related Parameters 640
14.2.5 Related Functions 642
14.3 Cyclic Synchronous Torque Mode (CST) 643
14.3.1 Function Block Diagram 643
14.3.2 Configuration Block Diagram 643
14.3.3 Recommended Configuration 643
14.3.4 Related Parameters 644
14.3.5 Related Functions 646
15 Function Applications 649
15.1 Absolute System 649
15.1.1 Overview 649
15.1.2 Related Parameters 651
15.1.3 Precautions for Using the Battery Box 658

15.2 Full Closed-loop 659
15.2.1 Full Closed-loop Parameter Setting 659
15.2.2 Enable Fully Closed-loop 665
15.3 Software Limit 666
15.4 Software Reset 668
15.5 Motor Protection 668
15.6 DI Filter Time [P] 671
15.7 DI Filter Time [N] 672
15.8 Communication-forced DO [P] 672
15.9 EtherCAT-forced DO [N] 673
15.10 Position Comparison 674
15.11 Black Box 685
15.12 Touch Probe 689
15.13 SEMI F47 Voltage Drop 694
15.14 Accuracy Compensation 698
15.14.1 Function 698
15.14.2 Application Cases 706
15.15 Gantry Synchronization 723
15.15.1 Wiring 724
15.15.2 Gantry Commissioning Schemes 727
15.15.3 Gantry Commissioning Process 732
15.15.4 Single-axis Installation and Commissioning 733
15.15.5 Commissioning of 2-axis Gantry 733
15.15.5.1 Commissioning Process of Gantry Sync Control Scheme 1 735
15.15.5.2 Commissioning Process of Gantry Sync Control Scheme 2 741
15.15.6 Flexible Gantry Homing Trajectory 743
16 Extended Safety Functions [functional safety] 761
16.1 General 761
16.1.1 List of Safety Functions 761
16.1.2 Terms and Abbreviations 762
16.1.3 Safety Standards 763
16.1.4 Precautions for Use 765
16.2 General 770
16.3 Software Parameter Configuration 772
16.4 Safety DIDO Function 775
16.4.1 Safety DI Function 775
16.4.2 Safety DO Function 778
16.5 FSoE [functional safety N] 779
16.5.1 Overview 779
16.5.2 Fixed Safety PDO Setting 780

16.6 Safe Torque Off (STO) 782
16.6.1 Overview 782
16.6.2 STO Triggered by Local Mode 782
16.6.3 STO Triggered by Bus Mode [functional safety N] 786
16.6.4 Sequence Diagram 787
16.7 Safe Brake Control (SBC) 789
16.7.1 Overview 789
16.7.2 SBC Triggered by Local Mode 790
16.7.3 SBC Triggered by Bus Mode [functional safety N] 794
16.7.4 Sequence Diagram 794
16.8 1: Safe Stop 1 (SS1) 797
16.8.1 Overview 797
16.8.2 SS1 Triggered by Local Mode 798
16.8.3 SS1 Triggered by Bus Mode 802
16.8.4 Sequence Diagram 804
16.9 2: Safe Stop 1 (SS2) 806
16.9.1 Overview 806
16.9.2 SS2 Triggered by Local Mode 807
16.9.3 SS2 Triggered by Bus Mode 812
16.9.4 Sequence Diagram 814
16.10 Safe Operating Stop (SOS) 816
16.10.1 Overview 816
16.10.2 SOS Triggered by Local Mode 816
16.10.3 SOS Triggered by Bus Mode [functional safety N] 818
16.10.4 Sequence Diagram 819
16.11 Safety-limited Speed (SLS) 820
16.11.1 Overview 820
16.11.2 SLS Triggered by Local Mode 820
16.11.3 SLS Triggered by Bus Mode [functional safety N] 825
16.11.4 Sequence Diagram 826
16.12 Safe Direction (SDI) 827
16.12.1 Overview 827
16.12.2 SDI Triggered by Local Mode 828
16.12.3 SDI Triggered by Bus Mode [functional safety N] 833
16.12.4 Sequence Diagram 833
16.13 Safe Speed Monitor (SSM) 835
16.13.1 Overview 835
16.13.2 SSM Triggered Locally 836
16.13.3 SSM Triggered by Bus Mode [functional safety N] 838
16.13.4 Sequence Diagram 839
16.14 Safety Function Response Time 840
16.14.1 Response Time in Local Mode 840
16.14.2 Response Time in Bus Mode 841

16.15 Fault Reset . . . 842
16.16 Safety Module Working with Beckhoff Safety CPU [Functional Safety N] . . . 842
17 Commissioning and Operation [functional safety] . . . 876
17.1 Pre-operation Inspection . . . 876
17.2 Trial Run . . . 876
17.3 Verification and validation . . . 877
18 STO . . . 882
18.1 General . . . 882
18.1.1 Terms and Abbreviations . . . 882
18.1.2 Safety Standards . . . 882
18.1.3 Precautions for Use . . . 884
18.2 Safety Function . . . 890
18.2.1 Overview . . . 890
18.2.2 Function Use and Monitoring . . . 891
18.2.3 Fault reset . . . 893
18.2.4 Safety Function Response Time . . . 894
18.3 Acceptance . . . 895
18.4 Troubleshooting . . . 897
19 Communication . . . 899
19.1 Communication Protocols . . . 899
19.2 Modbus Communication [P] . . . 899
19.2.1 Communication . . . 899
19.2.1.1 Communication Technical Data . . . 899
19.2.1.2 Protocols . . . 899
19.2.2 Hardware Configuration . . . 900
19.2.2.1 Terminal Arrangement . . . 900
19.2.2.2 RS485 Communication Connection Example . . . 900
19.2.3 Communication Transmission Mode . . . 902
19.2.4 Data Frame Structure . . . 903
19.2.5 Communication Parameters . . . 911
19.3 CANopen Communication [P] . . . 912
19.3.1 Communication . . . 912
19.3.1.1 Communication Technical Data . . . 912
19.3.1.2 Protocols . . . 913
19.3.2 Hardware Configuration . . . 913
19.3.2.1 Terminal Layout . . . 913
19.3.2.2 CAN Communication Connection Example . . . 914
19.3.3 Communication Transmission Mode . . . 916
19.3.4 Data Frame Structure . . . 917
19.3.4.1 Network Management System (NMT) . . . 917
19.3.4.2 Service data object (SDO) . . . 922
19.3.4.3 Process Data Object (PDO) . . . 922

19.3.4.4 Synchronization Object (SYNC) 928
19.3.4.5 Emergency (EMCY) Object Service 931
19.3.4.6 SDO Transmission Message 932
19.3.4.7 SDO Transmission Framework 934
19.3.5 Communication Parameters 935
19.4 EtherCAT Communication [N] 936
19.4.1 Communication 936
19.4.1.1 Communication Technical Data 936
19.4.1.2 Communication Specifications 937
19.4.1.3 Protocols 937
19.4.2 Hardware Configuration 939
19.4.2.1 Terminal Arrangement 939
19.4.2.2 EtherCAT Communication Connection Example 940
19.4.3 Communication Transmission Mode 943
19.4.3.1 Structure of EtherCAT Communication 943
19.4.3.2 Communication State Machine 944
19.4.3.3 Distributed clock 945
19.4.3.4 Status Indication 946
19.4.4 Data Frame Structure 949
19.4.4.1 Process Data 949
19.4.4.2 Mailbox Data 954
19.4.5 Communication Parameters 954
19.5 Communication Configuration Instance 955
19.5.1 Modbus Communication Configuration Case [P] 955
19.5.1.1 Communication Overview 955
19.5.1.2 Wiring of Modbus RTU Communication Between SV680P-INT and Third-Party PLCs . 956
19.5.1.3 Related Parameter Settings 958
19.5.1.4 PLC Program Examples 958
19.5.2 CANopen Communication Configuration Case [P] 959
19.5.2.1 Connecting SV680P-INT to Schneider 3S Master 959
19.5.2.2 Connecting SV680P-INT to Beckoff CANopen Master 978
19.5.2.3 Connecting SV680P-INT to Inovance H3U CANopen Master 994
19.5.2.4 Connecting SV680P-INT to Inovance EASY CANopen Master 1005
19.5.3 EtherCAT Communication Configuration Case [N] 1015
19.5.3.1 SV680N-INT and AM600 Controller 1015
19.5.3.2 SV680N-INT and Omron Controller 1024
19.5.3.3 SV680N-INT and Beckhoff Controller 1040
19.5.3.4 SV680N-INT and KEYENCE KV7500 Controller 1056
19.5.3.5 SV680N-INT and EASY Controller 1073
20 Parameter List [Standard P] 1087
20.1 H00 Servo Motor Parameters 1088
20.2 H01 Servo Drive Parameters 1091
20.3 H02 Basic Control Parameters 1092
20.4 H03 Terminal Input Parameters 1097

20.5 H04 Terminal Output Parameters 1103
20.6 H05 Position Control Parameters 1108
20.7 H06 Speed Control Parameters 1116
20.8 H07 Torque Control Parameters 1122
20.9 H08 Gain Parameters 1125
20.10 H09 Auto-tuning Parameters 1130
20.11 H0A Fault and Protection Parameters 1135
20.12 H0b Monitoring Parameters 1140
20.13 H0C Fault and Protection Parameters 2 1146
20.14 H0d Auxiliary Function Parameters 1146
20.15 H0E Communication Function Parameters 1147
20.16 H0F Fully Closed-loop Parameters 1150
20.17 H11 Multi-Position Parameters 1154
20.18 H12 Multi-Speed Parameters 1159
20.19 H13 Application Safety Parameters 1168
20.20 H14 Gantry Synchronization Parameters 1168
20.21 H17 Virtual DI/DO Parameters 1172
20.22 H18 Position Comparison Output Parameters 1188
20.23 H19 Target Position Parameters 1190
20.24 H1F Software Tool Parameters 1214
20.25 H21 Current Loop Gain Switchover Parameters 1214
20.26 H22 Process Segment Parameters 1215
20.27 H23 Process Segment Parameters 1219
20.28 H30 Related Variables Read through Communication 1221
20.29 H31 References Set through Communication 1221
20.30 H32 Direct Drive Parameters 1222
20.31 H33 Compensation Parameters 1228
20.32 H34 Servo Motor Parameters 2 1231
20.33 List of 1000h Object Dictionary 1232
20.34 List of 6000h Object Dictionary 1237
21 Description of Parameters [Standard P] 1244
21.1 H00 Servo Motor Parameters 1244
21.2 H01 Servo Drive Parameters 1253
21.3 H02 Basic Control Parameters 1258
21.4 H03 Terminal Input Parameters 1271

21.5 H04 Terminal Output Parameters 1294
21.6 H05 Position Control Parameters 1303
21.7 H06 Speed Control Parameters 1324
21.8 H07 Torque Control Parameters 1341
21.9 H08 Gain Parameters 1351
21.10 H09 Auto-tuning Parameters 1368
21.11 H0A Fault and Protection Parameters 1387
21.12 H0B Monitoring Parameters 1406
21.13 H0C Fault and Protection Parameters 2 1425
21.14 H0D Auxiliary Parameters 1426
21.15 H0E Communication Function Parameters 1431
21.16 H0F Fully Closed-Loop 1439
21.17 H11 Multi-position 1452
21.18 H12 Multi-Speed 1475
21.19 H13 Application Safety Parameters 1499
21.20 H14 Gantry Synchronization 1500
21.21 H17 Virtual DI/DO 1512
21.22 H18 Position Comparison Output 1562
21.23 H19 Target Position Parameters 1567
21.24 H1F Software Parameters 1603
21.25 H21 Current Loop Gain Switchover Parameters 1605
21.26 H22 Technology Segment Parameters 1605
21.27 H23 Technology Segment 1619
21.28 H30 Related Variables Read through Communication 1628
21.29 H31 Communication Setting 1630
21.30 H32 Direct Drive Parameters 1631
21.31 H33 Compensation Parameters 1649
21.32 H34 Servo Motor Parameters 2 1666
21.33 1000h Object Dictionary 1667
21.34 6000h Object Dictionary 1688
22 Parameter List [Standard N] 1714
22.1 H00 Servo Motor Parameters 1715
22.2 H01 Servo Drive Parameters 1718
22.3 H02 Basic Control Parameters 1719
22.4 H03 Terminal Input Parameters 1724

22.5 H04 Terminal Output Parameters 1731
22.6 H05 Position Control Parameters 1732
22.7 H06 Speed Control Parameters 1739
22.8 H07 Torque Control Parameters 1745
22.9 H08 Gain Parameters 1747
22.10 H09 Auto-tuning Parameters 1752
22.11 H0A Fault and Protection Parameters 1757
22.12 H0b Monitoring Parameters 1761
22.13 H0C Fault and Protection Parameters 2 1767
22.14 H0d Auxiliary Function Parameters 1768
22.15 H0E Communication Function Parameters 1769
22.16 H0F Fully Closed-loop Parameters 1772
22.17 H11 Multi-Position Parameters 1776
22.18 H12 Multi-Speed Parameters 1781
22.19 H13 Application Safety Parameters 1790
22.20 H14 Gantry Synchronization Parameters 1790
22.21 H17 Virtual DI/DO Parameters 1794
22.22 H18 Position Comparison Output Parameters 1820
22.23 H19 Target Position Parameters 1822
22.24 H1F Software Tool Parameters 1845
22.25 H21 Current Loop Gain Switchover Parameters 1846
22.26 H22 Process Segment Parameters 1846
22.27 H23 Process Segment Parameters 1850
22.28 H30 Related Variables Read through Communication 1852
22.29 H31 References Set through Communication 1853
22.30 H32 Direct Drive Parameters 1853
22.31 H33 Compensation Parameters 1859
22.32 H34 Servo Motor Parameters 2 1863
22.33 List of 1000h Object Dictionary 1863
22.34 List of 6000h Object Dictionary 1867
23 Description of Parameters [Standard N] 1874
23.1 H00 Servo Motor Parameters 1874
23.2 H01 Servo Drive Parameters 1883
23.3 H02 Basic Control Parameters 1888
23.4 H03 Terminal Input Parameters 1899

23.5 H04 Terminal Output Parameters 1911
23.6 H05 Position Control Parameters 1915
23.7 H06 Speed Control Parameters 1929
23.8 H07 Torque Control Parameters 1945
23.9 H08 Gain Parameters 1954
23.10 H09 Auto-tuning Parameters 1970
23.11 H0A Fault and Protection Parameters 1989
23.12 H0B Monitoring Parameters 2007
23.13 H0C Fault and Protection Parameters 2 2025
23.14 H0D Auxiliary Parameters 2026
23.15 H0E Communication Function Parameters 2031
23.16 H0F Fully Closed-Loop 2040
23.17 H11 Multi-position 2054
23.18 H12 Multi-Speed 2077
23.19 H13 Application Safety Parameters 2100
23.20 H14 Gantry Synchronization 2101
23.21 H17 Virtual DI/DO 2113
23.22 H18 Position Comparison Output 2150
23.23 H19 Target Position Parameters 2156
23.24 H1F Software Parameters 2191
23.25 H21 Current Loop Gain Switchover Parameters 2194
23.26 H22 Technology Segment Parameters 2194
23.27 H23 Technology Segment 2208
23.28 H30 Related Variables Read through Communication 2216
23.29 H31 Communication Setting 2218
23.30 H32 Direct Drive Parameters 2220
23.31 H33 Compensation Parameters 2237
23.32 H34 Servo Motor Parameters 2 2255
23.33 1000h Object Dictionary 2256
23.34 6000h Object Dictionary 2272
24 Parameter List [Functional Safety P] 2298
24.1 H02 Parameters 2298
24.2 H0A Parameters 2298
24.3 H20 Parameters 2299
25 Description of Parameters [Functional safety P] 2306

25.1 H02 Basic Control Parameters 2306
25.2 H0A Fault and Protection Parameters. 2307
25.3 H20 Functional Safety Parameters 2308
26 Parameter List [Functional Safety N]. 2329
26.1 H02 Parameters 2329
26.2 H0A Parameters 2329
26.3 H20 Parameters 2330
26.4 6000 Parameters 2337
27 Description of Parameters [Functional safety N] 2341
27.1 H02 Basic Control Parameters 2341
27.2 H0A Fault and Protection Parameters. 2342
27.3 H20 Functional Safety Parameters 2343
27.4 6000h Object Dictionary 2363
28 Troubleshooting. 2385
28.1 Fault Level and Display. 2385
28.2 Fault Reset. 2386
28.3 Handling of Faults and Alarms [Standard P] 2387
28.3.1 List of Fault Codes 2387
28.3.2 List of Alarm Codes. 2393
28.3.3 Description of Fault Codes 2396
28.3.3.1 Solutions to Faults 2396
28.3.3.2 Internal Faults 2466
28.3.4 Description of Alarm Codes. 2467
28.4 Handling of Faults and Alarms [Standard N] 2487
28.4.1 List of Fault Codes 2487
28.4.2 List of Alarm Codes. 2495
28.4.3 Description of Fault Codes 2497
28.4.3.1 Solutions to Faults 2497
28.4.3.2 Internal Faults 2576
28.4.4 Description of Alarm Codes. 2577
28.5 Handling of Faults and Alarms [Functional Safety P] 2597
28.5.1 List of Fault and Alarm Codes 2597
28.5.2 Solutions to Faults 2601
28.5.3 Solutions to Alarms 2622
28.6 Handling of Faults and Alarms [Functional Safety N] 2624
28.6.1 List of Fault and Alarm Codes 2624
28.6.2 Solutions to Faults 2628
28.6.3 Solutions to Alarms 2653
29 Maintenance 2656
29.1 Routine Maintenance Items. 2656

29.1.1 Routine Inspection 2656
29.1.2 Routine Cleaning 2656
29.2 Periodic Inspection Items 2657
29.2.1 Periodic Inspection Items 2657
29.2.2 Periodic Maintenance 2657
29.3 Replacing the drive 2658
30 Service and Support 2660
31 Appendix 2662
31.1 Certification and Standard Requirements 2662
31.1.1 CE Certification 2663
31.1.1.1 Requirements for Compliance with EMC 2663
31.1.1.2 Requirements for Compliance with LVD 2664
31.1.1.3 Cable Specifications (CE) 2665
31.1.2 UL&UL Certification 2667
31.1.2.1 UL/cUL Certification. 2667
31.1.2.2 Cable Specifications (UL) 2671
31.1.3 KC Certification 2673
31.1.4 UKCA Certification 2674
31.1.5 Functional Safety Certification 2674
31.1.6 FSoE Conformance 2674
31.2 Solutions to Common EMC Problems 2674
31.2.1 Residual Current Device Malfunction 2674
31.2.2 Harmonic Suppression 2675
31.2.3 Control Circuit Interference. 2676
31.2.3.1 High-speed Pulse Interference [P] 2676
31.2.3.2 Interference with Control Circuit Wiring 2676
31.2.3.3 Common I/O Signal Interference 2676
31.2.4 Communication Interference 2677
31.2.4.1 RS485&CAN Communication Interference [P] 2677
31.2.4.2 EtherCAT Communication Interference [N] 2678
31.3 Display of Monitoring Parameters 2678
31.4 DIDO Function Assignment [Standard P] 2685
31.5 DIDO Function Assignment [Standard N] 2694
31.6 DIDO Function Assignment [Functional Safety N] 2699

Safety Instructions

Disclaimer

- This chapter presents essential safety instructions for a proper use of the equipment. Before operating the equipment, read through the guide and comprehend all the safety instructions. Failure to comply with the safety precautions may result in death, serious injury, or equipment damage.
- "CAUTION", "WARNING", and "DANGER" items in the guide only indicate some of the precautions that need to be followed; they just supplement the safety precautions.
- Use this equipment according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by improper use.

Safety Levels and Definitions

	Indicates that failure to comply with the notice will result in death or severe personal injuries.
	Indicates that failure to comply with the notice may result in death or severe personal injuries.
	Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage.

Safety Instructions

- Drawings in the guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.
- Users must take mechanical precautions to protect personal safety and wear protective equipment, such as anti-smashing shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

Unpacking

• Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon unpacking.

- Do not install the equipment if you find water seepage or missing or damaged components upon unpacking.
- Do not install the equipment if you find the packing list does not conform to the equipment you received.



- Check whether the package is intact and whether there is damage, water seepage, dampness, and deformation before unpacking.
- Unpack the package by following the unpacking sequence. Do not strike the package violently.
- Check whether there is damage, rust, or injuries on the surface of the equipment and equipment accessories before unpacking.
- Check whether the package contents are consistent with the packing list before unpacking.

Storage and Transportation



- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries or equipment damage.
- Before hoisting the equipment, ensure the equipment components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is being hoisted by the hoisting equipment.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injuries or equipment damage.



- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing this product for more than three months. Long-term storage requires stricter protection and necessary inspections.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.

Installation



- The equipment must be operated only by professionals with electrical knowledge. Non-professionals are not allowed.



- Read through the guide and safety instructions before installation.
- Do not install this equipment in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock.
- When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or a fire.
- Do not retrofit the equipment.
- Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- When this product is installed in a cabinet or terminal equipment, protection measures such as a fireproof enclosure, electrical enclosure, or mechanical enclosure must be provided. The IP rating must meet IEC standards and local laws and regulations.
- Before installing equipments with strong electromagnetic interference, such as a transformer, install a shielding equipment for the equipment to prevent malfunction.
- Install the equipment onto an incombustible object such as a metal. Keep the equipment away from combustible objects. Failure to comply will result in a fire.



- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on the top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.
- Resonance may occur when the equipment operating at a constant speed executes variable speed operations. In this case, install the vibration-proof rubber under the motor frame or use the vibration suppression function to reduce resonance.

Wiring



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Before wiring, cut off all the power supplies of the equipment. and wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. After waiting for the designated time, measure the DC voltage in the main circuit to ensure the DC voltage is within the safe voltage range. Failure to comply will result in an electric shock.

- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply will result in an electric shock.
- Check that the equipment is grounded properly. Failure to comply can result in electric shock.



- Do not connect the input power supply to the output end of the equipment. Failure to comply can result in equipment damage or even a fire.
- When connecting a drive to the motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- Fix the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may overheat or damage the connecting part, resulting in a fire.
- After wiring is done, check that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment. Failure to comply may result in an electric shock or equipment damage.



- Follow the proper electrostatic discharge (ESD) procedure and wear an anti-static wrist strap to perform wiring. Failure to comply may result in damage to the equipment or to the internal circuit of the product.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply will result in equipment malfunction.

Power-on



- Before power-on, check that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or a fire.
- After power-on, do not open the cabinet door or protective cover of the equipment, touch any terminal, or disassemble any unit or component of the equipment. Failure to comply will result in an electric shock.



- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in personal injuries or equipment damage.
- Before power-on, check that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may result in a fire.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in death or personal injuries.

Operation



- The equipment must be operated only by professionals. Failure to comply will result in death or personal injuries.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply will result in an electric shock.



- Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in personal injuries.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage.

Maintenance



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment with power ON. Failure to comply will result in an electric shock.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- In case of a permanent magnet motor, do not touch the motor terminals immediately after power-off because the motor terminals will generate induced voltage during rotation even after the equipment power supply is off. Failure to comply will result in an electric shock.



- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Repair



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not repair the equipment with power ON. Failure to comply will result in an electric shock.
- Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.



- Submit the repair request according to the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before

power-on or further operations. Failure to comply may result in death, personal injuries or equipment damage.
- When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly.
- Replace quick-wear parts of the equipment according to the replacement instructions.
- Do not use damaged equipment. Failure to comply may result in death, personal injuries, or severe equipment damage.
- After the equipment is replaced, check the wiring and set parameters again.

Disposal



- Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, personal injuries, or even death.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

Additional Precautions

Cautions for Motor Grounding

For applications such as welding machines, connect the PE cable of the motor to the screws of the cast component of the drive. Failure to comply may result in damage to the motor.

Effect of the electromagnetic field on implants

- The motor may harm a nearby person who wears a medical implant.
- The electromagnetic field may cause malfunction of the medical Implant (such as the heartbeat starter) being used.

Safety label

For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. The following table describes the meaning of the safety labels.

Safety label	Description
	• Never fail to connect the protective earth (PE) terminal. Read through the guide and follow the safety instructions before use. • Do not touch terminals within 15 minutes after disconnecting the power supply to prevent the risk of electric shock. • Do not touch the heatsink with power ON to prevent the risk of burn.

1 SV680-INT Series Drive

1.1 Product Information

1.1.1 Model Number and Nameplate

Description of the Model

SV680 N S 2R8 I - GINT
① ② ③ ④ ⑤ ⑥

①**Product series** SV680: SV680 general-purpose servo drive	④**Rated output current**		⑤**Model configuration** I: Standard type S: Functional safety type
②**Product type** N: EtherCAT P: Pulse + CANopen	S: 200 V	1R6: 1.6 A 2R8: 2.8 A 5R5: 5.5 A 7R6: 7.6 A 012: 12.0 A 018: 18.0 A 022: 22.0 A 027: 27.0 A	⑥**Model configuration** GINT: General (global version) PINT: Backup power supply (global version)
③**Voltage class** S: 200 V T: 400 V	T: 400 V	3R5: 3.5 A 5R4: 5.4 A 8R4: 8.4 A 012: 12.0 A 017: 17.0 A 021: 21.0 A 026: 26.0 A	

Nameplate

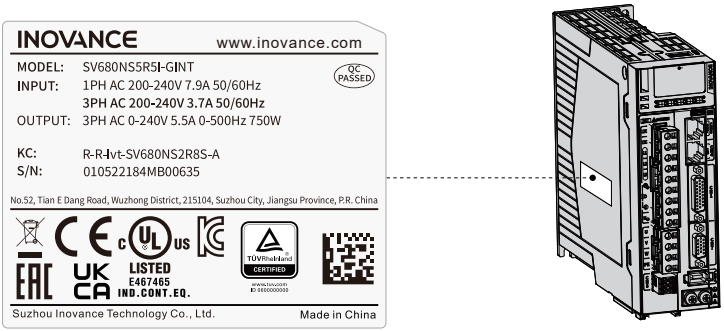


Figure 1-1 Nameplate (standard)

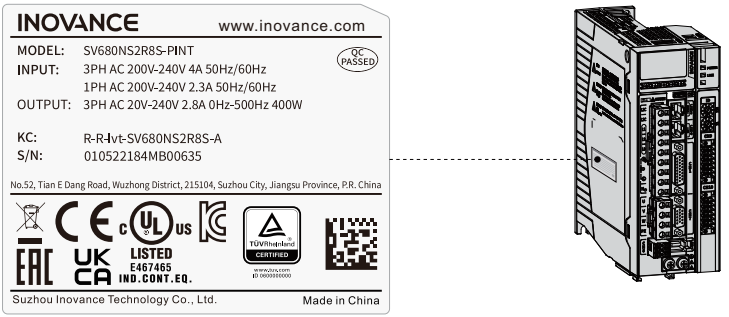


Figure 1-2 Nameplate (functional safety)

Encryption of the production serial number

01050202 4 S 7 00001
① ② ③ ④ ⑤

① **Internal code** Equipment material code	③ **Year** 9: 2009 A: 2010 ... S: 2024 ... Note: I/L/O/Q is not used.	⑤ **Lot number** 00001: 1st in current month 00002: 2nd in current month 00003: 3rd in current month ... Range: 00001 to 99999
② **Manufacturer code** 4: Suzhou Inovance	④ **Month** 1: January 2: February ... A: October B: November C: December	

Example: The S/N 010502024S700001 indicates the drive is manufactured in July, 2024.

Product Name Abbreviation

The following abbreviations will be used herein to refer to the corresponding servo drives.

Abbreviation	Servo Drive
[P]	SV680P*****-*INT
[N]	SV680N*****-*INT
[Standard P]	SV680P****I-*INT
[Standard N]	SV680N****I-*INT
[Functional safety P]	SV680P****S-*INT
[Functional safety N]	SV680N****S-*INT

1.1.2 Components [Standard P]

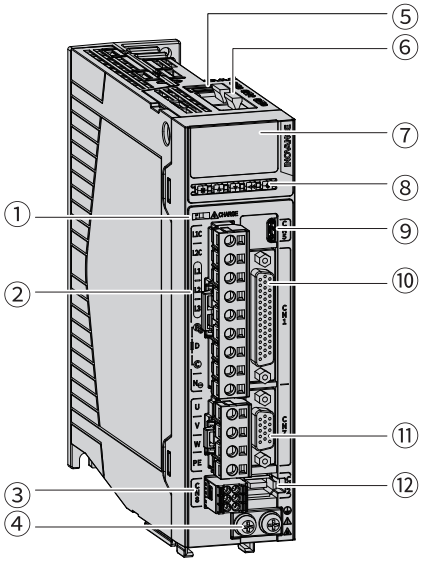


Figure 1-3 Servo drive components

Table 1–1 Description of servo drive components

No.	Name	Description
①	CHARGE (bus voltage indicator)	Indicates the electric charge is present in the bus capacitor. When the indicator turns on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To prevent electric shock, do not touch the power terminals when this indicator lights up.
②	Main circuit terminal	For detailed description of main circuit terminals, see the related section.
③	CN8 (brake and PTC input terminal)	Connected to brake and PTC.
④	Servo drive grounding terminal	Connected to the grounding terminal of the power supply for grounding purpose.
⑤	CN6 (STO safety function terminal)	Connected to external functional safety signal for functional safety purpose.
⑥	CN3, CN4 (communication terminals)	Connected to Modbus and CANopen host controllers in parallel.
⑦	LED display	The 5-digit 8-segment LED display is used to show servo system's running state and parameter setting.

No.	Name	Description
⑧	Keys	M: Used to switch parameters in sequence. ▲: Increases the value of the blinking digit. ▼: Decreases the value of the blinking digit. ◀◀ : Used to shift the blinking position leftwards (long press to turn to the next page when the displayed number exceeds five digits). S: Saves modifications and enters the next menu.
⑨	CN5 communication terminal	Supports online upgrade and background commissioning when the drive is powered on. In USB mode, the terminal only supports download and upload of parameters, and driver firmware update; The terminal uses USB power supply. If there is a fault that cannot be completely reset, disconnect the USB power supply and drive control power, and then power on again.
⑩	CN1 (control terminal)	Used by reference input signals and other I/O signals.
⑪	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder. Supports gantry synchronization.
12	CN2 (encoder feedback terminal)	Supports communication-type encoders. Supports gantry synchronization.

1.1.3 Components [Standard N]

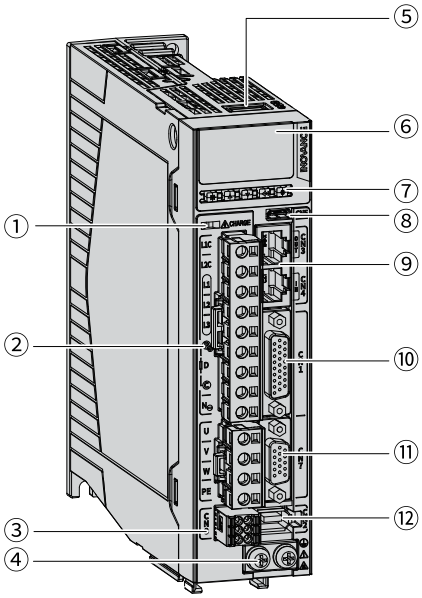


Figure 1-4 Servo drive components

Table 1–2 Description of servo drive components

No.	Name	Description
①	CHARGE (bus voltage indicator)	Indicates the electric charge is present in the bus capacitor. When the indicator turns on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To prevent electric shock, do not touch the power terminals when this indicator lights up.
②	Main circuit terminal	For detailed description of main circuit terminals, see the related section.
③	CN8 (brake and PTC input terminal)	Connected to brake and PTC.
④	Servo drive grounding terminal	Connected to the grounding terminal of the power supply for grounding purpose.
⑤	CN6 (STO safety function terminal)	Connected to external functional safety signal for functional safety purpose.
⑥	LED display	The 5-digit 8-segment LED display is used to show servo system's running state and parameter setting.
⑦	Keys	M: Used to switch parameters in sequence. ▲: Increases the value of the blinking digit. ▼: Decreases the value of the blinking digit. ◀◀: Used to shift the blinking position leftwards (long press to turn to the next page when the displayed number exceeds five digits). S: Saves modifications and enters the next menu.
⑧	CN5 (communication terminals)	Supports online upgrade and background commissioning when the drive is powered on.
⑨	CN3, CN4 (EtherCAT communication terminals)	CN4 (IN): Connected to the master or the last slave device CN3 (OUT): Connected to the next slave device
⑩	CN1 (control terminal)	Used by reference input signals and other I/O signals.
⑪	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder. Supports gantry synchronization.
12	CN2 (encoder feedback terminal)	Supports communication-type encoders. Supports gantry synchronization.

1.1.4 Components - Standby Power Supply Type [Standard P]

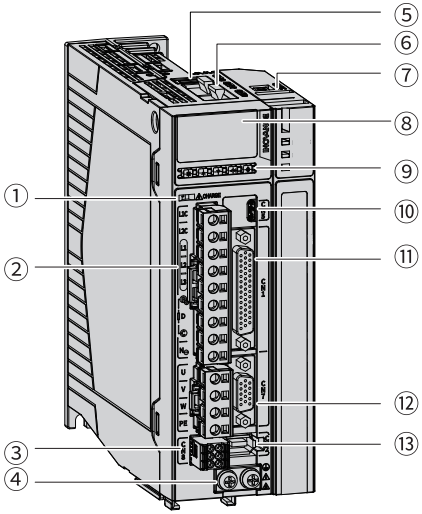


Figure 1-5 Servo drive components

Table 1–3 Description of servo drive components

No.	Name	Description
①	CHARGE (bus voltage indicator)	Indicates the electric charge is present in the bus capacitor. When the indicator turns on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To prevent electric shock, do not touch the power terminals when this indicator lights up.
②	Main circuit terminal	For detailed description of main circuit terminals, see see the related section.
③	CN8 (brake and PTC input terminal)	Connected to brake and PTC.
④	Servo drive grounding terminal	Connected to the grounding terminal of the power supply for grounding purpose.
⑤	CN6 (STO safety function terminal)	Connected to external functional safety signal for functional safety purpose.
⑥	CN3, CN4 (communication terminals)	Connected to Modbus and CANopen host controllers in parallel.
⑦	CN11 (24 V standby power input terminal)	When the main circuit is not energized, it supplies power to the control circuit to maintain functions like programming, parameter configuration in the software tool, and communication.

No.	Name	Description
⑧	LED display	The 5-digit 8-segment LED display is used to show servo system's running state and parameter setting.
⑨	Keys	M: Used to switch parameters in sequence. ▲: Increases the value of the blinking digit. ▼: Decreases the value of the blinking digit. ◀◀ : Used to shift the blinking position leftwards (long press to turn to the next page when the displayed number exceeds five digits). S: Saves modifications and enters the next menu.
⑩	CN5 communication terminal	Supports online upgrade and background commissioning when the drive is powered on. In USB mode, the terminal only supports download and upload of parameters, and driver firmware update; The terminal uses USB power supply. If there is a fault that cannot be completely reset, disconnect the USB power supply and drive control power, and then power on again.
⑪	CN1 (control terminal)	Used by reference input signals and other I/O signals.
12	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder. Supports gantry synchronization.
13	CN2 (encoder feedback terminal)	Supports communication-type encoders. Supports gantry synchronization.

Note

CN11 24 V backup power input terminal: It is only available in functional safety and backup power-enabled products.

1.1.5 Components - Standby Power Supply Type [Standard N]

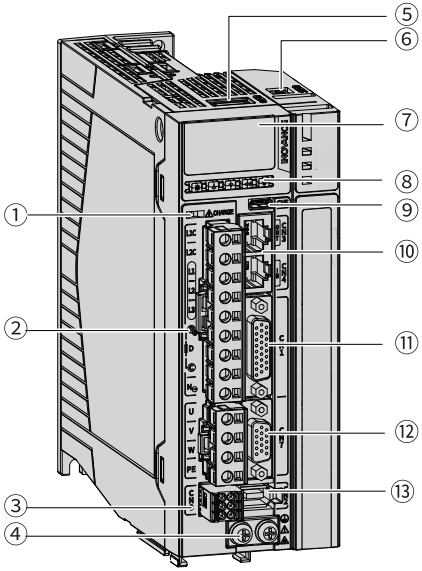


Figure 1-6 Servo drive components

Table 1–4 Description of servo drive components

No.	Name	Description
①	CHARGE (bus voltage indicator)	Indicates the electric charge is present in the bus capacitor. When the indicator turns on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To prevent electric shock, do not touch the power terminals when this indicator lights up.
②	Main circuit terminal	For detailed description of main circuit terminals, see the related section.
③	CN8 (brake and PTC input terminal)	Connected to brake and PTC.
④	Servo drive grounding terminal	Connected to the grounding terminal of the power supply for grounding purpose.
⑤	CN6 (STO safety function terminal)	Connected to external functional safety signal for functional safety purpose.
⑥	CN11 (24 V standby power input terminal)	When the main circuit is not energized, it supplies power to the control circuit to maintain functions like programming, parameter configuration in the software tool, and communication.

No.	Name	Description
⑦	LED display	The 5-digit 8-segment LED display is used to show servo system's running state and parameter setting.
⑧	Keys	M: Used to switch parameters in sequence. ▲: Increases the value of the blinking digit. ▼: Decreases the value of the blinking digit. ◀◀: Used to shift the blinking position leftwards (long press to turn to the next page when the displayed number exceeds five digits). S: Saves modifications and enters the next menu.
⑨	CN5 (communication terminals)	Supports online upgrade and background commissioning when the drive is powered on.
⑩	CN3, CN4 (EtherCAT communication terminals)	CN4 (IN): Connected to the master or the last slave device CN3 (OUT): Connected to the next slave device
⑪	CN1 (control terminal)	Used by reference input signals and other I/O signals.
12	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder. Supports gantry synchronization.
13	CN2 (encoder feedback terminal)	Supports communication-type encoders. Supports gantry synchronization.

Note

CN11 24 V backup power input terminal: It is only available in functional safety and backup power-enabled products.

1.1.6 Components [Functional safety P]

1.1.6.1 Servo Drives in Size A and Size C (Rated Power 0.2 kW to 1.5 kW)

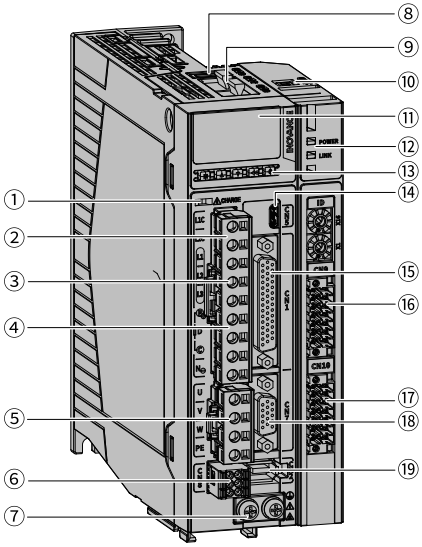


Figure 1-7 Components of servo drive in sizes A and C

Table 1–5 Description of components of servo drive in sizes A and C

No.	Name	Description
①	CHARGE (bus voltage indicator)	Indicates the electric charge is present in the bus capacitor. When the indicator turns on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To prevent electric shock, do not touch the power terminals when this indicator lights up.
②	L1C, L2C (control circuit power input terminals)	See the nameplate for the rated voltage class.
③	L1, L2, L3 (main circuit power input terminals)	Power input terminals of the servo drive. See the nameplate for the rated voltage class.
④	P ⊕ , D, C (terminals for connecting external braking resistor)	Remove the jumper bar between terminals P⊕ and C before connecting an external braking resistor between terminals P ⊕ and D.
	P ⊕ , N ⊖ (servo bus terminals)	Used by the common DC bus for multiple servo drives.
⑤	U, V, W and PE (terminals for	Connected to U, V, and W phases and the grounding terminal of the servo motor.

No.	Name	Description
	connecting the servo motor)	
⑥	CN8 (brake and PTC input terminal)	Connected to brake and motor temperature feedback.
⑦	Servo drive grounding terminal	Connected to the grounding terminal of the power supply for grounding purpose.
⑧	CN6 (STO safety function terminal)	Connected to external functional safety signal for functional safety purpose. For the description and function introduction of this terminal, refer to the corresponding function manual and hardware manual.
⑨	CN3, CN4 (communication terminals)	Connected to RS485 host controllers in parallel.
⑩	CN11 (24 V standby power input terminal)	When power failure occurs, the standby power functions to help commissioning.
⑪	LED display	The 5-digit 8-segment LED display is used to show servo system's running state and parameter setting.
12	Power supply indicator of the safety module	Power: When the safety module is connected and the power supply is normal, the indicator is on. Link: Safety communication status indicator. Note: Since the P-type drive does not have FSoE, this indicator is not on.
13	Keys	M: Switches parameters in sequence. ▲: Increases the value of the blinking bit. ▲: Decreases the value of the blinking bit. ◀◀ : Used to shift the blinking bit leftwards (Hold down: Turning to the next page when the displayed number exceeds five digits). S: Saves modifications and enters the next menu.
14	CN5 (communication terminals)	Supports online upgrade and background commissioning when the drive is powered on. In USB mode, the terminal only supports download and upload of parameters, and driver firmware update; The terminal uses USB power supply. If there is a fault that cannot be completely reset, disconnect the USB power supply and drive control power, and then power on again.
15	CN1 (control terminal)	Used by reference input signals and other I/O signals.
⑯	CN9 (safety module control terminal A)	Control terminal A of the safety module.
⑰	CN10 (safety module control terminal B)	Command input and output terminal B of the safety module.

No.	Name	Description
⑱	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder. Supports gantry synchronization.
⑲	CN2 (encoder feedback terminal)	Supports communication-type encoders. Supports gantry synchronization.

Note

- Built-in braking resistors or jumper bars are not included in S1R6 and S2R8 models. Connect an external braking resistor between terminals P ⊕ and C if needed.
- [1] The power input terminals of the 200V–240V servo drive's main circuit are L1, L2, and L3, you can use any two of which for single-phase input; and the power input terminals of the 380–480V servo drive's main circuit are R, S, and T.

1.1.6.2 Servo Drives in Size D (Rated Power 1.5 kW to 3.0 kW)

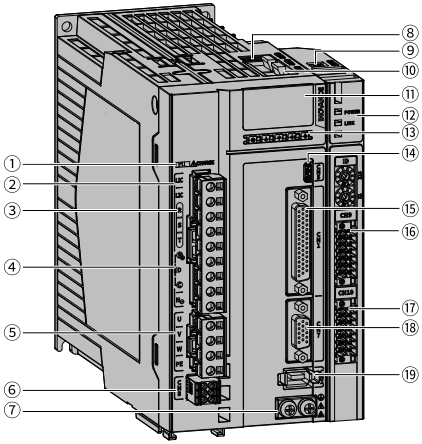


Figure 1-8 Components of servo drives in size D

Table 1–6 Description of components of servo drives in size D

No.	Name	Description
①	CHARGE (bus voltage indicator)	Indicates the electric charge is present in the bus capacitor. When the indicator turns on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To prevent electric shock, do not touch the power terminals when this indicator lights up.
②	L1C, L2C (control circuit power input terminals)	See the nameplate for the rated voltage class.
③	R, S, T (main circuit power input terminals)	Power input terminals of the servo drive. See the nameplate for the rated voltage class.
④	P ⊕ , D, C (terminals for connecting external braking resistor)	Remove the jumper bar between terminals P ⊕ and D before connecting an external braking resistor between terminals P ⊕ and C.
	P ⊕ , N ⊖ (servo bus terminals)	Used by the common DC bus for multiple servo drives.
⑤	U, V, W and PE (terminals for connecting the servo motor)	Connected to U, V, and W phases and the grounding terminal of the servo motor.
⑥	CN8 (brake and PTC input terminal)	Connected to brake and motor temperature feedback.
⑦	Servo drive grounding terminal	Connected to the grounding terminal of the power supply for grounding purpose.
⑧	CN6 STO safety function terminal	Connected to external functional safety signal for functional safety purpose. For the description and function introduction of this terminal, refer to the corresponding function manual and hardware manual.
⑨	CN11 (24 V standby power input terminal)	When power failure occurs, the standby power functions to help commissioning.
⑩	CN3, CN4 (communication terminals)	Connected to RS485 host controllers in parallel.
⑪	LED display	The 5-digit 8-segment LED display is used to show servo system's running state and parameter setting.
12	Power supply indicator of the safety module	Power: When the safety module is connected and the power supply is normal, the indicator is on. Link: Safety communication status indicator. Note: Since the P-type drive does not have FSoE, this indicator is not on.
13	Keys	M: Switches parameters in sequence. ▲: Increases the value of the blinking bit. ▲: Decreases the value of the blinking bit.

14	CN5 (communication terminals)	Supports online upgrade and background commissioning when the drive is powered on. In USB mode, the terminal only supports download and upload of parameters, and driver firmware update; The terminal uses USB power supply. If there is a fault that cannot be completely reset, disconnect the USB power supply and drive control power, and then power on again.
15	CN1 (control terminal)	Used by reference input signals and other I/O signals.
⑯	CN9 (safety module control terminal A)	Control terminal A of the safety module.
⑰	CN10 (safety module control terminal B)	Command input and output terminal B of the safety module.
⑱	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder. Supports gantry synchronization.
⑲	CN2 (encoder feedback terminal)	Supports communication-type encoders. Supports gantry synchronization.

Note

- Built-in braking resistors or jumper bars are not included in S1R6 and S2R8 models. Connect an external braking resistor between terminals P ⊕ and C if needed.
- [1] The power input terminals of the 200V–240V servo drive's main circuit are L1, L2, and L3, you can use any two of which for single-phase input; and the power input terminals of the 380–480V servo drive's main circuit are R, S, and T.

No.	Name	Description
	CN1 (control terminal)	Used by reference input signals and other I/O signals.
⑯	CN9 (safety module control terminal A)	Control terminal A of the safety module.
⑰	CN10 (safety module control terminal B)	Command input and output terminal B of the safety module.
⑱	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder. Supports gantry synchronization.
⑲	CN2 (encoder feedback terminal)	Supports communication-type encoders. Supports gantry synchronization.

Note

- Built-in braking resistors or jumper bars are not included in S1R6 and S2R8 models. Connect an external braking resistor between terminals P ⊕ and C if needed.
- [1] The power input terminals of the 200V–240V servo drive's main circuit are L1, L2, and L3, you can use any two of which for single-phase input; and the power input terminals of the 380–480V servo drive's main circuit are R, S, and T.

1.1.6.3 Servo Drives in Size E (Rated Power 2.0 kW to 7.5 kW)

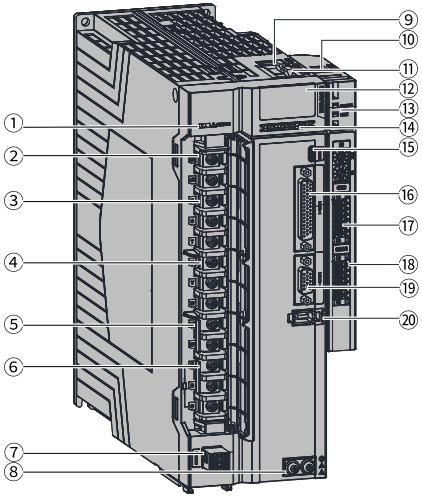


Figure 1-9 Components of servo drives in size E

Table 1–7 Description of components of servo drives in size E

No.	Name	Description
①	CHARGE (bus voltage indicator)	Indicates the electric charge is present in the bus capacitor. When the indicator turns on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To prevent electric shock, do not touch the power terminals when this indicator lights up.
②	L1C, L2C (control circuit power input terminals)	See the nameplate for the rated voltage class.
③	R, S, T (main circuit power input terminals)	Power input terminals of the servo drive. See the nameplate for the rated voltage class.
④	U, V, W (terminals for connecting the servo motor)	Connected to U, V, and W phases of the servo motor.
⑤	N2, N1 (terminals for connecting external reactor)	Terminals N1 and N2 are jumpered by default. To suppress harmonics in the power supply, remove the jumper between terminals N1 and N2 first and connect an external DC reactor between terminals N1 and N2.
⑥	P ⊕ , D, C (terminals for connecting external braking resistor)	Remove the jumper bar between terminals P ⊕ and D before connecting an external braking resistor between terminals P ⊕ and C.
⑦	CN8 (brake and PTC input terminal)	Connected to brake and motor temperature feedback.
⑧	Servo drive grounding terminal	Connected to the grounding terminal of the power supply for grounding purpose.
⑨	CN6 (STO safety function terminal)	Connected to external functional safety signal for functional safety purpose. For the description and function introduction of this terminal, refer to the corresponding function manual and hardware manual.
⑩	CN11 (24 V standby power input terminal)	When power failure occurs, the standby power functions to help commissioning.
⑪	CN3, CN4 (communication terminals)	Connected to RS485 host controllers in parallel.
12	LED display	The 5-digit 8-segment LED display is used to show servo system's running state and parameter setting.
13	Power supply indicator of the safety module	Power: When the safety module is connected and the power supply is normal, the indicator is on. Link: Safety communication status indicator. Note: Since the P-type drive does not have FSoE, this indicator is not on.
14	Keys	M: Switches parameters in sequence. ▲: Increases the value of the blinking bit.

No.	Name	Description
		▲: Decreases the value of the blinking bit. ◀◀: Used to shift the blinking bit leftwards (Hold down: Turning to the next page when the displayed number exceeds five digits). S: Saves modifications and enters the next menu.
15	CN5 (communication terminals)	Supports online upgrade and background commissioning when the drive is powered on. In USB mode, the terminal only supports download and upload of parameters, and driver firmware update; The terminal uses USB power supply. If there is a fault that cannot be completely reset, disconnect the USB power supply and drive control power, and then power on again.
⑯	CN1 (control terminal)	Used by reference input signals and other I/O signals.
⑰	CN9 (safety module control terminal A)	Control terminal A of the safety module.
⑱	CN10 (safety module control terminal B)	Command input and output terminal B of the safety module.
⑲	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder. Supports gantry synchronization.
⑳	CN2 (encoder feedback terminal)	Supports communication-type encoders. Supports gantry synchronization.

Note

- Built-in braking resistors or jumper bars are not included in S1R6 and S2R8 models. Connect an external braking resistor between terminals P ⊕ and C if needed.
- [1] The power input terminals of the 200V–240V servo drive's main circuit are L1, L2, and L3, you can use any two of which for single-phase input; and the power input terminals of the 380–480V servo drive's main circuit are R, S, and T.

1.1.7 Components [Functional safety model N]

1.1.7.1 Servo Drives in Size A and Size C (Rated Power 0.2 kW to 1.5 kW)

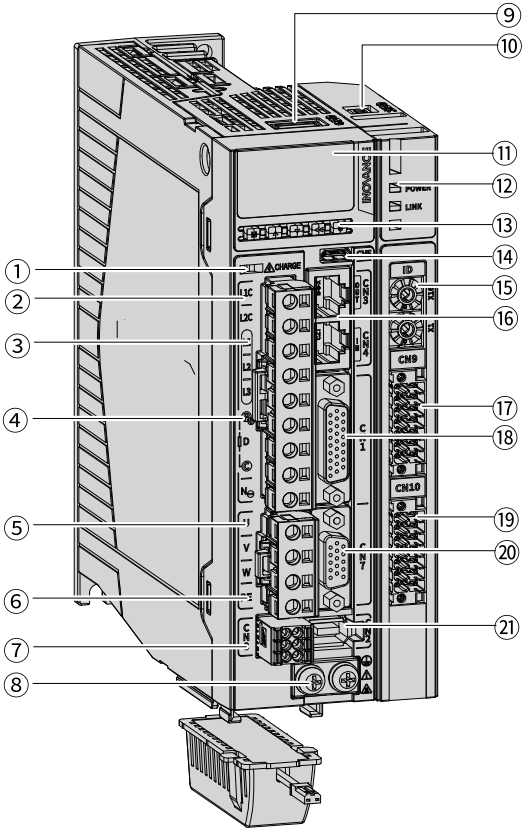


Figure 1-10 Components of servo drive in sizes A and C

Table 1–8 Description of components of servo drive in sizes A and C

No.	Name	Description
①	CHARGE (bus voltage indicator)	Indicates the electric charge is present in the bus capacitor. When the indicator turns on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To prevent electric shock, do not touch the power terminals when this indicator lights up.
②	L1C, L2C (control circuit power input terminals)	See the nameplate for the rated voltage class.
③	L1, L2, L3 (main circuit power input terminals)[1]	Power input terminals of the servo drive. See the nameplate for the rated voltage class.
④	P ⊕ , D, C (terminals for connecting external braking resistor)	Remove the jumper bar between terminals P⊕ and C before connecting an external braking resistor between terminals P ⊕ and D.
	P ⊕ , N ⊖ (servo bus terminals)	Used by the common DC bus for multiple servo drives.
⑤	U, V, W (terminals for connecting the servo motor)	Connected to U, V, and W phases of the servo motor.
⑥	PE (grounding) terminal	Connected to the grounding terminal of the motor for grounding purpose.
⑦	CN8 (brake and PTC input terminal)	Connected to brake and motor temperature feedback.
⑧	Servo drive grounding terminal	Connected to the grounding terminal of the power supply for grounding purpose.
⑨	CN6 (STO safety function terminal)	Connected to external functional safety signal for functional safety purpose. For the description and function introduction of this terminal, refer to the corresponding function manual and hardware manual.
⑩	CN11 (24 V standby power input terminal)	When power failure occurs, the standby power functions to help commissioning.
⑪	LED display	The 5-digit 8-segment LED display is used to show servo system's running state and parameter setting.
12	Power supply indicator of the safety module	Power: When the safety module is connected and the power supply is normal, the indicator is on. Link: Safety communication status indicator. Steady ON: FSoE is ready; flashing: communication is normal; OFF: FSoE is closed.
13	Keys	M: Switches parameters in sequence. ▲: Increases the value of the blinking bit.

No.	Name	Description
		▲: Decreases the value of the blinking bit. ◀◀: Used to shift the blinking bit leftwards (Hold down: Turning to the next page when the displayed number exceeds five digits). S: Saves modifications and enters the next menu.
14	CN5 (communication terminals)	Supports online upgrade and background commissioning when the drive is powered on. In USB mode, the terminal only supports download and upload of parameters, and driver firmware update; The terminal uses USB power supply. If there is a fault that cannot be completely reset, disconnect the USB power supply and drive control power, and then power on again.
15	FSoE ID address setting knob	Sets ID address of the slave drive for FSoE communication. Address setting method: The number of the upper knob x 16 + the number of the lower knob.
⑯	CN3, CN4 (EtherCAT communication terminals)	CN4 (IN): Connected to the master or the last slave device CN3 (OUT): Connected to the next slave device
⑰	CN9 (safety module control terminal A)	Control terminal A of the safety module.
⑱	CN1 (control terminal)	Used by reference input signals and other I/O signals.
⑲	CN10 (safety module control terminal B)	Command input and output terminal B of the safety module.
⑳	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder. Supports gantry synchronization.
㉑	CN2 (encoder feedback terminal)	Supports communication-type encoders. Supports gantry synchronization.

Note

- Built-in braking resistors or jumper bars are not included in S1R6 and S2R8 models. Connect an external braking resistor between terminals P ⊕ and C if needed.
- [1] The power input terminals of the 200V–240V servo drive's main circuit are L1, L2, and L3, you can use any two of which for single-phase input; and the power input terminals of the 380–480V servo drive's main circuit are R, S, and T.

1.1.7.2 Servo Drives in Size D (Rated Power 1.5 kW to 3.0 kW)

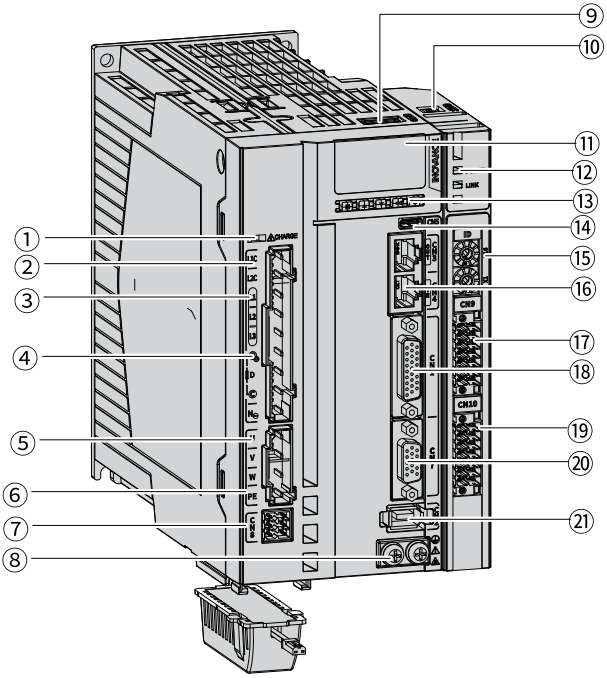


Figure 1-11 Components of servo drives in size D

Table 1–9 Description of components of servo drives in size D

No.	Name	Description
①	CHARGE (bus voltage indicator)	Indicates the electric charge is present in the bus capacitor. When the indicator turns on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To prevent electric shock, do not touch the power terminals when this indicator lights up.
②	L1C, L2C (control circuit power input terminals)	See the nameplate for the rated voltage class.
③	L1, L2, L3 (main circuit power input terminals)[1]	Power input terminals of the servo drive. See the nameplate for the rated voltage class.
④	P ⊕ , D, C (terminals for connecting external braking resistor)	Remove the jumper bar between terminals P⊕ and C before connecting an external braking resistor between terminals P ⊕ and D.

No.	Name	Description
	P ⊕ , N ⊖ (servo bus terminals)	Used by the common DC bus for multiple servo drives.
⑤	U, V, W (terminals for connecting the servo motor)	Connected to U, V, and W phases of the servo motor.
⑥	PE (grounding) terminal	Connected to the grounding terminal of the motor for grounding purpose.
⑦	CN8 (brake and PTC input terminal)	Connected to brake and motor temperature feedback.
⑧	Servo drive grounding terminal	Connected to the grounding terminal of the power supply for grounding purpose.
⑨	CN6 (STO safety function terminal)	Connected to external functional safety signal for functional safety purpose. For the description and function introduction of this terminal, refer to the corresponding function manual and hardware manual.
⑩	CN11 (24 V standby power input terminal)	When power failure occurs, the standby power functions to help commissioning.
⑪	LED display	The 5-digit 8-segment LED display is used to show servo system's running state and parameter setting.
12	Power supply indicator of the safety module	Power: When the safety module is connected and the power supply is normal, the indicator is on. Link: Safety communication status indicator. Steady ON: FSoE is ready; flashing: communication is normal; OFF: FSoE is closed.
13	Keys	M: Switches parameters in sequence. ▲: Increases the value of the blinking bit. ▲: Decreases the value of the blinking bit. ◀◀: Used to shift the blinking bit leftwards (Hold down: Turning to the next page when the displayed number exceeds five digits). S: Saves modifications and enters the next menu.
14	CN5 (communication terminals)	Supports online upgrade and background commissioning when the drive is powered on. In USB mode, the terminal only supports download and upload of parameters, and driver firmware update; The terminal uses USB power supply. If there is a fault that cannot be completely reset, disconnect the USB power supply and drive control power, and then power on again.
15	FSoE ID address setting knob	Sets ID address of the slave drive for FSoE communication. Address setting method: The number of the upper knob x 16 + the number of the lower knob.

No.	Name	Description
⑯	CN3, CN4 (EtherCAT communication terminals)	CN4 (IN): Connected to the master or the last slave device CN3 (OUT): Connected to the next slave device
⑰	CN9 (safety module control terminal A)	Control terminal A of the safety module.
⑱	CN1 (control terminal)	Used by reference input signals and other I/O signals.
⑲	CN10 (safety module control terminal B)	Command input and output terminal B of the safety module.
⑳	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder. Supports gantry synchronization.
㉑	CN2 (encoder feedback terminal)	Supports communication-type encoders. Supports gantry synchronization.

Note

- Built-in braking resistors or jumper bars are not included in S1R6 and S2R8 models. Connect an external braking resistor between terminals P ⊕ and C if needed.
- [1] The power input terminals of the 200V–240V servo drive's main circuit are L1, L2, and L3, you can use any two of which for single-phase input; and the power input terminals of the 380–480V servo drive's main circuit are R, S, and T.

1.1.7.3 Servo Drives in Size E (Rated Power 2.0 kW to 7.5 kW)

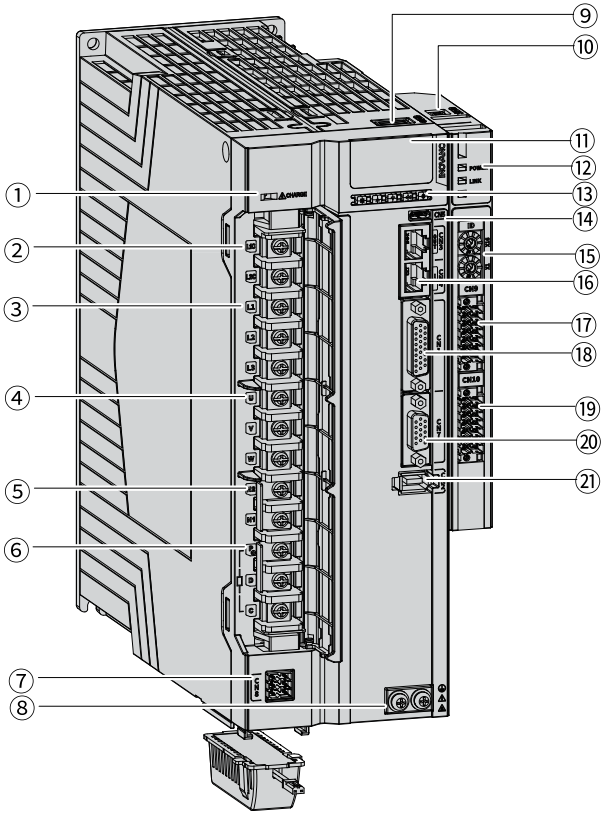


Figure 1-12 Components of servo drives in size E

Table 1–10 Description of components of servo drives in size E

No.	Name	Description
①	CHARGE (bus voltage indicator)	Indicates the electric charge is present in the bus capacitor. When the indicator turns on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To prevent electric shock, do not touch the power terminals when this indicator lights up.
②	L1C, L2C (control circuit power input terminals)	See the nameplate for the rated voltage class.
③	L1, L2, L3 (main circuit power input terminals)[1]	Power input terminals of the servo drive. See the nameplate for the rated voltage class.

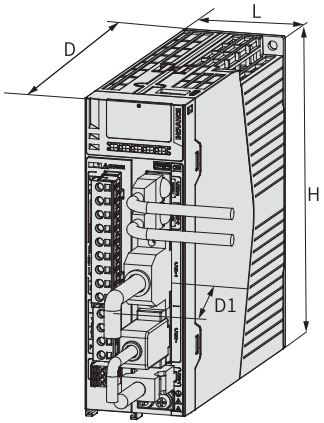
No.	Name	Description
④	U, V, W (terminals for connecting the servo motor)	Connected to U, V, and W phases of the servo motor.
⑤	N2, N1 (terminals for connecting external reactor)	Terminals N1 and N2 are jumpered by default. To suppress harmonics in the power supply, remove the jumper between terminals N1 and N2 first and connect an external DC reactor between terminals N1 and N2.
⑥	P ⊕ , D, C (terminals for connecting external braking resistor)	Remove the jumper bar between terminals P ⊕ and D before connecting an external braking resistor between terminals P ⊕ and C.
⑦	CN8 (brake and PTC input terminal)	Connected to brake and motor temperature feedback.
⑧	Servo drive grounding terminal	Connected to the grounding terminal of the power supply for grounding purpose.
⑨	CN6 (STO safety function terminal)	Connected to external functional safety signal for functional safety purpose. For the description and function introduction of this terminal, refer to the corresponding function manual and hardware manual.
⑩	CN11 (24 V standby power input terminal)	When power failure occurs, the standby power functions to help commissioning.
⑪	LED display	The 5-digit 8-segment LED display is used to show servo system's running state and parameter setting.
12	Power supply indicator of the safety module	Power: When the safety module is connected and the power supply is normal, the indicator is on. Link: Safety communication status indicator. Steady ON: FSoE is ready; flashing: communication is normal; OFF: FSoE is closed.
13	Keys	M: Switches parameters in sequence. ▲: Increases the value of the blinking bit. ▲: Decreases the value of the blinking bit. ◀◀: Used to shift the blinking bit leftwards (Hold down: Turning to the next page when the displayed number exceeds five digits). S: Saves modifications and enters the next menu.
14	CN5 (communication terminals)	Supports online upgrade and background commissioning when the drive is powered on. In USB mode, the terminal only supports download and upload of parameters, and driver firmware update; The terminal uses USB power supply. If there is a fault that cannot be completely reset, disconnect the USB power supply and drive control power, and then power on again.
15	FSoE ID address setting knob	Sets ID address of the slave drive for FSoE communication.

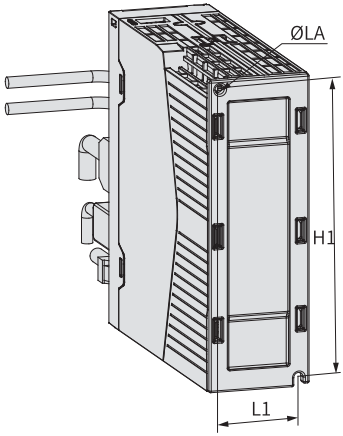
No.	Name	Description
		Address setting method: The number of the upper knob*16 + the number of the lower knob.
⑯	CN3, CN4 (EtherCAT communication terminals)	CN4 (IN): Connected to the master or the last slave device CN3 (OUT): Connected to the next slave device
⑰	CN9 (safety module control terminal A)	Control terminal A of the safety module.
⑱	CN1 (control terminal)	Used by reference input signals and other I/O signals.
⑲	CN10 (safety module control terminal B)	Command input and output terminal B of the safety module.
⑳	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder. Supports gantry synchronization.
㉑	CN2 (encoder feedback terminal)	Supports communication-type encoders. Supports gantry synchronization.

Note

- Built-in braking resistors or jumper bars are not included in S1R6 and S2R8 models. Connect an external braking resistor between terminals P ⊕ and C if needed.
- [1] The power input terminals of the 200V–240V servo drive's main circuit are L1, L2, and L3, you can use any two of which for single-phase input; and the power input terminals of the 380–480V servo drive's main circuit are R, S, and T.

1.1.8 Product Dimensions





Size	L	H	D	L1	H1	D1	ϕLA	Tightening Torque	Mass
	Unit: mm (in.)							Unit: (N·m)	Unit: (kg)
A	45.5 (1.79)	170 (6.69)	150 (5.91)	33 (1.30)	161 (6.34)	75 (2.95)	2×M4	1.2	0.96
C	55±1 (2.17±0.04)	170 (6.69)	173±1 (6.81±0.04)	44 (1.73)	160 (6.30)	75 (2.95)	2×M4	1.2	1.3
D	80±1 (3.15±0.04)	170 (6.69)	183 (7.20)	71 (2.80)	160 (6.30)	75 (2.95)	3×M4	1.2	1.8
E	90 (3.54)	250 (9.84)	230 (9.06)	78 (3.07)	240.5 (9.47)	75 (2.95)	4×M4	1.2	3.6

Note

For detailed drawings on product dimensions, see the related section.

1.2 Specifications

1.2.1 Electrical Specifications

- Single-phase 200 V drive

Item		Size A		Size C		Size D
Servo Drive Model		S1R6	S2R8	S5R5	S7R6	S012
Drive Power (kW)		0.2	0.4	0.75	1.0	1.5
Max. applicable motor capacity (kW)		0.2	0.4	0.75	1.0	1.5
Power supply equipment capacity (kVA)		1.4	2.8	4.6	6.0	8.0
Continuous output current (Arms)		1.6	2.8	5.5	7.6	12.0
Max. output current (Arms)		5.8	10.1	16.9	23.0	32.0
Main circuit[*]	Continuous input current (Arms)	2.3	4.0	7.9	9.6	12.8
	Main circuit power supply	Single-phase 200 VAC–240 VAC, -10% to +10%, 50 Hz/60 Hz				
	Heat (W)[1]	12	23.8	38.2	47.32	69.84
Control circuit	Control circuit power supply	Single-phase 200 VAC–240 VAC, -10% to +10%, 50 Hz/60 Hz				
	Heat (W)[2]	16				
Control circuit backup power circuit[3]	Power input range	24 VDC±15% (must be SELV/PELV[4] power supply)				
	Power of the external power supply	⩾ 50 W				
Braking resistor	Resistance (Ω)	Optional	Optional	50	25	25
	Resistor power (W)	Optional	Optional	50	80	80
	Min resistance of external resistor (Ω)	40	40	40	20	15
	Max. braking energy absorbed by capacitor (J)	9.3	18.59	32.42	32.42	47.68
	Braking resistor	All models in the series support built-in and external braking resistors. But Size A does not come with a built-in braking resistor as standard				
Cooling mode		Self-cooling		Air cooling		
Overvoltage class		III				
Max. Input Surge Current at Start-up (A)		18.65	18.65	9.325	9.325	12.43333
3τ(ms) (3 x RC time constant[5])		23.4	46.8	163.2	163.2	180

Note

[*]: For S1R6, S2R8, S5R5, S7R6 and S012 drives, the main circuit of the servo drive supports single-phase 200 V power supplies without derating.

- Three-phase 200 V drive

Item		Size A		Size C		Size D	Size E		
Servo Drive Model		S1R6	S2R8	S5R5	S7R6	S012	S018	S022	S027
Drive Power (kW)		0.2	0.4	0.75	1.0	1.5	2.0	3.0	5.0
Max. applicable motor capacity (kW)		0.2	0.4	0.75	1.0	1.5	2.0	3.0	5.0
Power supply equipment capacity (kVA)		1.21	2.42	3.84	5.05	6.68	8.33	10.42	20.08
Continuous output current (Arms)		1.6	2.8	5.5	7.6	12.0	18.0	22.0	27.0
Max. output current (Arms)		5.8	10.1	16.9	23.0	32.0	45	55	67.5
Main circuit	Continuous input current (Arms)	1.1	2.3	4.4	5.1	8.0	8.7	11.0	23.8
	Main circuit power supply	3-phase 200 VAC–240 VAC, -10% to +10%, 50 Hz/60 Hz							
	Heat (W)[1]	12	23.8	38.2	47.32	69.84	120	125	200
Control circuit	Control circuit power supply	Single-phase 200 VAC–240 VAC, -10% to +10%, 50 Hz/60 Hz							
	Heat (W)[2]	16							
Control circuit backup power circuit[3]	Power input range	24 VDC±15% (must be SELV/PELV[4] power supply)							
	Power of the external power supply	⩾ 50 W							
Braking resistor	Resistance (Ω)	Optional	Optional	50	25	25	20	20	20
	Resistor power (W)	Optional	Optional	50	80	80	100	100	100
	Min resistance of external resistor (Ω)	40	40	40	20	15	20	20	20
	Max. braking energy absorbed by capacitor (J)	9.3	18.59	32.42	32.42	47.68	78.19	114.43	114.43
	Braking resistor	All models in the series support built-in and external braking resistors. But Size A does not come with a built-in braking resistor as standard					Built-in and external resistor is supported		
Cooling mode		Self-cooling		Air cooling					
Overvoltage class		III							
Max. Input Surge Current (A)		18.65	18.65	9.325	9.325	12.43333	12.43333	12.43333	12.43333
3τ(ms) (3 x RC time constant[5])		23.4	46.8	163.2	163.2	180	295.2	432	432

- Three-phase 400 V drive

Item	Size C		Size D		Size E		
Servo Drive Model	T3R5	T5R4	T8R4	T012	T017	T021	T026
Drive Power (kW)	1.0	1.5	2.0	3.0	5.0	6.0	7.5

Item		Size C		Size D		Size E		
Max. applicable motor capacity (kW)		1.0	1.5	2.0	3.0	5.0	6.0	7.5
Power supply equipment capacity (kVA)		6.05	9.08	10.23	15.15	22.25	25.0	31.25
Continuous output current (Arms)		3.5	5.4	8.4	12.0	17.0	21.0	26.0
Max. output current (Arms)		11.0	14.0	20.0	30.0	42.5	52.5	65.0
Main circuit	Continuous input current (Arms)	2.4	3.6	5.6	8.0	12.0	16.0	21.0
	Main circuit power supply	3-phase 380 VAC–480 VAC, -10% to +10%, 50 Hz/60 Hz						
	Heat (W)[1]	39.5	63.25	94.82	135.47	187.62	228.28	258.63
Control circuit	Control circuit power supply	Single-phase 380 VAC–480 VAC, -10% to +10%, 50 Hz/60 Hz						
	Heat (W)[2]	16						
Control circuit backup power circuit[3]	Power input range	24 VDC±15% (must be SELV/PELV[4] power supply)						
	Power of the external power supply	⩾ 50 W						
Braking resistor	Resistance (Ω)	100	100	50	50	35	35	35
	Resistor power (W)	80	80	80	80	100	100	100
	Min resistance of external resistor (Ω)	80	60	45	40	35	25	25
	Max. braking energy absorbed by capacitor (J)	36.06	43.79	64.40	64.40	105.62	154.56	154.56
	Braking resistor	Built-in braking resistor						
Cooling mode		Air cooling						
Overvoltage class		III						
Max. Input Surge Current (A)		18.65	18.65	24.867	24.867	24.867	24.867	24.867
3τ(ms) (3 x RC time constant[5])		33.6	40.8	45	45	73.8	108	108

Note

- [1]: Main circuit heat refers to the heat generated by the drive under rated output current.
- [2]: Control circuit heat refers to the heat generated by the drive under rated input current.
- [3]: This power supply is only applicable to PINT models with backup power.
- [4]: SELV and PELV are voltage protection standards specific for different scenarios. SELV refers to the safety extra-low voltage of the non-grounding system, and PELV refers to the safety extra-low voltage of the protective grounding system.
- [5] RC time constant = Pre-charge resistor R x Bus capacitor C, used to represent the power-on process.
- Select the external braking resistor according to actual operating conditions. Fore details, see the related section.

1.2.2 Technical Specifications [P]

<table>
<tr><th colspan="3">Item</th><th>Description</th></tr>
<tr><td rowspan="11">General Specifications</td><td rowspan="2">Control mode</td><td></td><td>IGBT SVPWM control, sine wave current drive mode</td></tr>
<tr><td></td><td>200 V, 400 V: Single-phase/Three-phase full bridge rectification</td></tr>
<tr><td colspan="2">Encoder feedback</td><td>The drive supports Inovance 23-bit/26-bit multi-turn absolute encoders and 26-bit functional safety encoders (the drive must be of the functional safety type).
Other supported encoder types:
DDL motor: Inovance communication encoder, sine-cosine analog encoder, ABZ incremental encoder (TTL signal), BiSS-C encoder, SSI encoder and EnDat 2.2 encoder
DDR motor: Inovance communication encoder, sine-cosine analog encoder, ABZ incremental encoder (TTL signal), BiSS-C encoder, SSI encoder and EnDat 2.2 encoder
Servo motor: Inovance communication encoder, sine-cosine analog encoder, ABZ incremental encoder (TTL signal), BiSS-C encoder, EnDat 2.2 encoder, SSI encoder, Nikon encoder, and TAMAGAWA encoder
You can use the Inovance multi-turn absolute encoder as an incremental encoder if you remove the battery.
Note: For details, see Section "Description of Commissioning Objects" in SV680-INT Series Servo Drive Quick Start Guide.</td></tr>
<tr><td rowspan="4">Conditions for use</td><td>Operating/Storage temperature [1]</td><td>0°C to 55°C (average load ratio not exceeding 80% in ambient temperatures between 45°C to 55°C) (non freezing)/ -40°C to 70°C</td></tr>
<tr><td>Operating/Storage humidity</td><td>Below 90% RH (no condensation)</td></tr>
<tr><td rowspan="2">Vibration resistance</td><td>Operation:
• Displacement vibration amplitude: 3.5 mm at 5 Hz–8.4 Hz
• Acceleration vibration amplitude: 1 g at 8.4 Hz–200 Hz</td></tr>
<tr><td>Product package:</td></tr>
</table>

Item				Description
				• 5 Hz–100 Hz：0.01g^2/Hz • 200 Hz: 0.001g^2/Hz • Grms = 1.14 g
		Impact resistance		19.6 m/s^2
		IP rating		IP20
				Note: excluding terminals (IP00)
		Pollution degree		PD2
		Protection class		Class I
		Altitude		The maximum altitude is 2000 m. • For altitudes not higher than 1000 m, derating is not required • Derating is required for altitudes above 1000 m (derate 1% for every additional 100 m) • For altitudes above 2000 m, contact Inovance.
Speed/ torque control mode	Performance	Speed control range		1 rpm–10000 rpm (The lower limit of the speed control range is that the load can be rotated under rated motor torque)
		Torque control accuracy[2]		±1%
		Soft startup time setting		0s to 65s (Acceleration and deceleration can be set separately.)
	Input signal	Speed Reference Input		Analog input signal; digital input signal; DI signal combination is used to achieve selection of speed 0 to 15
		Torque Reference		Analog input signal; digital input signal
		CANopen communication mode		PV/PT mode
Position Control Mode	Input signal	Pulse reference	Input pulse form	Four forms: direction+pulse, positive logic; direction+pulse, negative logic; phase A + phase B quadrature pulse; CW/ CCW pulse
			Input form	Differential input; open collector
			Input pulse frequency	Differential input: single: 4 Mpps, quadrature: 16 Mpps, pulse width ⩾ 0.125 μs Open collector: max. single pulse frequency: 200 kpps, pulse width must not be less than 2.5 μs
		Power supply for built-in open collector [3]		24 V (built-in 2.4 kΩ resistor)
		Multi-position reference selection		Position 0 to position 15 selectable through DI signal combination. You can assign this function to any other terminal.
		CANopen communication mode		PP mode/HM mode/IP mode
	Position output	Output mode		Phase A, phase B: differential output
				Phase Z: differential output or open collector output
		Frequency division ratio		Any frequency division
Input/ Output signal	DI signal	DI signal function assignment		8 DIs DI1–DI6: normal DI (rising edge (24 V input low to high) input delay: 50 μs, falling edge (24 V input high to low) input delay: 200 μs, voltage range: 20 V–30 V) DI7–DI8: fast DI (rising edge (24 V input low to high) input delay: 10 μs, falling edge (24 V input high to low) input delay: 50 μs, voltage range: 20 V–30 V)

Item			Description
	Digital output signal	Output signal function selection	5 DOs. With-load capacity: 50 mA; Voltage range: 5 V to 30 V
	Analog input signal		AI1 voltage input: 16-bit, -10 V to +10 V; max. allowable voltage: ±12 V Sampling frequency: 8 kHz with gantry disabled and 4 kHz with gantry enabled
			AI2 voltage input: 12-bit, -10 V to +10 V; max. allowable voltage: ±12 V Sampling frequency: 8 kHz with gantry disabled and 4 kHz with gantry enabled
	Analog output signal		AO1 voltage output range: -10 V to +10 V Output frequency: 8 kHz with gantry disabled, and 4 kHz with gantry enabled
Built-in functions	Overtravel (OT) prevention		The servo drive stops immediately when P-OT or N-OT is active
	Electronic gear ratio		0.001 ⩽ B/A ⩽ 26843545.6
	Protective functions		Including protections against overcurrent, overvoltage, undervoltage, overload, main circuit detection error, heatsink overheat, power phase loss, overspeed, encoder error, CPU error, and parameter error
	Safety Function	Type	STO (standard)/SS1/SBC/SOS/SS2/SLS/SDI/SSM[4]
		Applicable standard	IEC61800-5-2:2016
	LED display		Main circuit CHARGE indicator, 5-digit LED display
	Vibration suppression		5 notches (including two adaptive notches) available, 50 Hz to 8000 Hz
	Usability functions		One-key parameter tuning, adaptive parameter tuning, intelligent parameter tuning, speed observer, and model tracking
	Communication function	Software commissioning	Type_C
		Multi-station communication	Modbus (RS485 interface), CANopen
		Number of multi-station communication axes	Up to 32 For Modbus, and up to 127 for CANopen
		Axis address setting	No physical knob, set through the software
		Function	Including status display, user parameter setting, monitored value display, fault tracing display, JOG and auto-tuning, and communication and motion control command setting
	Others		Gain tuning, alarm log, JOG

Note

- [1] Install the servo drive within the allowable ambient temperature range. When it is installed inside a control cabinet, the temperature inside the cabinet must also be within this range.
- [2]: Under standard working conditions, the use of an Inovance servo motor can achieve a torque control precision of ±1%.
- [3] The internal open collector power supply is not electrically insulated from the control circuit in the servo drive.
- [4] For S models only.

1.2.3 Technical Specifications [N]

Item			Description
General Specifications	Control mode		IGBT SVPWM control, sine wave current drive mode
			200 V, 400 V: Single-phase/Three-phase full bridge rectification
	Encoder feedback		The drive supports Inovance 23-bit/26-bit multi-turn absolute encoders and 26-bit functional safety encoders (the drive must be of the functional safety type). Other supported encoder types: **DDL motor**: Inovance communication encoder, sine-cosine analog encoder, ABZ incremental encoder (TTL signal), BiSS-C encoder, SSI encoder and EnDat 2.2 encoder **DDR motor**: Inovance communication encoder, sine-cosine analog encoder, ABZ incremental encoder (TTL signal), BiSS-C encoder, SSI encoder and EnDat 2.2 encoder Servo motor: Inovance communication encoder, sine-cosine analog encoder, ABZ incremental encoder (TTL signal), BiSS-C encoder, EnDat 2.2 encoder, SSI encoder, Nikon encoder, and TAMAGAWA encoder You can use the Inovance multi-turn absolute encoder as an incremental encoder if you remove the battery. **Note:** For details, see Section "Description of Commissioning Objects" in SV680-INT Series Servo Drive Quick Start Guide.
	Conditions for use	Operating/Storage temperature [1]	0°C to 55°C (average load ratio not exceeding 80% in ambient temperatures between 45°C to 55°C) (non freezing)/ -40°C to 70°C
		Operating/Storage humidity	Below 90% RH (no condensation)
		Vibration resistance	Operation: ● Displacement vibration amplitude: 3.5 mm at 5 Hz–8.4 Hz ● Acceleration vibration amplitude: 1 g at 8.4 Hz–200 Hz Product package: ● 5 Hz–100 Hz: $0.01g^2$/Hz ● 200 Hz: $0.001g^2$/Hz ● Grms = 1.14 g
		Impact resistance	19.6 m/s^2

Item				Description
		IP rating		IP20 Note: excluding terminals (IP00)
		Pollution degree		PD2
		Protection class		Class I
		Altitude		The maximum altitude is 2000 m. • For altitudes not higher than 1000 m, derating is not required • Derating is required for altitudes above 1000 m (derate 1% for every additional 100 m) • For altitudes above 2000 m, contact Inovance.
Speed/torque control mode	Performance	Speed control range		1 rpm–10000 rpm (The lower limit of the speed control range is that the load can be rotated under rated motor torque)
		Torque control accuracy[2]		±1%
	Input signal	Speed Reference Input	EtherCAT communication mode	CSV/PV mode
			Analog setting; digital setting (H06.03)	
		Torque Reference	EtherCAT communication mode	CST/PT mode
			Analog setting; digital setting (H07.03)	
Position Control Mode	Input signal	EtherCAT communication mode		CSP mode/PP mode/HM mode
	Output mode			Phase A, phase B: differential output
				Phase Z: differential output or open collector output
	Position output	Frequency division ratio		Any frequency division
Input/Output signal	DI signal	DI signal function assignment		5 DIs DI1–DI3: normal DI (rising edge (24 V input low to high) input delay: 50 μs, falling edge (24 V input high to low) input delay: 200 μs, voltage range: 20 V–30 V) DI4–DI5: fast DI (rising edge (24 V input low to high) input delay: 10 μs, falling edge (24 V input high to low) input delay: 50 μs, voltage range: 20 V–30 V)
	Digital output signal	Output signal function selection		2 DOs With-load capacity: 50 mA Voltage range: 5 V to 30 V
	Analog input signal			AI1 voltage input: 16-bit, -10 V to +10 V; max. allowable voltage: ±12 V Sampling frequency: 4 kHz
				AI2 voltage input: 12-bit, -10 V to +10 V; max. allowable voltage: ±12 V Sampling frequency: 4 kHz
	Analog output signal			AO1 voltage output range: -10 V to +10 V Output frequency: 4 kHz
Built-in functions	Overtravel (OT) prevention			The servo drive stops immediately when P-OT or N-OT is active
	Electronic gear ratio			0.001 ⩽ B/A ⩽ 26843545.6

Item			Description
	Protective functions		Including protections against overcurrent, overvoltage, undervoltage, overload, main circuit detection error, heatsink overheat, power phase loss, overspeed, encoder error, CPU error, and parameter error
	Safety Function	Type	STO (standard)/SS1/SBC/SOS/SS2/SLS/SDI/SSM[3]
		Applicable standard	IEC61800-5-2:2016
	LED display		Main circuit CHARGE indicator, 5-digit LED display
	Vibration suppression		5 notches (including two adaptive notches) available, 50 Hz to 8000 Hz
	Usability functions		One-key parameter tuning, adaptive parameter tuning, intelligent parameter tuning, speed observer, and model tracking
	Communication function	Software commissioning	Type-C
		Multi-station communication	EtherCAT, FSoE[3]
		Number of multi-station communication axes	Maximum number of slaves: 65535
		Axis address setting	No physical knob, set to 0 to 65535 through the software
		Function	Including status display, user parameter setting, monitored value display, fault tracing display, JOG and auto-tuning, and communication and motion control command setting
	Others		Gain tuning, alarm log, JOG

Note

- [1] Install the servo drive within the allowable ambient temperature range. When it is installed inside a control cabinet, the temperature inside the cabinet must also be within this range.
- [2]: Under standard working conditions, the use of an Inovance servo motor can achieve a torque control precision of ±2%.
- [3] For S models only.

1.2.4 Communication Technical Data

Modbus [P]

Item		Specification
Modbus Basic performance of slave	Link layer protocol	RS485
	Application layer protocol	Modbus-RTU, GBT 19582.2-2008, custom command areas
	Baud rate	2400kbps, 4800kbps, 9600kbps, 19200kbps, 38400kbps, 57600kbps, 115200kbps
	Duplex mode	Half-duplex
	Data format	8-N-1 (8 data bits, no parity, 1 stop bit)

CANopen [P]

Item		Specification
Item	Name	Description
Parameter setting	Node address switching	The node address can only be set manually. The maximum value is 127.
	Baud rate switching	The baud rate can only be set manually.
Description of state machine	State description/display of communication layer	Initializing, Pre-Operational, Operational, Stopped
	Description/display of emergency error codes	Time-Out, State-Switch-Err, PDO-Length-Err, Manu-Err
Error frame recording	Reception error frames can be recorded.	Count of NMT frames with incorrect length
		Count of NMT frames with incorrect command
		Count of heartbeat/node protection frames with incorrect length
Sync deviation detection	Multi-quantile sync deviation detection	1/4-period deviation
		1/2-period deviation
		3/4-period deviation
		1-period deviation
		2-period deviation
Baud rate	20 k–1 M	20kbps, 50kbps, 100kbps, 125kbps, 250kbps, 500kbps, 1Mbps
SYNC	SYNC Producer	Synchronous frame production
	SYNC Consumer	Synchronous signal consumption with deviation detection (in IP mode)
SDO	Start domain upload/ download	Transmit data ⩽ 4 bytes
	SDO abort error	Report an SDO error code contextually
	Name	Segmented upload/download
	Description	Transmit data larger than 4 bytes
PDO	Synchronous TPDO	The sync number is 1–240. The default number of TPDOs/RPDOs is 4, which can be configured.
	Asynchronous TPDO	Time-triggered by time. The default number of TPDOs/RPDOs is 4, which can be configured.
EMCY	**Emergency message**	Heartbeat timeout, PDO length error, node state switching error, application layer error
NMT	Bootup Service	Support for node online message transmit
NMTErrCtl	Life Guard	Optional node protection (cannot be used with heartbeat production)
	Heartbeat Consumer	Node heartbeat consumption
	Heartbeat Producer	Node heartbeat production
Expert mode	PDO communication parameters and their mapping are set through parameters.	PDO communication parameters and their mapping are set manually.

EtherCAT [N]

Item		Specification
Basic performance of slave	Communication protocol	EtherCAT protocol
	Service supported	CoE (PDO, SDO)
	Synchronization mode	DC - Distributed clock FreeRun
	Physical layer	100Base-TX
	Baud rate	100 Mbit/s (100Base-TX)
	Duplex mode	Full duplex
	Topology	Ring, linear, star, tree
	Transmission medium	Shielded cables of Cat 6 or higher
	Transmission distance	Less than 100 m between two nodes (with proper environment and cables)
	Number of slaves	Up to 65535 by protocol
	EtherCAT frame length	44 bytes to 1498 bytes
	Process Data	A maximum of 1486 bytes per Ethernet frame
	Synchronous jitter of two slaves	< 1 μs
	Min. sync period	250μs
	Bit error rate	10^{-10} Ethernet standard
Configuration unit	Number of FMMU units	8
	Number of storage synchronization management units	8
	Process data RAM	8 KB
	Distributed clock	64-bit
	EEPROM capacity	32 kbit

1.2.5 Dynamic Brake Characteristics

According to the motor model, initial speed and load inertia, the dynamic braking distance can be estimated. The approximate value of the dynamic braking distance can be calculated by the following formula. For the accurate value, please use the dynamic braking calculation function provided by our software.

Maximum braking distance s (turn) is:

$$s = \frac{V_0}{60}\left(t_e + (\tau_1 + \tau_2 V_0^2)\left(1 + \frac{J_L}{J_M}\right)\right)$$

The coefficient is as follows:

$$\tau_1 = \frac{2R_s J}{3p_n^2 \Psi_f^2} = \frac{10000\pi^2 R_s J}{9K_e^2}$$

$$\tau_2 = \frac{\pi^2 L_d^2 J}{4050 R_s \Psi_f^2} = \frac{100 L_d^2 \pi^4 P_n^2 J}{243 R_s K_e^2}$$

$$\Psi_f = \frac{\sqrt{6} K_e}{100 \pi P_n}$$

- V_0: Maximum feedback speed
- t_e: Dynamic brake program and relay delay
- J_L: Load moment of inertia
- J_M: Motor moment of inertia
- P_n: Number of motor pole pairs
- R_s: Stator resistance (Ω)
- K_e: Kelvin, thermodynamic temperature unit
- L_q, L_d: q-axis inductance (mH), d-axis inductance (mH).

1.2.6 Load Moment of Inertia

The load moment of inertia represents the inertia of the load. The larger the load moment of inertia is, the weaker the responsiveness is. An excessively high inertia may result in unstable motion. The allowable load moment of inertia () of the motor is restricted. This value is provided strictly as a guideline and results depend on the motor driving conditions.

An overvoltage warning may occur during deceleration if the load moment of inertia exceeds the allowable value. For servo drives with a built-in braking resistor, an overload alarm my be present. In case of such warnings, take one of the following measures:

- Reduce the torque limit values.
- Reduce the deceleration rate.
- Reduce the maximum speed.
- Install an external braking resistor if the warning cannot be cleared using the above measures.



- Drives below 400 W does not provide a built-in braking resistor.
- Even you use a built-in resistor, the energy generated in some conditions will exceed the allowable capacity loss (W) of the resistor. Therefore, an external braking resistor is required.

Table 1–11 Allowable Load Moment of Inertia

Motor speed	Size A		Size C				Size D			Size E					
	S1R6	S2R8	S5R5	S7R6	T3R5	T5R4	S012	T8R4	T012	S018	S022	S027	T017	T021	T026
1500rpm	x 20														
3,000 rpm	x 20									x 10					
4500rpm	x 20									x 5					Not supported
6000 rpm	x 20									x 5					Not supported
7000rpm	x 20				Not supported										

Note: *Motor speed* refers to the maximum speed supported by the motor driven by the drive. For example, MS1H1/H4 can reach 7000 rpm, MS1H2 can reach 6000 rpm, and MS1H3 can reach 4500 rpm. The AC drive may raise an alarm if you set a short acceleration/deceleration time when the running speed exceeds 10 times of the maximum speed.

2 Selection

2.1 Nameplate and Model Number of the Servo Motor

Description of the Model

MS1 H1 - 75B 30C B A3 3 1 R - INT
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

① **MS1 series servo motor** -	② **Inertia and Capacity** H1: low inertia, small capacity H2: low inertia, medium capacity H3: medium inertia, medium capacity H4: medium inertia, small capacity	③ **Rated Power (W)** One letter and two digits B: x 10 C: x 100 Example: 75B: 750 W
④ **Rated speed (rpm)** One letter and two digits B: x 10 C: x 100 Example: 30C: 3,000 rpm	⑤ **Voltage Class (V)** B: 220 D: 380	⑥ **Encoder Type** One letter and one digit A6: 26-bit multi-turn absolute encoder S6: 26-bit multi-turn absolute encoder of functional safety type A3: 23-bit multi-turn absolute encoder
⑦ **Shaft Connection Mode** 3: Solid shaft, with key and threaded hole	⑧ **Brake, Reducer and Oil Sealing**[1] 0: No oil sealing and brake 1: With oil sealing but no brake 2: No oil sealing but with brake 4: With oil sealing and brake	⑨ **Series** R: R version ⑩ **Non-standard Features** INT: Global version

Note

- [1]: Oil seals are provided as standard for all motors except the 40-flange motor.
- The MS1-R series frame-40 servo motor is upcoming.
- [2]:-S flying leads type only applies to 40/60/80-flange motors.

Nameplate

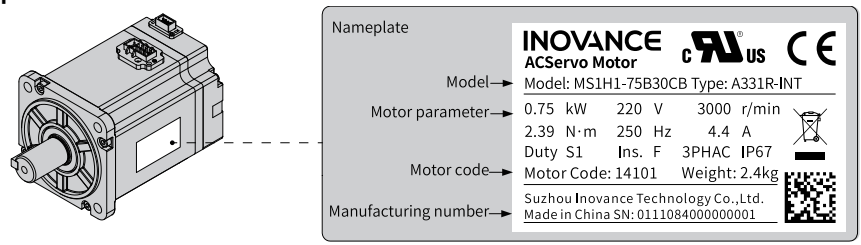


Figure 2-1 Model Number and Nameplate

For details on the SM1-R-INT series servo motor, see *MS1-R-INT Series Servo Motor Selection Guide*.

Visit http://www.inovance.com, go to Support > Download, search by keyword, and then download the PDF file. You can also get the PDF file in the app My Inovance.

2.2 Selection List [Standard]

Motors with a 26-bit encoder

Servo motor				Servo drive SV680N-INT (standard)			
Models without brake	Models with Brake	Flange Size (mm)	Capacity (W) (kW)	Voltage class (V)	Size	Recommended Model	No.
MS1H1 (n_N= 3000 rpm, n_{max}=7000 rpm) series ratings							
MS1H1-05B30CB-A6/ S630R-INT	MS1H1-05B30CB-A6/ S632R-INT	40	0.05	Single-phase/ Three-phase 220 V	A	S1R6	00002
MS1H1-10B30CB-A6/ S630R-INT	MS1H1-10B30CB-A6/ S632R-INT	40	0.1	Single-phase/ Three-phase 220 V			
MS1H1-20B30CB-A6/ S631R-INT	MS1H1-20B30CB-A6/ S634R-INT	60	0.2	Single-phase/ Three-phase 220 V			
MS1H1-40B30CB-A6/ S631R-INT	MS1H1-40B30CB-A6/ S634R-INT	60	0.4	Single-phase/ Three-phase 220 V		S2R8	00003
MS1H1-55B30CB-A6/ S631R-INT	-	80	0.55	Single-phase/ Three-phase 220 V	C	S5R5	00005
MS1H1-75B30CB-A6/ S631R-INT	MS1H1-75B30CB-A6/ S634R-INT	80	0.75	Single-phase/ Three-phase 220 V		S5R5	00005

Servo motor				Servo drive SV680N-INT (standard)			
Models without brake	Models with Brake	Flange Size (mm)	Capacity (W) (kW)	Voltage class (V)	Size	Recommended Model	No.
MS1H1-10C30CB-A6/ S631R-INT	MS1H1-10C30CB-A6/ S634R-INT	80	1.0	Single-phase/ Three-phase 220 V	C	S7R6	00006
MS1H2 (n_N= 3000 rpm, n_{max}= 6000 rpm) series ratings							
MS1H2-10C30CB-A6/ S631R-INT	MS1H2-10C30CB-A6/ S634R-INT	100	1.0	Single-phase/ Three-phase 220 V	C	S7R6	00006
MS1H2-10C30CD-A6/ S631R-INT	MS1H2-10C30CD-A6/ S634R-INT	100	1.0	Three-phase 380 V		T3R5	10001
MS1H2-15C30CB-A6/ S631R-INT	MS1H2-15C30CB-A6/ S634R-INT	100	1.5	Single-phase/ Three-phase 220 V	D	S012	00007
MS1H2-15C30CD-A6/ S631R-INT	MS1H2-15C30CD-A6/ S634R-INT	100	1.5	Three-phase 380 V	C	T5R4	10002
MS1H2-20C30CB-A6/ S631R-INT	MS1H2-20C30CB-A6/ S634R-INT	100	2.0	Three-phase 220 V	E	S018	00008
MS1H2-20C30CD-A6/ S631R-INT	MS1H2-20C30CD-A6/ S634R-INT	100	2.0	Three-phase 380 V	D	T8R4	10003
MS1H2-25C30CB-A6/ S631R-INT	MS1H2-25C30CB-A6/ S634R-INT	100	2.5	Three-phase 220 V	E	S022	00009
MS1H2-25C30CD-A6/ S631R-INT	MS1H2-25C30CD-A6/ S634R-INT	100	2.5	Three-phase 380 V	D	T012	10004
MS1H2-30C30CB-A6/ S631R-INT	MS1H2-30C30CB-A6/ S634R-INT	130	3.0	Three-phase 220 V	E	S022	00009
MS1H2-30C30CD-A6/ S631R-INT	MS1H2-30C30CD-A6/ S634R-INT	130	3.0	Three-phase 380 V	D	T012	10004
MS1H2-40C30CB-A6/ S631R-INT	MS1H2-40C30CB-A6/ S634R-INT	130	4.0	Three-phase 220 V	E	S027	00010
MS1H2-40C30CD-A6/ S631R-INT	MS1H2-40C30CD-A6/ S634R-INT	130	4.0	Three-phase 380 V		T017	10005
MS1H2-50C30CB-A6/ S631R-INT	MS1H2-50C30CB-A6/ S634R-INT	130	5.0	Three-phase 220 V		S027	00010
MS1H2-50C30CD-A6/ S631R-INT	MS1H2-50C30CD-A6/ S634R-INT	130	5.0	Three-phase 380 V		T021	10006
MS1H3 (n_N=1500 rpm, n_{max}= 4500 rpm) series ratings							
MS1H3-85B15CB-A6/ S631R-INT	MS1H3-85B15CB-A6/ S634R-INT	130	0.85	Single-phase/ Three-phase 220 V	C	S7R6	00006
MS1H3-85B15CD-A6/ S631R-INT	MS1H3-85B15CD-A6/ S634R-INT	130	0.85	Three-phase 380 V		T3R5	10001

Servo motor				Servo drive SV680N-INT (standard)			
Models without brake	Models with Brake	Flange Size (mm)	Capacity (W) (kW)	Voltage class (V)	Size	Recommended Model	No.
MS1H3-13C15CB-A6/ S631R-INT	MS1H3-13C15CB-A6/ S634R-INT	130	1.3	Single-phase/ Three-phase 220 V	D	S012	00007
MS1H3-13C15CD-A6/ S631R-INT	MS1H3-13C15CD-A6/ S634R-INT	130	1.3	Three-phase 380 V	C	T5R4	10002
MS1H3-18C15CB-A6/ S631R-INT	MS1H3-18C15CB-A6/ S634R-INT	130	1.8	Three-phase 220 V	E	S018	00008
MS1H3-18C15CD-A6/ S631R-INT	MS1H3-18C15CD-A6/ S634R-INT	130	1.8	Three-phase 380 V	D	T8R4	10003
MS1H3-29C15CB-A6/ S631R-INT	MS1H3-29C15CB-A6/ S634R-INT	180	2.9	Three-phase 220 V	E	S022	00009
MS1H3-29C15CD-A6/ S631R-INT	MS1H3-29C15CD-A6/ S634R-INT	180	2.9	Three-phase 380 V	D	T012	10004
MS1H3-44C15CB-A6/ S631R-INT	MS1H3-44C15CB-A6/ S634R-INT	180	4.4	Three-phase 220 V	E	S027	00010
MS1H3-44C15CD-A6/ S631R-INT	MS1H3-44C15CD-A6/ S634R-INT	180	4.4	Three-phase 380 V	E	T017	10005
MS1H3-55C15CD-A6/ S631R-INT	MS1H3-55C15CD-A6/ S634R-INT	180	5.5	Three-phase 380 V		T021	10006
MS1H3-75C15CD-A6/ S631R-INT	MS1H3-75C15CD-A6/ S634R-INT	180	7.5	Three-phase 380 V		T026	10007
MS1H4 (n_N= 3000 rpm, n_{max}=7000 rpm) series ratings							
MS1H4-05B30CB-A6/ S630R-INT	MS1H4-05B30CB-A6/ S632R-INT	40	0.05	Single-phase/ Three-phase 220 V	A	S1R6	00002
MS1H4-10B30CB-A6/ S630R-INT	MS1H4-10B30CB-A6/ S632R-INT	40	0.1	Single-phase/ Three-phase 220 V		S1R6	00002
MS1H4-05B30CB-A6/ S631R-INT	MS1H4-05B30CB-A6/ S634R-INT	40	0.05	Single-phase/ Three-phase 220 V		S1R6	00002
MS1H4-10B30CB-A6/ S631R-INT	MS1H4-10B30CB-A6/ S634R-INT	40	0.1	Single-phase/ Three-phase 220 V		S1R6	00002
MS1H4-20B30CB-A6/ S631R-INT	MS1H4-20B30CB-A6/ S634R-INT	60	0.2	Single-phase/ Three-phase 220 V		S1R6	00002
MS1H4-40B30CB-A6/ S631R-INT	MS1H4-40B30CB-A6/ S634R-INT	60	0.4	Single-phase/ Three-phase 220 V		S2R8	00003

Servo motor				Servo drive SV680N-INT (standard)			
Models without brake	Models with Brake	Flange Size (mm)	Capacity (W) (kW)	Voltage class (V)	Size	Recommended Model	No.
MS1H4-55B30CB-A6/ S631R-INT	-	80	0.55	Single-phase/ Three-phase 220 V	C	S5R5	00005
MS1H4-75B30CB-A6/ S631R-INT	MS1H4-75B30CB-A6/ S634R-INT	80	0.75	Single-phase/ Three-phase 220 V		S5R5	00005
MS1H4-10C30CB-A6/ S631R-INT	MS1H4-10C30CB-A6/ S634R-INT	80	1.0	Single-phase/ Three-phase 220 V	C	S7R6	00006

Note

Models of drives:

- S: 220 V voltage class
- T: 380 V voltage class
- 1R6: 1.6 A rated output current, 2R8: 2.8 A rated output current..., 026: 26 A rated output current, 027: 27 A rated output current

2.3 Selection List [Functional Safety]

Table 2–1 Functional safety drives and compatible functional safety motors

Drive				Motor				
Voltage Class	Size	Recommended Drive Model	H01.10 No.	Motor without Brake	Motor with Brake	Flange Size (mm)	Capacity (kW)	Built-in Safety Encoder
MS1H1 (n_N= 3000 rpm, n_{max}=7000 rpm) series ratings								
Single-phase/ Three-phase 220	A	S1R6	00002	MS1H1-05B30CB-S630Z-INT	MS1H1-05B30CB-S632Z-INT	40	0.05	EA33H6-B26M16-TH5N1T
				MS1H1-10B30CB-S630Z-INT	MS1H1-10B30CB-S632Z-INT	40	0.1	EA33H6-B26M16-TH5N1T
				MS1H1-20B30CB-S630R-INT	MS1H1-20B30CB-S632R-INT	60	0.2	EA45H8-B26M16-TH5N1T

Drive				Motor				
Voltage Class	Size	Recommended Drive Model	H01.10 No.	Motor without Brake	Motor with Brake	Flange Size (mm)	Capacity (kW)	Built-in Safety Encoder
Single-phase/ Three-phase 220		S2R8	00003	MS1H1-40B30CB-S630R-INT	MS1H1-40B30CB-S632R-INT	60	0.4	EA45H8-B26M16-TH5N1T
Single-phase/ Three-phase 220	C	S5R5	00005	MS1H1-55B30CB-S630R-INT	MS1H1-55B30CB-S632R-INT	80	0.55	EA45H8-B26M16-TH5N1T
Single-phase/ Three-phase 220		S5R5	00005	MS1H1-75B30CB-S630R-INT	MS1H1-75B30CB-S632R-INT	80	0.75	EA45H8-B26M16-TH5N1T
Single-phase/ Three-phase 220	C	S7R6	00006	MS1H1-10C30CB-S630R-INT	MS1H1-10C30CB-S632R-INT	80	1.0	EA45H8-B26M16-TH5N1T
MS1H2 (n_N= 3000 rpm, n_{max}= 6000 rpm) series ratings								
Single-phase/ Three-phase 220	C	S7R6	00006	MS1H2-10C30CB-S631R-INT	MS1H2-10C30CB-S634R-INT	100	1.0	EA79R8-B26M16-TH5Y3-FS
Three-phase 400		T3R5	10001	MS1H2-10C30CD-S631R-INT	MS1H2-10C30CD-S634R-INT	100	1.0	EA79R8-B26M16-TH5Y3-FS
Single-phase/ Three-phase 220	D	S012	00007	MS1H2-15C30CB-S631R-INT	MS1H2-15C30CB-S634R-INT	100	1.5	EA79R8-B26M16-TH5Y3-FS
Three-phase 400	C	T5R4	10002	MS1H2-15C30CD-S631R-INT	MS1H2-15C30CD-S634R-INT	100	1.5	EA79R8-B26M16-TH5Y3-FS
Three-phase 200	E	S018	00008	MS1H2-20C30CB-S631R-INT	MS1H2-20C30CB-S634R-INT	100	2.0	EA79R8-B26M16-TH5Y3-FS
Three-phase 400	D	T8R4	10003	MS1H2-20C30CD-S631R-INT	MS1H2-20C30CD-S634R-INT	100	2.0	EA79R8-B26M16-TH5Y3-FS
Three-phase 200	E	S022	00009	MS1H2-25C30CB-S631R-INT	MS1H2-25C30CB-S634R-INT	100	2.5	EA79R8-B26M16-TH5Y3-FS

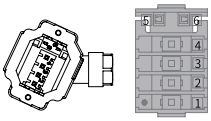
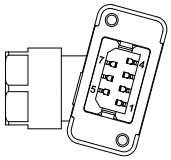
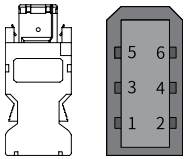
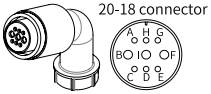
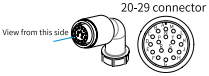
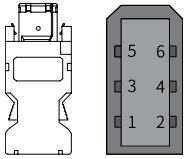
Drive				Motor				
Voltage Class	Size	Recommended Drive Model	H01.10 No.	Motor without Brake	Motor with Brake	Flange Size (mm)	Capacity (kW)	Built-in Safety Encoder
Three-phase 400	D	T8R4	10003	MS1H2-25C30CD-S631R-INT	MS1H2-25C30CD-S634R-INT	100	2.5	EA79R8-B26M16-TH5Y3-FS
Three-phase 200	E	S022	00009	MS1H2-30C30CB-S631R-INT	MS1H2-30C30CB-S634R-INT	130	3.0	EA79R8-B26M16-TH5Y3-FS
Three-phase 400	D	T012	10004	MS1H2-30C30CD-S631R-INT	MS1H2-30C30CD-S634R-INT	130	3.0	EA79R8-B26M16-TH5Y3-FS
Three-phase 200	E	S027	00010	MS1H2-40C30CB-S631R-INT	MS1H2-40C30CB-S634R-INT	130	4.0	EA79R8-B26M16-TH5Y3-FS
Three-phase 400		T017	10005	MS1H2-40C30CD-S631R-INT	MS1H2-40C30CD-S634R-INT	130	4.0	EA79R8-B26M16-TH5Y3-FS
Three-phase 200		S027	00010	MS1H2-50C30CB-S631R-INT	MS1H2-50C30CB-S634R-INT	130	5.0	EA79R8-B26M16-TH5Y3-FS
Three-phase 400		T021	10006	MS1H2-50C30CD-S631R-INT	MS1H2-50C30CD-S634R-INT	130	5.0	EA79R8-B26M16-TH5Y3-FS
MS1H3 (n_N=1500 rpm, n_{max}= 4500 rpm) series ratings								
Single-phase/ Three-phase 220	C	S7R6	00006	MS1H3-85B15CB-S631R-INT	MS1H3-85B15CB-S634R-INT	130	0.85	EA79R8-B26M16-TH5Y3-FS
Three-phase 400		T3R5	10001	MS1H3-85B15CD-S631R-INT	MS1H3-85B15CD-S634R-INT	130	0.85	EA79R8-B26M16-TH5Y3-FS
Single-phase/ Three-phase 220	D	S012	00007	MS1H3-13C15CB-S631R-INT	MS1H3-13C15CB-S634R-INT	130	1.3	EA79R8-B26M16-TH5Y3-FS
Three-phase 400	C	T5R4	10002	MS1H3-13C15CD-S631R-INT	MS1H3-13C15CD-S634R-INT	130	1.3	EA79R8-B26M16-TH5Y3-FS
Three-phase 200	D	S018	00008	MS1H3-18C15CB-S631R-INT	MS1H3-18C15CB-S634R-INT	130	1.8	EA79R8-B26M16-TH5Y3-FS
Three-phase 400	D	T8R4	10003	MS1H3-18C15CD-S631R-INT	MS1H3-18C15CD-S634R-INT	130	1.8	EA79R8-B26M16-TH5Y3-FS

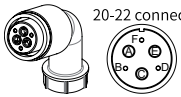
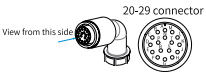
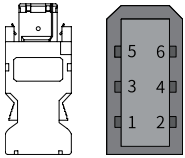
Drive				Motor				
Voltage Class	Size	Recommended Drive Model	H01.10 No.	Motor without Brake	Motor with Brake	Flange Size (mm)	Capacity (kW)	Built-in Safety Encoder
Three-phase 200	E	S022	00009	MS1H3-29C15CB-S631R-INT	MS1H3-29C15CB-S634R-INT	180	2.9	EA79R8-B26M16-TH5Y3-FS
Three-phase 400		T012	10004	MS1H3-29C15CD-S631R-INT	MS1H3-29C15CD-S634R-INT	180	2.9	EA79R8-B26M16-TH5Y3-FS
Three-phase 200	E	S027	00010	MS1H3-44C15CB-S631R-INT	MS1H3-44C15CB-S634R-INT	180	4.4	EA79R8-B26M16-TH5Y3-FS
Three-phase 400	E	T017	10005	MS1H3-44C15CD-S631R-INT	MS1H3-44C15CD-S634R-INT	180	4.4	EA79R8-B26M16-TH5Y3-FS
Three-phase 400		T021	10006	MS1H3-55C15CD-S631R-INT	MS1H3-55C15CD-S634R-INT	180	5.5	EA79R8-B26M16-TH5Y3-FS
Three-phase 400		T026	10007	MS1H3-75C15CD-S631R-INT	MS1H3-75C15CD-S634R-INT	180	7.5	EA79R8-B26M16-TH5Y3-FS
MS1H4 (n_N= 3000 rpm, n_{max}=7000 rpm) series ratings								
Single-phase/ Three-phase 220	A	S1R6	00002	MS1H4-10B30CB-S630Z-INT	MS1H4-10B30CB-S632Z-INT	40	0.1	EA33H6-B26M16-TH5N1T
				MS1H4-20B30CB-S631R-INT	MS1H4-20B30CB-S634R-INT	60	0.2	EA45H8-B26M16-TH5N1T
Single-phase/ Three-phase 220		S2R8	00003	MS1H4-40B30CB-S631R-INT	MS1H4-40B30CB-S634R-INT	60	0.4	EA45H8-B26M16-TH5N1T
Single-phase/ Three-phase 220	C	S5R5	00005	MS1H4-55B30CB-S631R-INT	MS1H4-55B30CB-S634R-INT	80	0.55	EA45H8-B26M16-TH5N1T
Single-phase/ Three-phase 220		S5R5	00005	MS1H4-75B30CB-S631R-INT	MS1H4-75B30CB-S634R-INT	80	0.75	EA45H8-B26M16-TH5N1T
Single-phase/ Three-phase 220	C	S7R6	00006	MS1H4-10C30CB-S631R-INT	MS1H4-10C30CB-S634R-INT	80	1.0	EA45H8-B26M16-TH5N1T

Note

Safety functions SS1-r/SLS/SSM/SOS/SS2/SDI require the use of a safety motor, while safety functions SS1-t/STO/SBC do not.

2.4 Terminals on the Motor Side

<table>
<tr><th>Name</th><th>Diagram</th><th colspan="3">Power cable 6-pin connector</th><th colspan="3">Motor-side encoder 7-pin connector</th><th colspan="3">Drive-side 6-pin male connector</th></tr>
<tr><td rowspan="10">Terminals of 40, 60, and 80 flange motors (terminal type)</td><td rowspan="10"></td><td colspan="3"></td><td colspan="3"></td><td colspan="3"></td></tr>
<tr><td>Pin No.</td><td>Signal Name</td><td>Color</td><td>Pin No.</td><td>Signal Name</td><td>Color</td><td>Pin No.</td><td>Signal Name</td><td>Color</td></tr>
<tr><td>1</td><td>PE</td><td>Yellow/ Green</td><td>1</td><td>PS+</td><td>Gray</td><td>1</td><td>+5 V</td><td>White</td></tr>
<tr><td>2</td><td>W</td><td>Black 3</td><td>2</td><td>PS-</td><td>Pink</td><td>2</td><td>GND</td><td>Brown</td></tr>
<tr><td>3</td><td>V</td><td>Black 2</td><td>3</td><td>DC+</td><td>Yellow</td><td>5</td><td>PS+</td><td>Gray</td></tr>
<tr><td>4</td><td>U</td><td>Black 1</td><td>4</td><td>DC-</td><td>Green</td><td>6</td><td>PS-</td><td>Pink</td></tr>
<tr><td>5</td><td rowspan="2">Brake (polarity insensitive)</td><td>White</td><td>5</td><td>+5 V</td><td>White</td><td rowspan="2">Enclosure</td><td rowspan="2">PE</td><td rowspan="2">-</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Brown</td><td>6</td><td>GND</td><td>Brown</td></tr>
<tr><td>7</td><td>PE</td><td>-</td></tr>
<tr><td rowspan="10">Terminals of 100 and 130 flange motors</td><td rowspan="10"></td><td colspan="3">Power cable connector</td><td colspan="3">Encoder cable connector of motors</td><td colspan="3">Drive-side 6-pin male connector</td></tr>
<tr><td colspan="3"></td><td colspan="3"></td><td colspan="3"></td></tr>
<tr><td>Pin No.</td><td>Pin No.</td><td>Color</td><td>Pin No.</td><td>Signal Name</td><td>Color</td><td>Pin No.</td><td>Signal Name</td><td>Color</td></tr>
<tr><td>B</td><td>U</td><td>Black 1</td><td>A</td><td>PS+</td><td>Gray</td><td>1</td><td>+5 V</td><td>White</td></tr>
<tr><td>I</td><td>V</td><td>Black 2</td><td>B</td><td>PS-</td><td>Pink</td><td>2</td><td>GND</td><td>Brown</td></tr>
<tr><td>F</td><td>W</td><td>Black 3</td><td>E</td><td>DC+</td><td>Yellow</td><td>5</td><td>PS+</td><td>Gray</td></tr>
<tr><td>G</td><td>PE</td><td>Yellow/ Green</td><td>F</td><td>DC-</td><td>Green</td><td>6</td><td>PS-</td><td>Pink</td></tr>
<tr><td>C</td><td rowspan="2">Brake</td><td>Black 4</td><td>G</td><td>+5 V</td><td>White</td><td rowspan="2">Enclosure</td><td rowspan="2">PE</td><td rowspan="2">-</td></tr>
<tr><td>E</td><td>Black 5</td><td>H</td><td>GND</td><td>Brown</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td>(polarity insensitive)</td><td></td><td>J</td><td>Shield</td><td>-</td><td></td><td></td><td></td></tr>
<tr><td rowspan="11">Terminals of 180 flange motors</td><td rowspan="11"></td><td colspan="3">Power cable connector</td><td colspan="3">Encoder cable connector of motors</td><td colspan="3">Drive-side 6-pin male connector</td></tr>
<tr><td colspan="3">
</td><td colspan="3">
</td><td colspan="3">
</td></tr>
<tr><td>Pin No.</td><td>Pin No.</td><td>Color</td><td>Pin No.</td><td>Signal Name</td><td>Color</td><td>Pin No.</td><td>Signal Name</td><td>Color</td></tr>
<tr><td>A</td><td>U</td><td>Black 1</td><td>A</td><td>PS+</td><td>Gray</td><td>1</td><td>+5 V</td><td>White</td></tr>
<tr><td>C</td><td>V</td><td>Black 2</td><td>B</td><td>PS-</td><td>Pink</td><td>2</td><td>GND</td><td>Brown</td></tr>
<tr><td>E</td><td>W</td><td>Black 3</td><td>E</td><td>DC+</td><td>Yellow</td><td>5</td><td>PS+</td><td>Gray</td></tr>
<tr><td>F</td><td>PE</td><td>Yellow/ Green</td><td>F</td><td>DC-</td><td>Green</td><td>6</td><td>PS-</td><td>Pink</td></tr>
<tr><td>B</td><td rowspan="2">Brake (polarity insensitive)</td><td rowspan="2">Black 4</td><td>G</td><td>+5 V</td><td>White</td><td rowspan="2">Enclosure</td><td rowspan="2">PE</td><td rowspan="2">-</td></tr>
<tr><td rowspan="2">D</td><td>H</td><td>GND</td><td>Brown</td></tr>
<tr><td rowspan="2">Black 5</td><td>J</td><td>Shield</td><td>-</td></tr>
</table>

2.5 Cables

2.5.1 Power cable

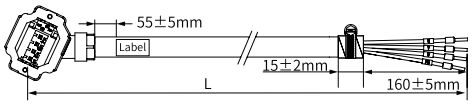
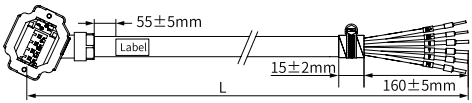
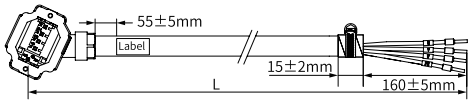
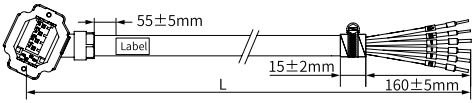
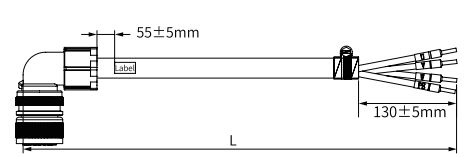
Power Cable Model

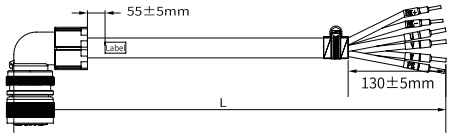
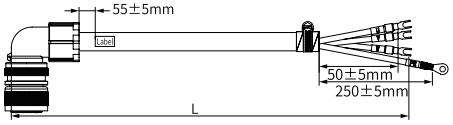
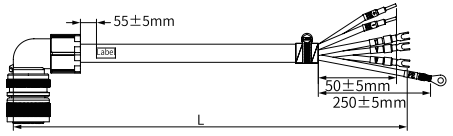
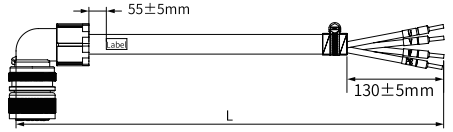
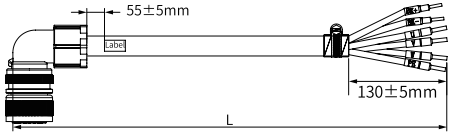
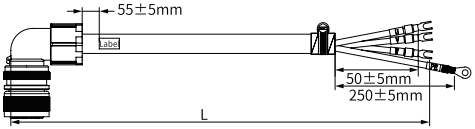
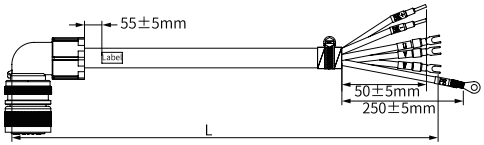
$$\underset{①}{\text{S6-L-M}} - \underset{②}{0}\,\underset{③}{0}\,\underset{④}{1} - \underset{⑤}{3.0} - \underset{⑥}{T} - \underset{⑦}{INT}$$

① **Cable Type** S6-L-B/M: motion control power cable B: with brake M: without brake	③ **Motor Power** 0: 40/60/80 mm frames 1: 100/130/180 mm frames 2: 180 mm frames (4.4 kW and above)	⑤ **Cable Length (m)** 3.0: 3 5.0: 5 10.0: 10

② **Connector type at drive side** 0: Spade tongue terminal 1: Pin terminal	④ **Connector type at motor side** 1: 9-core military-spec connector 2: 6-core military-spec connector 7: SDC-06T series connector (front outgoing) 8: SDC-06T series connector (rear outgoing)	⑥ **Special requirements** _: Fixed cable T: Drag chain ⩾ 10 million times ⑦ **Version** INT: global version

List of power cables

Motor Model	Cable Name		Cable Model	L Cable Length (mm)	Illustration
MS1H1/ MS1H4 motor	Front outlet	Power cable for motor without brake	S6-L-M107-3.0 (-T) -INT	3000	
			S6-L-M107-5.0 (-T) -INT	5000	
			S6-L-M107-10.0 (-T) -INT	10000	
		Brake	S6-L-B107-3.0 (-T) -INT	3000	
			S6-L-B107-5.0 (-T) -INT	5000	
			S6-L-B107-10.0 (-T) -INT	10000	
	Rear outlet	Power cable for motor without brake	S6-L-M108-3.0 (-T) -INT	3000	
			S6-L-M108-5.0 (-T) -INT	5000	
			S6-L-M108-10.0 (-T) -INT	10000	
		Brake	S6-L-B108-3.0 (-T) -INT	3000	
			S6-L-B108-5.0 (-T) -INT	5000	
			S6-L-B108-10.0 (-T) -INT	10000	
MS1H2 motor rated 3 kW or below/ MS1H3 motor rated 1.8 kW	Power cable for motor without brake		S6-L-M111-3.0 (-T) -INT	3000	
			S6-L-M111-5.0 (-T) -INT	5000	
			S6-L-M111-10.0 (-T) -INT	10000	

Motor Model	Cable Name	Cable Model	L Cable Length (mm)	Illustration
or below	Brake	S6-L-B111-3.0 (-T) -INT	3000	
		S6-L-B111-5.0 (-T) -INT	5000	
		S6-L-B111-10.0 (-T) -INT	10000	
MS1H2 motor rated 4 kW/5 kW	Power cable for motor without brake	S6-L-M011-3.0 (-T) -INT	3000	
		S6-L-M011-5.0 (-T) -INT	5000	
		S6-L-M011-10.0 (-T) -INT	10000	
	Brake	S6-L-B011-3.0 (-T) -INT	3000	
		S6-L-B011-5.0 (-T) -INT	5000	
		S6-L-B011-10.0 (-T) -INT	10000	
MS1H3 motors (2.9 kW)	Power cable for motor without brake	S6-L-M112-3.0 (-T) -INT	3000	
		S6-L-M112-5.0 (-T) -INT	5000	
		S6-L-M112-10.0 (-T) -INT	10000	
	Brake	S6-L-B112-3.0 (-T) -INT	3000	
		S6-L-B112-5.0 (-T) -INT	5000	
		S6-L-B112-10.0 (-T) -INT	10000	
MS1H3 (4.4 kW and above)	Power cable for motor without brake	S6-L-M022-3.0 (-T) -INT	3000	
		S6-L-M022-5.0 (-T) -INT	5000	
		S6-L-M022-10.0 (-T) -INT	10000	
	Brake	S6-L-B022-3.0 (-T) -INT	3000	
		S6-L-B022-5.0 (-T) -INT	5000	
		S6-L-B022-10.0 (-T) -INT	10000	

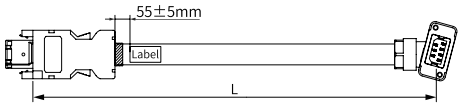
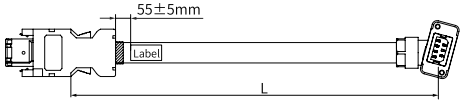
2.5.2 Encoder cable

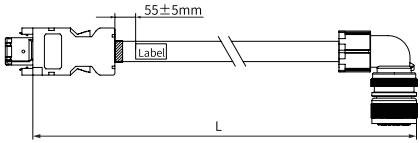
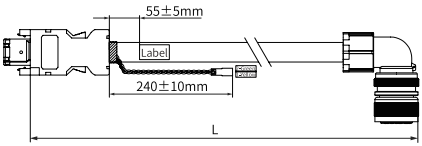
Encoder Cable Model

S6-L-P - 1 2 1 - 3.0 - T - INT
① ②③④ ⑤ ⑥ ⑦

① **Cable Type** S6-L-P: encoder cable	③ **Encoder** 1: Communication incremental encoder 2: Multi-turn absolute	⑤ **Cable Length (m)** 3.0: 3 5.0: 5 10.0: 10
② **Connector type at drive side** 1: USB	④ **Connector type at motor side** 1: 9-core military-spec connector 4: SDC-06T series connector (front outgoing) 5: SDC-06T series connector (rear outgoing)	⑥ **Special requirements** _: Fixed cable T: Drag chain ⩾ 10 million times
		⑦ **Version** INT: global version

List of encoder cables

Motor Model	Cable Name		Cable Model	L Cable Length (mm)	Illustration
MS1H1/ MS1H4 termi nal-type motor	Front outlet	Single-turn absolute encoder cable	S6-L-P114-3.0 (-T) -INT	3000	
			S6-L-P114-5.0 (-T) -INT	5000	
			S6-L-P114-10.0 (-T) -INT	10000	
		Multi-turn absolute encoder cable	S6-L-P124-3.0 (-T) -INT	3000	
			S6-L-P124-5.0 (-T) -INT	5000	
			S6-L-P124-10.0 (-T) -INT	10000	
	Rear outlet	Single-turn absolute encoder cable	S6-L-P115-3.0 (-T) -INT	3000	
			S6-L-P115-5.0 (-T) -INT	5000	
			S6-L-P115-10.0 (-T) -INT	10000	
		Multi-turn absolute encoder cable	S6-L-P125-3.0 (-T) -INT	3000	
			S6-L-P125-5.0 (-T) -INT	5000	
			S6-L-P125-10.0 (-T) -INT	10000	

Motor Model	Cable Name	Cable Model	L Cable Length (mm)	Illustration
MS1H2/MS1H3 motor	Single-turn absolute encoder cable	S6-L-P111-3.0 (-T) -INT	3000	
		S6-L-P111-5.0 (-T) -INT	5000	
		S6-L-P111-10.0 (-T) -INT	10000	
	Multi-turn absolute encoder cable	S6-L-P121-3.0 (-T) -INT	3000	
		S6-L-P121-5.0 (-T) -INT	5000	
		S6-L-P121-10.0 (-T) -INT	10000	

Note

The encoder cable comes with a shield as standard.

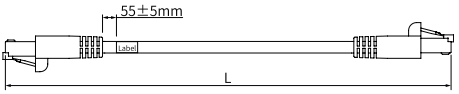
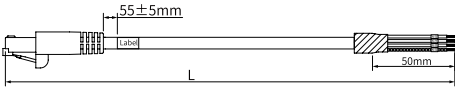
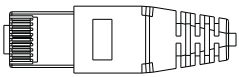
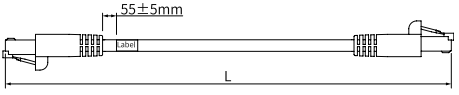
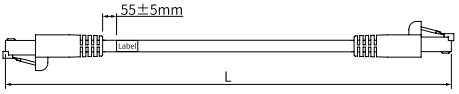
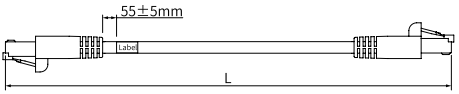
2.5.3 Communication Cable

Model number of communication cables

S6-L-T ① - 02 ② - 0.3 ③

① **Cable Type**	② **Cable type**	③ **Cable Length (m)**
S6-L-T: Motion control communication cable	01: Servo drive multi-drive communication cable (CAN&RS485) 02: Drive-PLC communication cable 03: Servo drive communication termination resistor cable (CAN&RS485) 04: Servo drive network communication cable (CAT.5E&PROFINET) 07: Servo drive network communication cable (CAT6A&PROFINET) 08: Servo drive network communication cable (CAT7&PROFINET)	0.3: 0.3 2.0: 2 ...

List of communication cables

Cable Name	Cable Model	Cable Length (mm)	Illustration
Multi-drive communication cable	S6-L-T01-0.3	300	
Drive-PLC communication cable	S6-L-T02-2.0	2000	
Servo drive termination resistor connector	S6-L-T03-0.0	-	
Servo drive network communication cable (CAT.5E&PROFINET)	S6-L-T04-0.3	300	
Servo drive network communication cable (CAT.T6A&PROFINET)	S6-L-T07-0.3	300	
Servo drive network communication cable (CAT7&PROFINET)	S6-L-T08-0.3	300	

2.6 Options

2.6.1 Peripheral Electrical Components

2.6.1.1 List of Peripheral Electrical Components

Name	Installation Position	Applicable drive model	Function
Fuse and circuit breaker	Input side of the servo drive	All	To comply with EN 61800-5-1 and UL61800-5-1 standards, install a fuse/ circuit breaker on the input side of the servo drive to prevent accidents caused by short circuit in the internal circuit.
Electromagnetic Contactor	Input side of the servo drive		Used to connect or disconnect the circuit.

Name	Installation Position	Applicable drive model	Function
AC Input Reactor	Input side of the servo drive		It is used to eliminate the higher harmonics of the input side effectively and improve the power factor of the input side.
EMC filter	Input side of the servo drive		It is used to reduce external conduction and radiation interference of the drive.
Magnetic ring and ferrite clamp	Output side of the drive		Reduces interferences to the outside and the bearing current.
	Signal cable		Improves the anti-interference performance of signals.

2.6.1.2 Fuse

To prevent accidents caused by short circuit, install a fuse on the input side of the drive.

Table 2–2 List of recommended fuses

Servo drive SV680-INT series			Recommended Fuse		
Size	Model	Rated Input Current (A)	Manufacturer	Rated Current (A)	Model
Single-phase 200 V					
A	S1R6	2.3	Bussmann	5	FWP-5B
	S2R8	4.0		10	FWP-10B
C	S5R5	7.9		20	FWP-20B
	S7R6	9.6		20	FWP-20B
D	S012	12.8		20	FWP-20B
Three-phase 200 V					
A	S1R6	1.1	Bussmann	5	FWP-5B
	S2R8	2.3		5	FWP-5B
C	S5R5	4.4		15	FWP-15B
	S7R6	5.1		15	FWP-15B
D	S012	8.0		20	FWP-20B
E	S018	8.7		20	FWP-20B
	S022	11.0		35	FWP-35B
	S027	23.8		40	FWP-40B
Three-phase 400 V					
C	T3R5	2.4	Bussmann	5	FWP-5B
	T5R4	3.6		10	FWP-10B
D	T8R4	5.6		15	FWP-15B
	T012	8.0		20	FWP-20B

Servo drive SV680-INT series			Recommended Fuse		
Size	Model	Rated Input Current (A)	Manufacturer	Rated Current (A)	Model
E	T017	12.0		35	FWP-35B
	T021	16.0		35	FWP-35B
	T026	21.0		40	FWP-40B

Note

For instructions of installing the fuse, see the related section.

2.6.1.3 Electromagnetic Contactor

Table 2–3 Recommended electromagnetic contactor models

Servo drive SV680-INT series			Recommended Contactor		
Size	Model	Rated Input Current (A)	Manufacturer	Current (A)	Model
Single-phase 200 V					
A	S1R6	2.3	Schneider	9	LC1 D09
	S2R8	4.0		9	LC1 D09
C	S5R5	7.9		9	LC1 D09
	S7R6	9.6		12	LC1 D12
D	S012	12.8		18	LC1 D18
Three-phase 200 V					
A	S1R6	1.1	Schneider	9	LC1 D09
	S2R8	2.3			
C	S5R5	4.4			
	S7R6	5.1			
D	S012	8.0		9	LC1 D09
E	S018	8.7		12	LC1 D12
	S022	11.0			
	S027	23.8		25	LC1 D25
Three-phase 400 V					
C	T3R5	2.4	Schneider	9	LC1 D09
	T5R4	3.6		9	LC1 D09
D	T8R4	5.6		9	LC1 D09
	T012	8.0		9	LC1 D09
E	T017	12.0		18	LC1 D18
	T021	16.0		18	LC1 D18

Servo drive SV680-INT series			Recommended Contactor		
Size	Model	Rated Input Current (A)	Manufacturer	Current (A)	Model
	T026	21.0		25	LC1 D25

2.6.1.4 Breaker

Table 2–4 Recommended circuit breaker models

Servo drive SV680-INT series			Recommended Circuit Breaker		
Size	Model	Rated Input Current (A)	Manufacturer	Current (A)	Model
Single-phase 200 V					
A	S1R6	2.3	Schneider	4	OSMC32N2D4
	S2R8	4.0		6	OSMC32N2D6
C	S5R5	7.9		16	OSMC32N2D16
	S7R6	9.6		16	OSMC32N2D16
D	S012	12.8		20	OSMC32N2D20
Three-phase 200 V					
A	S1R6	1.1	Schneider	4	OSMC32N3D4
	S2R8	2.3		6	OSMC32N3D6
C	S5R5	4.4		16	OSMC32N3D16
	S7R6	5.1		16	OSMC32N3D16
D	S012	8.0		16	OSMC32N3D16
E	S018	8.7		20	OSMC32N3D20
	S022	11.0		25	OSMC32N3D25
	S027	23.8		32	OSMC32N3D32
Three-phase 400 V					
C	T3R5	2.4	Schneider	4	OSMC32N3D4
	T5R4	3.6		6	OSMC32N3D6
D	T8R4	5.6		10	OSMC32N3D10
	T012	8.0		16	OSMC32N3D16
E	T017	12.0		20	OSMC32N3D20
	T021	16.0		25	OSMC32N3D25
	T026	21.0		32	OSMC32N3D32

Note

- For UL-compliant products, see the related section for recommended fuse/circuit breaker models.
- The rated current of the circuit breaker can be reduced as low as the rated current of the drive, if the load and operation conditions permit.
- This table only lists the recommended models. You can also use fuses/circuit breakers of the same specifications from other manufacturers that comply with UL North America certification.

If a residual current device (RCD) is needed, select the RCD according to the following requirements:

- Use a B-type RCD because the drive may generate DC leakage current in the protective conductor.
- For each drive, use an RCD whose tripping current is not lower than 100 mA to prevent RCD malfunction due to high-frequency leakage current generated by the drive.
- When multiple drives are connected in parallel and share one RCD, select an RCD whose tripping current is not lower than 300 mA.
- It is recommended to use Chint or Schneider RCDs.

Note

For instructions of installing the circuit breaker, see the related section.

2.6.1.5 AC Input Reactor

Selection

An AC input reactor is optional and mainly used to reduce harmonics in the input current. Install an external reactor as needed in actual applications. The following table lists the recommended manufacturers and models of input reactors.

Table 2–5 AC input reactor model selection

Servo drive SV680-INT series			Applicable Reactor	Inductance (mH)
Size	Model	Rated Input Current (A)		
Three-phase 200 V				
A	S1R6	1.1	MD-ACL-10-5-4T	5
	S2R8	2.3	MD-ACL-10-5-4T	5
C	S5R5	4.4	MD-ACL-10-5-4T	5

Servo drive SV680-INT series			Applicable Reactor	Inductance (mH)
Size	Model	Rated Input Current (A)		
	S7R6	5.1	MD-ACL-10-5-4T	5
D	S012	8.0	MD-ACL-10-5-4T	5
E	S018	8.7	MD-ACL-15-3-4T	3
	S022	11.0	MD-ACL-15-3-4T	3
	S027	23.8	MD-ACL-40-1.45-4T	1.45
Three-phase 400 V				
C	T3R5	2.4	MD-ACL-10-5-4T	5
	T5R4	3.6	MD-ACL-10-5-4T	5
D	T8R4	5.6	MD-ACL-10-5-4T	5
	T012	8.0	MD-ACL-10-5-4T	5
E	T017	12.0	MD-ACL-15-3-4T	3
	T021	16.0	MD-ACL-40-1.45-4T	1.45
	T026	21.0	MD-ACL-40-1.45-4T	1.45

Dimensions

- Inovance input reactors

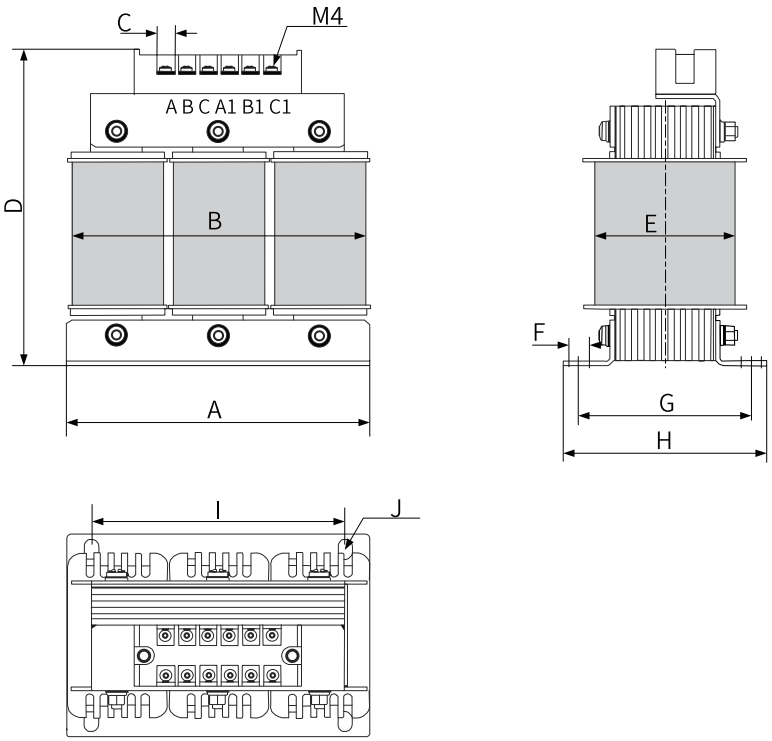


Figure 2-2 Dimensions of 10–15 A AC input reactors

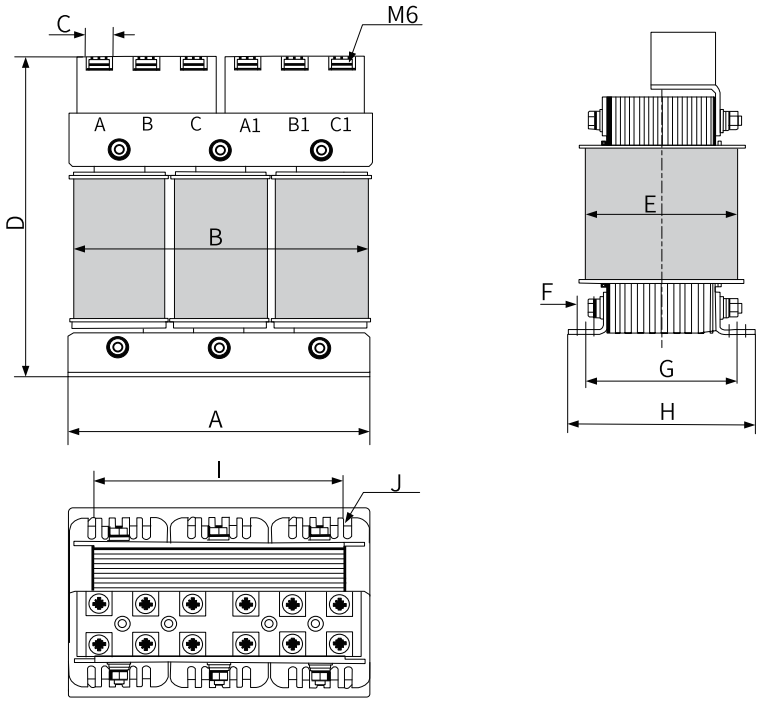


Figure 2-3 Dimensions of 40 A (1.45 mH) AC input reactors

Table 2–6 Dimensions of Inovance AC input reactors (unit: mm)

Model	A	B	C	D	E	F	G	H	I	J
MD-ACL-10-5-4T	150±2	155	8	160	80	10	85±2	100±2	125±1	Ø7 x 10
MD-ACL-15-3-4T	150±2	155	8	160	80	10	85±2	100±2	125±1	Ø7 x 10
MD-ACL-40-1.45-4T	180±2	185	16	200	105	10	95±2	117±2	150±1	Ø7 x 10

Note

For instructions of installing the AC input reactor, see the related section.

2.6.1.6 EMC filter

Selection

To comply with the radiated and conducted emission requirements of EN IEC 61800-3, install the EMC filter listed in the following table. EMC filter options are FN2090 and FN3287 series EMC filters manufactured by Schaffner. Select the EMC filter according to the rated input current of the servo drive, as shown in the following table.

Table 2–7 Standard EMC filter model and appearance

Filter Model		Appearance
Schaffner	FN2090 series	
	FN3287 series	

Table 2–8 Filter model selection (Schaffner)

Servo drive SV680-INT series			Applicable Filter
Size	Model	Rated Input Current (A)	
Single-phase 200 V			
A	S1R6	2.3	FN 2090-3-06
	S2R8	4.0	FN 2090-4-06
C	S5R5	7.9	FN 2090-8-06
	S7R6	9.6	FN 2090-10-06
D	S012	12.8	FN 2090-16-06
Three-phase 200 V			
A	S1R6	1.1	FN 3287-10-44-C28-R65
	S2R8	2.3	FN 3287-10-44-C28-R65
C	S5R5	4.4	FN 3287-10-44-C28-R65
	S7R6	5.1	FN 3287-10-44-C28-R65
D	S012	8.0	FN 3287-10-44-C28-R65
E	S018	8.7	FN 3287-10-44-C28-R65
	S022	11.0	FN 3287-16-44-C33-R65
	S027	23.8	FN 3287-25-33-C33-R65

Servo drive SV680-INT series			Applicable Filter
Size	Model	Rated Input Current (A)	
Three-phase 400 V			
C	T3R5	2.4	FN 3287-10-44-C28-R65
	T5R4	3.6	FN 3287-10-44-C28-R65
D	T8R4	5.6	FN 3287-10-44-C28-R65
	T012	8.0	FN 3287-10-44-C28-R65
E	T017	12.0	FN 3287-16-44-C33-R65
	T021	16.0	FN 3287-16-44-C33-R65
	T026	21.0	FN 3287-25-33-C33-R65

Dimensions

- Dimensions of Schaffner FN 2090 series filters

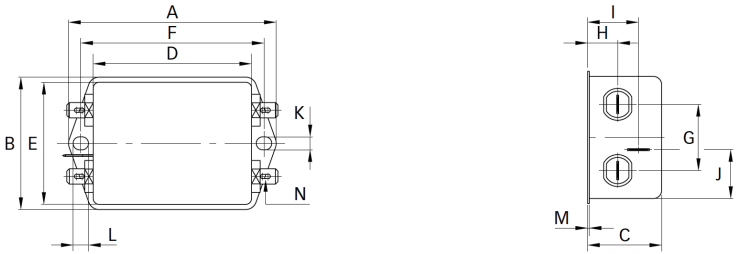


Figure 2-4 Dimensions of FN 2090 series filters (unit: mm)

Table 2–9 Dimensions of FN 2090 series filters (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
3	85	54	30.3	64.8	49.8	75	27	12.3	20.8	19.9	5.3	6.3	0.7	6.3×0.8
4														
6														
8	113.5±1	57.5±1	45.4±1	94±1	56	103	25	12.4	32.4	15.5	4.4	6	1	6.3×0.8

- Dimensions of Schaffner FN 3287 series filters

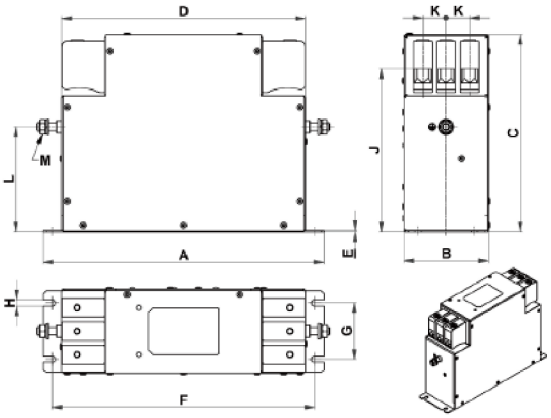


Figure 2-5 Dimension drawing of FN 3287 series filters (unit: mm)

Table 2–10 Dimensions of FN 3287 series filters (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	J±2	K	L±1	M
10	180	40	112	153	0.8	170	20	4.5	94	11	68	M5
16	200	45	112	170	0.8	185	25	5.4	102	11	76	M5
25	205	45	132	173	0.8	190	25	5.4	113	13	83	M5

Note

For instructions of installing the EMC filter, see the related section.

2.6.1.7 Magnetic Ring and Ferrite Clamp

The magnetic ring is intended to be installed on the input or output side of the drive. Install the magnetic ring as close to the drive as possible. Installing the magnetic ring on the input side can suppress the noise in the input power supply system of the drive. When it is installed on the output side, it can reduce the interference generated by the drive to external devices and the bearing current.

In applications with leakage current and signal cable interference, install a magnetic ring or a ferrite clamp.

Selection

- Amorphous magnetic ring: featuring a high permeability within 1 MHz and excellent anti-interference performance, but not as low-cost as the ferrite clamp. See *" Dimensions" on page 94* for details..

- Ferrite clamp: featuring a good interference suppression performance within a frequency band above 1MHz, applicable to low-power servo drives and signal cables, low-cost and easy to install

Magnetic Ring and Ferrite Clamp		Appearance
Magnetic ring	DY644020H	
	DY805020H	
Ferrite clamp	DYR-130-B	

Dimensions

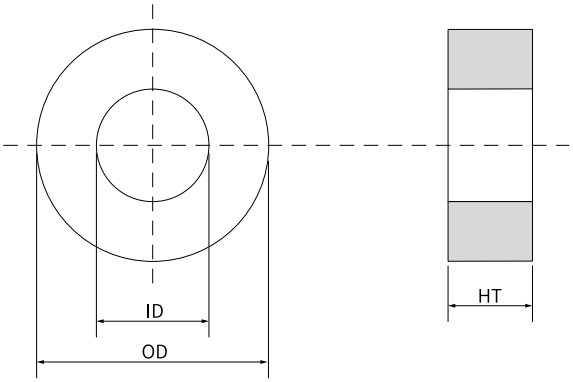


Figure 2-6 Dimensions of the magnetic ring

Table 2–11 Dimensions of the magnetic ring

Model	Dimension (OD x ID x HT) (mm)
DY644020H	64 x 40 x 20
DY805020H	80 x 50 x 20

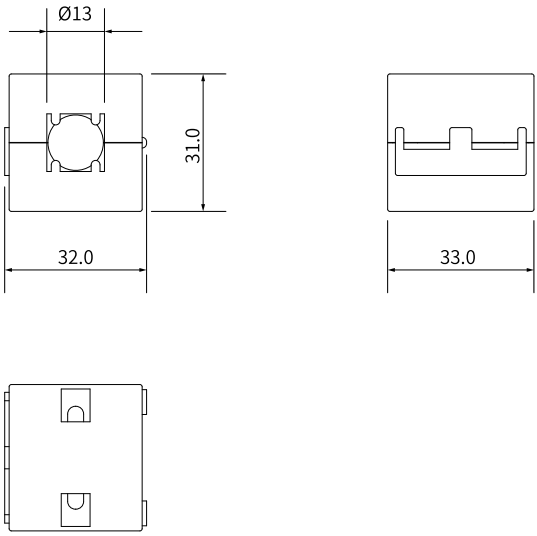


Figure 2-7 Dimensions of the ferrite clamp

Table 2–12 Dimensions of the ferrite clamp

Model	Size (Length × OD × ID) (mm)
DYR-130-B	32.0 x 31 x 13

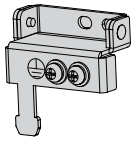
Note

For instructions of installing the magnetic ring and ferrite clamp, see the related section.

2.6.2 Shield Bracket

To reduce electromagnetic interference, a shield bracket and clamp are used with the drive cables.

Table 2–13 Shield Bracket

Model	Outline Drawing
S6-C25 (optional for SIZE A to SIZE C)	
S6-C27 (optional for SIZE D to SIZE E)	

Note

For instructions of installing the shield bracket, see the related section.

2.6.3 Absolute Encoder Batteries

Selection

Select an appropriate battery according to the following table.

Table 2–14 Description of the absolute encoder battery

Specification	Item	Rating			Condition
		Min.	Typical Value	Max.	
Output: 3.6 V, 2700 mAh	External battery voltage (V)	3.2	3.6	3.8	In standby state[1]
	Circuit fault voltage (V)	-	2.6	-	In standby state
	Battery alarm voltage (V)	2.85	3	3.15	-
	Current consumed by the circuit (uA)	-	2	-	In normal operation[2]
		-	10	-	In standby state, shaft at standstill
		-	300	-	In standby state, shaft rotating
	Ambient temperature (°C)	0	-	40	Same as the motor.
	Storage temperature (°C)	0	-	30	

The preceding values are obtained under an ambient temperature of 20°C.

Note

- [1]: The "standby state" means the encoder counts the multi-turn data by using the power from the external battery when the servo drive power supply is not switched on. In this case, data transceiving stops.
- [2]: During normal operation, the absolute encoder supports one-turn or multi-turn data counting and transceiving. Power on the servo drive after connecting the absolute encoder properly. The encoder starts data transceiving after a short delay of about 5s upon power-on. The motor speed must be lower than or equal to 10 rpm during transition from the standby state to the normal operation state (upon power-on). Otherwise, Er.740 (Encoder fault) may occur. In this case, you need to power off and on the servo drive again.

2.6.4 Braking resistor

When the motor torque direction is opposite to the direction of rotation, the energy is fed back to the servo drive from the motor side, leading to bus voltage rise. Once the bus voltage rises to the braking threshold, the excessive energy must be consumed by a braking resistor. Otherwise, the servo drive will be damaged. The braking resistor can be a built-in or an external one. The internal and built-in braking resistors must not be used together. Specifications of the braking resistor are as follows.

Table 2–15 Specifications of the braking resistor

<table>
<tr><th rowspan="2">Servo Drive Model (SV680*S1R6*-*INT)</th><th colspan="3">Specifications of Built-in Braking Resistor</th><th rowspan="2">Min. Permissible Resistance of External Braking Resistor (Ω) (H02.21)</th></tr>
<tr><th>Resistance (Ω)</th><th>Power (Pr) (W)</th><th>Processing Power (Pa) (W)</th></tr>
<tr><td>S1R6</td><td>-</td><td>-</td><td>-</td><td rowspan="3">40</td></tr>
<tr><td>S2R8</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>S5R5</td><td>50</td><td>50</td><td>40</td></tr>
<tr><td>S7R6</td><td rowspan="2">25</td><td rowspan="2">80</td><td rowspan="2">64</td><td>20</td></tr>
<tr><td>S012</td><td>15</td></tr>
<tr><td>S018</td><td rowspan="3">20</td><td rowspan="3">100</td><td rowspan="3">80</td><td rowspan="3">20</td></tr>
<tr><td>S022</td></tr>
<tr><td>S027</td></tr>
<tr><td>T3R5</td><td>100</td><td rowspan="4">80</td><td rowspan="4">64</td><td>80</td></tr>
<tr><td>T5R4</td><td>100</td><td>60</td></tr>
<tr><td>T8R4</td><td rowspan="2">50</td><td>45</td></tr>
<tr><td>T012</td><td>40</td></tr>
<tr><td>T017</td><td rowspan="3">35</td><td rowspan="3">100</td><td rowspan="3">80</td><td>35</td></tr>
<tr><td>T021</td><td rowspan="2">25</td></tr>
<tr><td>T026</td></tr>
</table>

Note

- The drive model "SV680*S1R6*-*INT" include the following models: SV680PS1R6I-PINT, SV680PS1R6I-GINT, SV680NS1R6I-PINT, SV680NS1R6S-GINT, SV680PS1R6S-PINT, SV680PS1R6S-GINT, SV680NS1R6S-PINT和SV680NS1R6S-GINT.
- The built-in braking resistor is not available in standard S1R6 or S2R8 models. You can install an external braking resistor as needed or contact Inovance to order customized S1R6 and S2R8 models that carry the built-in braking resistor.
- The processing power (P_a) of the built-in braking resistor is affected by the ambient temperature and actual load rate of the drive.

The kinetic energy generated upon braking of a reciprocating motor is converted into electric energy that fed back to the bus capacitor. When the bus voltage rises above the braking voltage threshold, the braking resistor starts consuming the excessive energy fed back by the motor. The motor speed curve is as shown in *"Figure 2–8 " on page 98*.

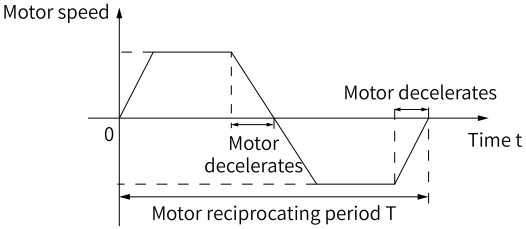


Figure 2-8 Motor speed curve

Energy calculation

The built-in braking resistor is not available in S1R6 and S2R8 models. Capacitors are used to sore energy. An external braking resistor is needed when the rotational energy of the motor and the load exceeds the values listed in the following table.

Drive Model (SV680*S1R6*-*INT)	Regenerative Energy Can Be Absorbed (W)	Remarks
S1R6	13.15	The input voltage of the main circuit power supply is 220 VAC.
S2R8	26.29	

Note

The drive model "SV680*S1R6*-*INT" include the following models: SV680PS1R6I-PINT, SV680PS1R6I-GINT, SV680NS1R6I-PINT, SV680NS1R6S-GINT, SV680PS1R6S-PINT, SV680PS1R6S-GINT, SV680NS1R6S-PINT和SV680NS1R6S-GINT.

- The following table shows the energy generated by a 200 V motor in decelerating from the rated speed to a standstill during no-load operation.

Table 2–16 200 V motor energy data

Capacity (kW)	Servo Motor Model MS1H*-*******-*****	Rotor Inertia J ($kg \cdot m^2$)	EO Generated During Decelerating from Rated Speed to a Standstill (J)	Max. Braking Energy Absorbed by the Capacitor E_C (J)
0.05	MS1H1-05B30CB-**30Z-INT MS1H1-05B30CB-**32Z-INT	0.026×10^4 (0.028×10^4)	0.13 (0.14)	9.3
0.1	MS1H1-10B30CB-**30Z-INT MS1H1-10B30CB-**32Z-INT	0.041×10^4 (0.043×10^4)	0.20 (0.21)	
0.2	MS1H1-20B30CB-**30R-INT MS1H1-20B30CB-**32R-INT	0.0938×10^4 (0.106×10^4)	0.46 (0.52)	
0.4	MS1H1-40B30CB-**30R-INT MS1H1-40B30CB-**32R-INT	0.145×10^4 (0.157×10^4)	0.72 (0.78)	18.59
0.55	MS1H1-55B30CB-**30R-INT	0.55×10^4	2.72	32.42
0.75	MS1H1-75B30CB-**30R-INT MS1H1-75B30CB-**32R-INT	0.68×10^4 (0.71×10^4)	3.36 (3.51)	32.42
1	MS1H1-10C30CB-**30R-INT MS1H1-10C30CB-**32R-INT	0.82×10^4 (0.87×10^4)	4.05 (4.30)	32.42
1	MS1H2-10C30CB-**31R-INT MS1H2-10C30CB-**34R-INT	1.78×10^4 (2.6×10^4)	8.80 (12.86)	32.42
1.5	MS1H2-15C30CB-**31R-INT MS1H2-15C30CB-**34R-INT	2.35×10^4 (3.17×10^4)	11.6 (15.68)	47.68
2.0	MS1H2-20C30CB-**31R-INT MS1H2-20C30CB-**34R-INT	2.92×10^4 (3.74×10^4)	14.44 (18.49)	78.19
2.5	MS1H2-25C30CB-**31R-INT MS1H2-25C30CB-**34R-INT	3.49×10^4 (4.3×10^4)	17.26 (21.26)	114.43
3.0	MS1H2-30C30CB-**31R-INT MS1H2-30C30CB-**34R-INT	6.4×10^4 (9.38×10^4)	31.65 (46.38)	114.43
4.0	MS1H2-40C30CB-**31R-INT MS1H2-40C30CB-**34R-INT	9×10^4 (11.98×10^4)	44.51 (59.24)	114.43
5.0	MS1H2-50C30CB-**31R-INT MS1H2-50C30CB-**34R-INT	11.6×10^4 (14.58×10^4)	57.36 (72.10)	114.43
0.85	MS1H3-85B15CB-**31R-INT MS1H3-85B15CB-**34R-INT	13.56×10^4 (15.8×10^4)	16.45 (17.3)	32.42
1.3	MS1H3-13C15CB-**31R-INT MS1H3-13C15CB-**34R-INT	19.25×10^4 (21.5×10^4)	22 (22.86)	47.68
1.8	MS1H3-18C15CB-**31R-INT MS1H3-18C15CB-**34R-INT	24.9×10^4 (27.2×10^4)	30.78 (33.63)	78.19
2.9	MS1H3-29C15CB-**31R-INT MS1H3-29C15CB-**34R-INT	44.7×10^4 (52.35×10^4)	55.26 (64.72)	114.43
4.4	MS1H3-44C15CB-**31R-INT MS1H3-44C15CB-**34R-INT	64.9×10^4 (72.55×10^4)	80.23 (89.69)	114.43
0.1	MS1H4-10B30CB-**30Z-INT	0.102×10^4	0.50	9.3

Capacity (kW)	Servo Motor Model MS1H*-*******-*****	Rotor Inertia J ($kg \cdot m^2$)	EO Generated During Decelerating from Rated Speed to a Standstill (J)	Max. Braking Energy Absorbed by the Capacitor E_C (J)
	MS1H4-10B30CB-**32Z-INT	(0.104×10^4)	(0.51)	
0.2	MS1H4-20B30CB-**31R-INT MS1H4-20B30CB-**34R-INT	0.22×10^4 (0.23×10^4)	1.09 (1.14)	9.3
0.4	MS1H4-40B30CB-**31R-INT MS1H4-40B30CB-**34R-INT	0.43×10^4 (0.44×10^4)	2.13 (2.18)	18.59
0.55	MS1H4-55B30CB-**31R-INT	1.12×10^4	5.54	32.42
0.75	MS1H4-75B30CB-**31R-INT MS1H4-75B30CB-**34R-INT	1.46×10^4 (1.51×10^4)	7.22 (7.47)	32.42
1.0	MS1H4-10C30CB**31R-INT MS1H4-10C30CB**34R-INT	1.87×10^4 (1.97×10^4)	9.25 (9.74)	32.42

- The following table shows the energy generated by a 400 V motor in decelerating from the rated speed to a standstill during no-load operation.

Table 2–17 400 V motor energy data

Capacity (kW)	Servo Motor Model MS1H*-*******-*****	Rotor Inertia J ($kg \cdot m^2$)	Braking Energy E_O (J) Generated During Operation	Max. Braking Energy Absorbed by the Capacitor E_C (J)
1.0	MS1H2-10C30CD-**31R-INT MS1H2-10C30CD-**34R-INT	1.78×10^4 (2.6×10^4)	8.8 12.86	36.06
1.5	MS1H2-15C30CD-**31R-INT MS1H2-15C30CD-**34R-INT	2.35×10^4 (3.17×10^4)	11.62 (15.68)	43.79
2.0	MS1H2-20C30CD-**31R-INT MS1H2-20C30CD-**34R-INT	2.92×10^4 (3.74×10^4)	14.44 (18.49)	64.40
2.5	MS1H2-25C30CD-**31R-INT MS1H2-25C30CD-**34R-INT	3.49×10^4 (4.3×10^4)	17.26 (21.26)	64.40
3.0	MS1H2-30C30CD-**31R-INT MS1H2-30C30CD-**34R-INT	6.4×10^4 (9.38×10^4)	31.65 (46.38)	64.40
4.0	MS1H2-40C30CD-**31R-INT MS1H2-40C30CD-**34R-INT	9×10^4 (11.98×10^4)	44.51 (59.24)	105.62
5.0	MS1H2-50C30CD-**31R-INT MS1H2-50C30CD-**34R-INT	11.6×10^4 (14.58×10^4)	57.36 (72.10)	154.56
0.85	MS1H3-85B15CD-**31R-INT MS1H3-85B15CD-**34R-INT	13.56×10^4 (15.8×10^4)	16.76 (19.53)	36.06
1.3	MS1H3-13C15CD-**31R-INT MS1H3-13C15CD-**34R-INT	19.25×10^4 (21.5×10^4)	23.8 (26.58)	43.79
1.8	MS1H3-18C15CD-**31R-INT MS1H3-18C15CD-**34R-INT	24.9×10^4 (27.2×10^4)	30.78 (33.63)	64.40
2.9	MS1H3-29C15CD-**31R-INT MS1H3-29C15CD-**34R-INT	44.7×10^4 (52.35×10^4)	55.26 (64.72)	64.40
4.4	MS1H3-44C15CD-**31R-INT MS1H3-44C15CD-**34R-INT	64.9×10^4 (72.55×10^4)	80.23 (89.69)	105.62

Capacity (kW)	Servo Motor Model MS1H*-*******-*****	Rotor Inertia J ($kg \cdot m^2$)	Braking Energy E_O (J) Generated During Operation	Max. Braking Energy Absorbed by the Capacitor E_C (J)
5.5	MS1H3-55C15CD-**31R-INT MS1H3-55C15CD-**34R-INT	86.9×10^4 (94.55×10^4)	107.43 (116.89)	154.56
7.5	MS1H3-75C15CD-**31R-INT MS1H3-75C15CD-**34R-INT	127.5×10^4 (135.15×10^4)	157.62 (167.08)	154.56

Note

- ** indicates the encoder type, which can be A3 (23-bit multi-turn absolute encoder), A6 (26-bit multi-turn absolute encoder) or S6 (26-bit multi-turn absolute encoder of functional safety type).
- Values inside the parentheses "()" are for the motor with brake.

If the total braking time T is known, you can determine whether an external braking resistor is needed and the power required using the following flowchart and formula.

Selection of the braking resistor for a servo rotary motor

- **Without external load torque**

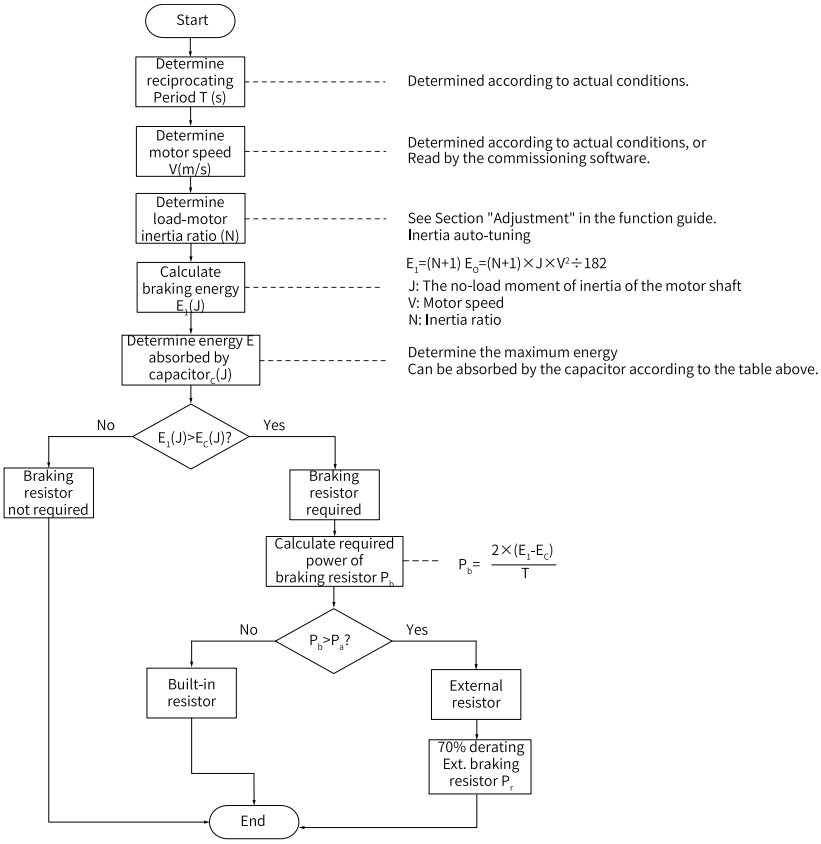


Figure 2-9 Flowchart for selecting the braking resistor

Note

- Take the process in which the motor decelerates from 3000 RPM to 3000 RPM as an example, suppose the load inertia is N times the motor inertia, then the braking energy is (N+1) x E_O when the motor decelerates from 3000 RPM to 3000 RPM, and the energy consumed by the braking resistor is (N+1) x EO - EC (EC represents the energy absorbed by the capacitor). The energy consumed by the braking resistor is (N + 1) x E_O - E_C (E_C represents the energy absorbed by the capacitor). Suppose the reciprocating cycle is T, then the power of the braking resistor needed is 2 x [(N + 1) x E_O - E_C]/T. See *"Table 2–16 200 V motor energy data" on page 99* and *"Table 2–17 400 V motor energy data" on page 100* for values of E_O and E_C .
- Determine whether to use the braking resistor according to the preceding figure and select a built-in or an external braking resistor as needed. Then, set H02.25 accordingly.
- The resistor with aluminum case is recommended.

Take the H1 series 750 W model as an example. Assume that the reciprocating cycle (T) is 2s, the maximum speed is 3000 RPM, and the load inertia is (4 x Motor inertia), then the required power of the braking resistor is as follows:

$$P_b = \frac{2 \times [(N+1) \times E_O - E_C]}{T} = \frac{2 \times [(4+1) \times 6.824 - 32.422]}{2} = 1.698W$$

The calculated result is smaller than the processing capacity (Pa = 40 W) of the built-in braking resistor, so a built-in braking resistor is enough.

If the inertia ratio in the preceding example is changed to 10 x motor inertia, and other conditions remain the same, the power of the braking resistor required will be as follows:

$$P_b = \frac{2 \times [(N+1) \times E_O - E_C]}{T} = \frac{2 \times [(10+1) \times 6.824 - 32.422]}{2} = 42.642W$$

The calculated result is larger than the processing capacity (Pa = 40 W) of the built-in braking resistor, so an external braking resistor is needed. so an external braking resistor is required. The recommended power of the external braking resistor is Pb/(1 – 70%) = 142.14W.

☆ Related parameters:

Parameter	Hex	Name	Value	Default	Unit	Change Mode
H02.21	2002-16h	Permissible minimum resistance of braking resistor	1Ω to 1000Ω	40	Ω	Unchangeable
H02.24	2002-19h	Resistor heat dissipation coefficient	10% to 100%	30	%	Real-time
H02.25	2002-1Ah	Braking resistor type	0: Built-in 1: External, natural cooling 2: External, forced air cooling 3: No resistor needed	3	-	Real-time
H02.26	2002-1Bh	Power of external braking resistor	1 W–65535W	40	W	Real-time
H02.27	2002-1Ch	Resistance of external braking resistor	15Ω to 1000Ω	50	Ω	Real-time

- Braking resistor not needed
  When $E_1 < E_C$, the braking resistor is not needed because the braking energy can be absorbed by the bus capacitor. In this case, set H02.25 to 3.
- Using the built-in braking resistor

When $P_b < P_a$ and $E_1 > E_C$, use the built-in braking resistor. In this case, set H02.25 to 0.

When using the built-in braking resistor, connect terminals $P_\oplus$ and D with a jumper bar.

- Using an external braking resistor
  When P_b is greater than P_a, use an external braking resistor. Set H02.25 to 1 or 2 based on the cooling mode of the braking resistor.

  Use the external braking resistor with 70% derated, that is, $P_r = P_b/(1 – 70\%)$, and ensure the resistance of the braking resistor is higher than the minimum permissible resistance allowed by the servo drive. Remove the jumper bar between terminals $P_\oplus$ and D, and connect the external braking resistor between terminals $P_\oplus$ and C.

  For the wiring diagram and lead wire specifications of the external braking resistor, *see the related section.* Set H02.5 to 1 or 2 based on the cooling mode of the braking resistor. Check and set the following parameters.

  ☆ Related parameters:

Parameter	Hex	Name	Value	Default	Unit	Change Mode
H02.21	2002-16h	Permissible minimum resistance of braking resistor	1Ω to 1000Ω	40	Ω	Unchangeable
H02.25	2002-1Ah	Braking resistor type	0: Built-in 1: External, natural cooling 2: External, forced air cooling 3: No resistor needed	3	-	Real-time
H02.26	2002-1Bh	Power of external braking resistor	1 W–65535W	40	W	Real-time
H02.27	2002-1Ch	Resistance of external braking resistor	15Ω to 1000Ω	50	Ω	Real-time



- Set the power and resistance of the external braking resistor in H02.26 and H02.27.
- Ensure the resistance of the external braking resistor is higher than or equal to the permissible minimum resistance.
- When the braking resistor is used at its rated power rather than the processing power (average value) in environments within the specified temperature range, the temperature of the resistor will rise to above 120°C under continuous braking. To ensure safety, cool the resistor down through forced air cooling, or use a resistor equipped with a thermal switch. For the load characteristics of the braking resistor, consult with the manufacturer.

Set the heat dissipation coefficient based on the heat dissipation condition of the external braking resistor.

☆ Related parameters:

Parameter	Hex	Name	Value	Default	Unit	Change Mode
H02.24	2002-19h	Resistor heat dissipation coefficient	10% to 100%	30	%	Real-time

Note

Higher resistor heat dissipation coefficient indicates higher braking efficiency.

- **External load torque applied, motor in generating state**
  When the motor direction of rotation is the same with the shaft direction of rotation, the motor outputs energy to the outside. In some applications where the motor direction of rotation is opposite to the shaft direction of rotation, the motor is in the generating state and feeds the electric energy back to the servo drive.

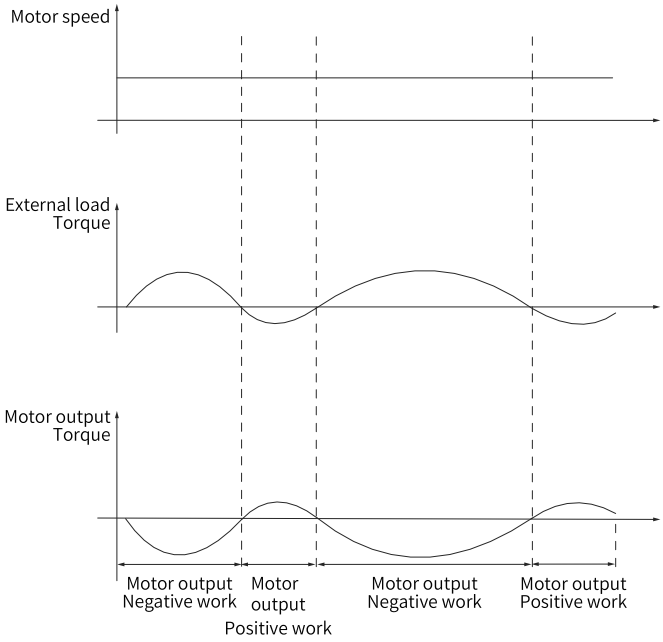


Figure 2-10 Example of the curve with external load torque

Take the H1 series 750 W model (rated torque 2.39 N·m) as an example. When the external load torque is 60% of the rated torque and the motor speed is 1500 RPM, the power pumped back to the drive is: (60% x 2.39) x (1500 x 2π/60) = 225 W. As the braking resistor is derated by 70%, and therefore, the power of the external braking resistor is: 225/(1 – 70%) = 750 W, with resistance 50 Ω

Selection of the braking resistor for a direct drive motor

- **Without external load torque**

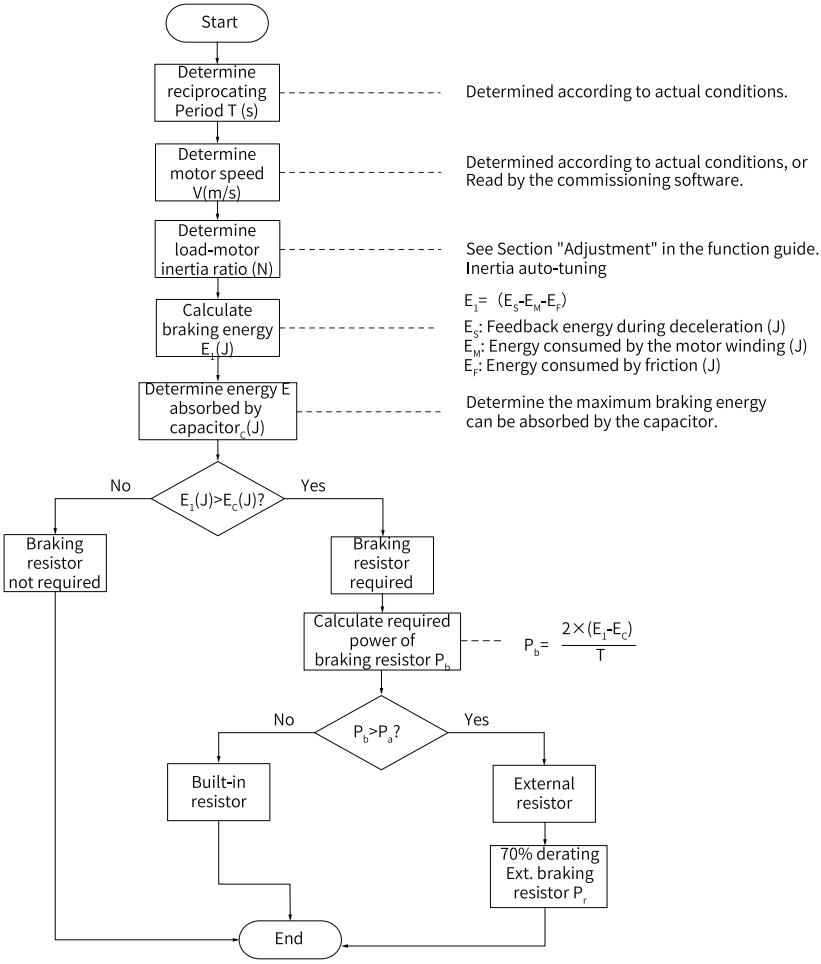


Figure 2-11 Flowchart for selecting the braking resistor

Note

- Determine whether to use the braking resistor and select a built-in or an external one as needed, and then set H02.25 accordingly.
- The resistor with aluminum case is recommended.

■ **Calculate the feedback energy at each deceleration**

$$E_S = \frac{1}{2} \times (M_M + M_L) \times (V_1^2 - V_2^2)$$

E_S: Feedback energy during deceleration (J)

M_M: Motor rotor mass (kg)

M_L: Load mass (kg)

V_1: Speed before deceleration (m/s)

V_2: Speed after deceleration (m/s)

- **Determine the energy consumed by the motor**

$$E_M=3\times I_M^2\times (R_M/2)\times t_d$$

E_M: Energy consumed by the motor winding (J)

I_M: Current at deceleration (A)

R_M: Motor phase resistance (Ω)

t_d: Deceleration time (s)

- **Determine the energy consumed by friction (the friction consumption of a direct drive motor is not great, and can be ignored if the working conditions permit)**

$$E_F=\frac{1}{2}\times T_f\times (V_1-V_2)\times t_d$$

E_f: Energy consumed by friction (J)

T_f: Friction resistance (N)

V_1: Speed before deceleration (m/s)

V_2: Speed after deceleration (m/s)

t_d: Deceleration time (s)

- **Determine the energy consumed by the drive**

$$E_1=E_F-E_M-E_F$$

E_1: Energy consumed by the drive (J)

- **Determine the energy consumed by the braking resistor**
  - $E_1>E_C$: The braking resistor is required.
  - $E_1<E_C$: The braking resistor is not required.
- **Calculate the power of the braking resistor**

$$P_b=2\times (E_1-E_C)/T$$
$$P_r=P_b/0.3$$

P_b: Power to be handled by the braking resistor (W)

P_r: Recommended braking resistor power (W)

T: Motor cyclic operation period (s)

0.3: Resistor heat dissipation coefficient (setpoint of H02.24)

- Take the S5R5 model as an example:
  Assume that the reciprocating period T=2s, the maximum operating speed is 8 m/s, deceleration ends at 0m/s in 0.05 s, load mass is three times of motor mass, and friction torque is 2.5 N·m. When motor mass is 0.6 kg, phase resistance is 1.53 Ω and force constant is 23.5 N/A, then:

  The deceleration current can be obtained by monitoring H0b.24 (RMS of phase current) at deceleration:

  I_M = 15 (A)

  Energy calculation:

$$E_S=\frac{1}{2}\times(1+3)\times0.6\times8^2=76.8\,(J)$$
$$E_M=3/15^2/\frac{1.53}{2}\times0.05=25.82\,(J)$$
$$E_F=\frac{1}{2}\times2.5\times8\times0.05=0.5\,(J)$$
$$E_1=E_S-E_M-E_F=50.48\,(J)$$

  Because $E_1 > E_C$, you need to use a braking resistor. The power of the braking resistor:

$$P_b=2\times(50.48-32.42)/2=18.06\,(W)$$

  Because $P_b < P_a$ (the power that can be handled by a built-in braking resistor) resistor, you can use a built-in braking resistor

- **External load torque applied, motor in generating state**
  When the motor direction of rotation is the same with the shaft direction of rotation, the motor outputs energy to the outside. In some applications where the motor direction of rotation is opposite to the shaft direction of rotation, the motor is in the generating state and feeds the electric energy back to the servo drive.

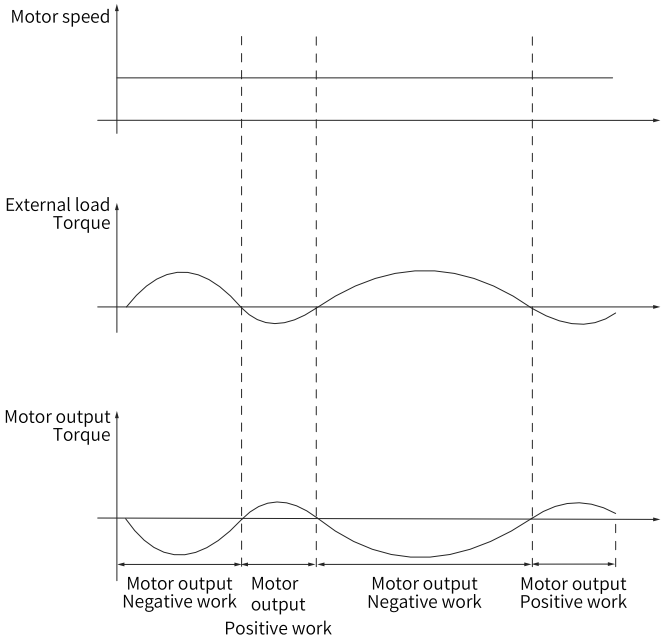
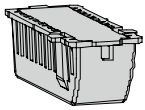
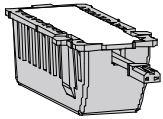
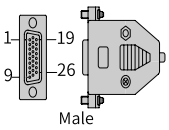
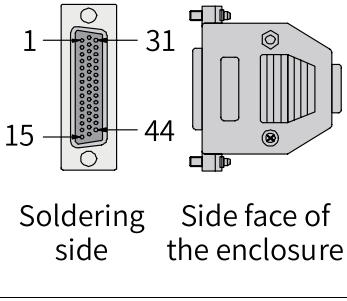
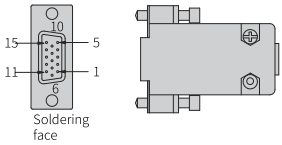
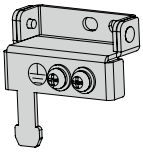
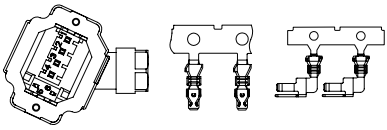
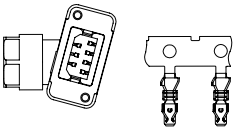
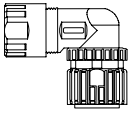
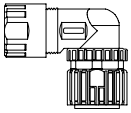
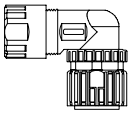
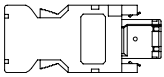
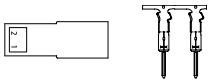
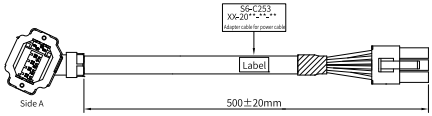
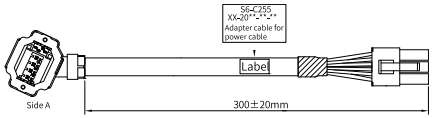
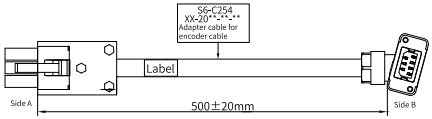
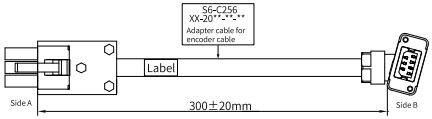


Figure 2-12 Example of the curve with external load torque

2.7 Connector Kit

Cable Name	Cable Model	Illustration
Battery box kit (without battery)	S6-C4A-NB	
Battery kit	S6-C4A	
CN1 terminal (DB26)	S6-C74	

Cable Name	Cable Model	Illustration
CN1 terminal (DB44)	S6-C8	
CN7 terminal (DB15)	S6-C6	
Shield Bracket	S6-C25 (optional for SIZE A–SIZE C) S6-C27 (optional for SIZE D to SIZE E)	
Motor side power connector below 750 W	S6-C246	
Motor side encoder connector below 750 W	S6-C247	
Motor side 100–130 frame power connector above 1000 W	S6-C248	
Motor side 180 frame power connector above 1000 W	S6-C249	

Cable Name	Cable Model	Illustration
Motor side encoder connector above 1000 W	S6-C250	
CN2 (1394)	S6-C251	
Battery box connector	S6-C252	
500 mm motor side power lead cable below 750 W	S6-C253	
300 mm motor side power lead cable below 750 W	S6-C255	
500 mm motor side encoder lead cable below 750 W	S6-C254	
300 mm motor side encoder lead cable below 750 W	S6-C256	

2.8 Selection of Terminal Accessory Kit

Material Code	Name
Standard model P	
98050921	Accessories (sale)-S6-C70-SV680P size A terminal accessory package
98050922	Complete accessories (sale)-S6-C58-SV680P size B, C, D terminal accessory package
98050923	Accessories (sale)-S6-C71-SV680P size E terminal accessory kit

Material Code	Name
Functional safety model P	
98050838	Accessories (sale)-S6-C158-SV680P size A terminal accessory kit (functional safety)
98050836	Accessories (sale)-S6-C159-SV680P size C/D terminal accessory kit (functional safety)
98050834	Accessories (sale)-S6-C160-SV680P size E terminal accessory kit (functional safety)
Standard model N	
98050833	Accessories (sale)-S6-C58-SV680N size C&D terminal accessory kit
98050837	Accessories (sale)-S6-C58-SV680N size C&D terminal accessory kit
98050847	Accessories (sale)-S6-C71-SV680N size E terminal accessory kit
Functional safety model N	
98050843	Accessories (sale)-S6-C158-SV680N size A terminal accessory kit (functional safety)
98050842	Accessories (sale)-S6-C159-SV680N size C/D terminal accessory kit (functional safety)
98050841	Accessories (sale)-S6-C160-SV680N size E terminal accessory kit (functional safety)

3 Installation

3.1 Unpacking Inspection

Check the following items upon unpacking.

Item	Description
Check whether the delivered product is consistent with your order.	Check whether the servo drive model and specifications comply with your order. See the dimensions of the packing box in *"Table 3–2 " on page 114* (standard) and *"Table 3–2 " on page 114* (functional safety). The deliverables include the product, cushion, carton box, and screw bag, as shown in *"Figure 3–1 " on page 115* .
Check whether the product is intact.	Check whether the product delivered is in good condition. If there is any missing or damage, contact Inovance or your supplier immediately.

Table 3–1 Dimensions of the outer packing box (standard)

Size	Model	Outer Width (mm)	Outer Height (mm)	Outer Depth (mm)	Mass (kg)
A	S1R6, S2R8	240	193	85	1.13
C	S5R5, S7R6, T3R5, T5R4	230	223	95	1.5
D	S012, T8R4, T012	240	223	125	2.0
E	S018, S022, S027, T017, T021, T026	325	285	145	3.9

Table 3–2 Dimensions of the outer packing box (functional safety)

Size	Model	Outer Width (mm)	Outer Height (mm)	Outer Depth (mm)	Mass (kg)
A	S1R6, S2R8	240	193	105	1.28
C	S5R5, S7R6, T3R5, T5R4	230	223	120	1.65
D	S012, T8R4, T012	240	223	145	2.15
E	S018, S022, S027, T017, T021, T026	325	285	165	4.05

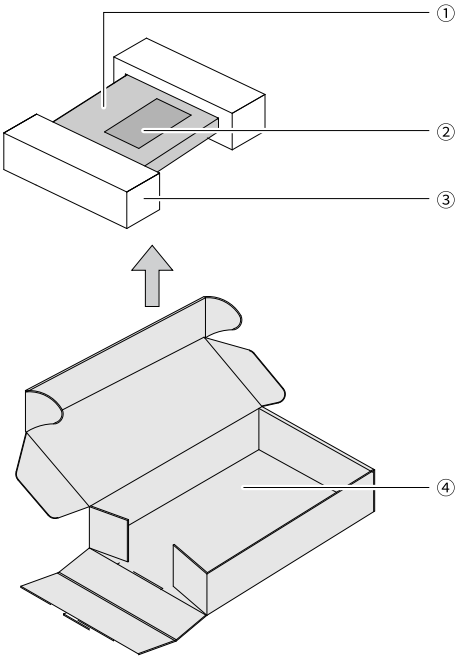


Figure 3-1 Contents inside the packing box

No.	Name
①	Product
②	Terminal accessory package
③	Cushion
④	Carton box

Table 3–3 Terminal accessory package list

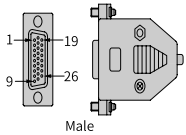
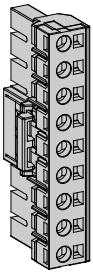
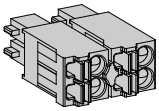
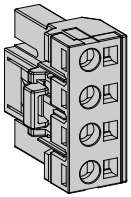
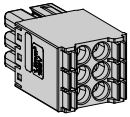
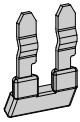
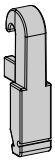
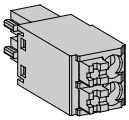
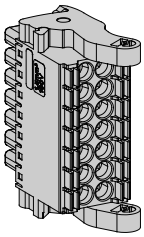
Diagram	Name	Applicable Model
	Cable set–servo drive S6–C74–DB26 connector kit (RoHS)	[N]
	Plug-in terminal block-plug-spring clamp wiring-9P-black-with safety lock	All
	Plug-in terminal block-plug-spring clamp wiring-2*2P-black-printing on both sides	All
	Plug-in terminal block-plug-spring clamp wiring-4P-black	All
	Plug-in terminal block-plug-spring clamp wiring-3.5mm-2*3P-black-180°-screen printed-RoHS	All
	Jumper bar-16A-pluggable bridge	All
-	Labels-labels for servo drive terminals	All

Diagram	Name	Applicable Model
	Plastic parts-plug wiring key-for use with servo drive power plug	All
	Plug-in terminal block-plug-spring clamp wiring-/-3.5mm-1*2P-Orange-180°-RoHS	Standard-standby power supply Functional safety
	Plug-in terminal station - plug-and-spring wire-/-3.5mm-2*7P - black-180° - push bar at both sides RoHs	Functional safety
	Plug-in terminal station - plug-and-spring wire - NA-3.5mm-2*7P - black-180° - push bar at both sides RoHs	Functional safety

Caution

Note that the terminal accessories package list of SV680 is slightly different from that of SV680N.

If you need to purchase the terminal accessory package separately, please contact Inovance. For the material code of the accessory package for each model, see *"Table 3–4 " on page 117*.

Table 3–4 Material code of the accessory package for each model

Material Code	Name
Standard model P	
98050921	Accessories (sale)-S6-C70-SV680P size A terminal accessory package
98050922	Complete accessories (sale)-S6-C58-SV680P size B, C, D terminal accessory package
98050923	Accessories (sale)-S6-C71-SV680P size E terminal accessory kit
Functional safety model P	
98050838	Accessories (sale)-S6-C158-SV680P size A terminal accessory kit (functional safety)

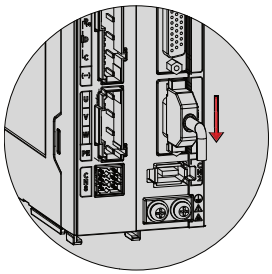
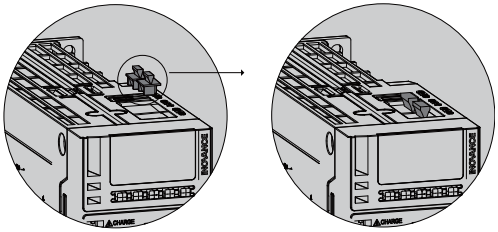
Material Code	Name
98050836	Accessories (sale)-S6-C159-SV680P size C/D terminal accessory kit (functional safety)
98050834	Accessories (sale)-S6-C160-SV680P size E terminal accessory kit (functional safety)
Standard model N	
98050833	Accessories (sale)-S6-C70-SV680N size A terminal accessory package
98050837	Accessories (sale)-S6-C58-SV680N size C&D terminal accessory kit
98050847	Accessories (sale)-S6-C71-SV680N size E terminal accessory kit
Functional safety model N	
98050843	Accessories (sale)-S6-C158-SV680N size A terminal accessory kit (functional safety)
98050842	Accessories (sale)-S6-C159-SV680N size C/D terminal accessory kit (functional safety)
98050841	Accessories (sale)-S6-C160-SV680N size E terminal accessory kit (functional safety)

3.2 Precautions

- Observe the installation direction described in this manual. Failure to comply may result in equipment fault or damage.
- Do not install or operate damaged or defective equipment. Failure to comply will result in personal injury.
- Do not install the equipment in environments exposed to water splashes or corrosive gases. Failure to comply will result in equipment fault.
- Do not install the equipment near inflammable gases or combustible objects. Failure to comply will result in a fire or electric shock.
- Install the equipment inside a fire-proof cabinet that provides electrical protection. Failure to comply may result in a fire.
- Ensure the specified clearance is reserved among the drive, the interior surface of the control cabinet, and other machines. Failure to comply will result in a fire or equipment fault.
- Do not put heavy objects on the equipment. Failure to comply may result in personal injury or equipment damage.
- Do not impose large impact on the equipment. Failure to comply may result in equipment damage.
- Do not block the air inlet/outlet of the equipment or allow unwanted objects to fall into the equipment. Failure to comply may result in a fire or equipment fault.

Table 3–5 Installation Precautions

Item	Description
Installation Method	• Install the servo drive vertically and upward to facilitate heat dissipation. For installation of multiple servo drives inside the cabinet, install them side by side. For dual-row installation, install an air guide plate. • Make sure the servo drive is installed vertically to the wall. Cool the servo drive down with natural convection or a cooling fan. Secure the servo drive to the mounting surface through two to four mounting holes (the number of mounting holes depends on the capacity of the servo drive). • Install the servo drive vertically to the wall, with its front (actual mounting face) facing the operator. • The mounting bracket (if needed) must be made of incombustible materials.
Cooling	Reserve sufficient space around the servo drive to ensure a good heat dissipation through the cooling fan or natural convection. Take the heat dissipated by other devices inside the cabinet into consideration. Install a cooling fan to the upper part of the servo drive to avoid excessive temperature rise in a certain area, keeping an even temperature inside the control cabinet.
Grounding	Ground the grounding terminal properly. Failure to comply may result in electric shock or malfunction due to interference.

Item	Description
Wiring requirements	As shown in the figure below, route the servo drive cables downwards to prevent liquid from flowing into the servo drive along the cables.  Route the cable connected downwards.
Dust-proof cover (included in the standard configuration)	Insert the dust-proof cover into the communication port (CN3/CN4) not in use. This is to prevent unwanted objects, such as solids or liquids, from falling into the servo drive and resulting in faults. Each servo drive is delivered with two dust-proof covers inserted into the communication ports by default. You can place an order for more dust-proof covers as needed (model: NEX-02-N2B; manufacturer: PINGOOD).  **Note:** • Dust-proof cover: Prevents unwanted objects, such as solids or liquids, from falling into the servo drive and resulting in faults. • Dust-proof covers are delivered along with the servo drive. Keep the dust-proof covers in a proper place.

3.3 Installation of the Servo Drive

3.3.1 Installation Environment Requirements

Table 3–6 Environment requirements

Item	Requirement
Installation location	Indoor
Grid overvoltage	Overvoltage category (OVC) III
Altitude	The maximum altitude is 2000 m. • For altitudes not higher than 1000 m, derating is not required • Derating is required for altitudes above 1000 m (derate 1% for every additional 100 m) • For altitudes above 2000 m, contact Inovance.
Temperature	• Mounting/Operating temperature: 0°C to +55°C For temperatures between 0°C to 45°C, derating is not required. For temperatures above 45°C, derate 2% for every additional 1°C. • Storage/Transportation temperature: -40°C to +70°C. • To improve the reliability of the machine, use the servo drive in environments without dramatic temperature change. • When installing the servo drive into an enclosed environment such as a control cabinet, use a cooling fan or air conditioner to keep the temperature of the inlet air below 45°C. Failure to comply will result in over-temperature or a fire. • Install the drive on the surface of an incombustible object and leave sufficient surrounding space for heat dissipation. • Take measures to prevent the servo drive from being frozen.
Environment humidity	Below 90% RH (no condensation)
Storage humidity	Below 90% RH (no condensation)
Vibration resistance	Operation: • 5 Hz–8.4 Hz: 3.5 mm displacement • 8.4 Hz–200 Hz: 1g Product package: • 5 Hz–100 Hz： $0.01g^2/Hz$ • 200 Hz: $0.001g^2/Hz$ • Grms = 1.14 g
Impact resistance	Below 19.6 m/s^2

Item	Requirement
IP rating	IP20 Note: excluding terminals (IP00)
Environment	Pollution Degree 2 and below Install the servo drive in a place that meets the following requirements: • Free from direct sunlight, dust, corrosive gas, explosive and inflammable gas, oil mist, vapor, water drop, salt corrosion, and radioactive materials. • Not prone to vibration and away from equipment such as punch presses • Free from unwanted objects such as metal powder, oil, and water inside the servo drive • Do not use the equipment in vacuum.

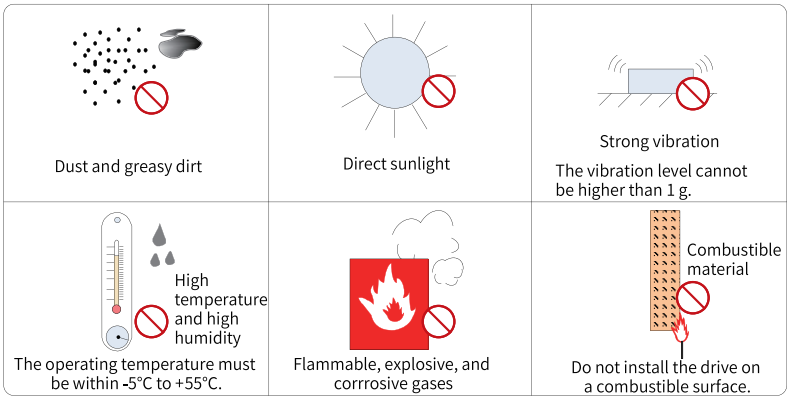


Figure 3-2 Environment requirements

3.3.2 Installation Clearance

Spaced installation

Servo drives in different specifications require different installation clearances. It is recommended to reserve a clearance of at least 10 mm (0.39 in.) between two drives, and a horizontal clearance of at least 20 mm (0.79 in.) and a vertical clearance of 80 mm (3.15 in.) between the drive and cabinet for heat dissipation.

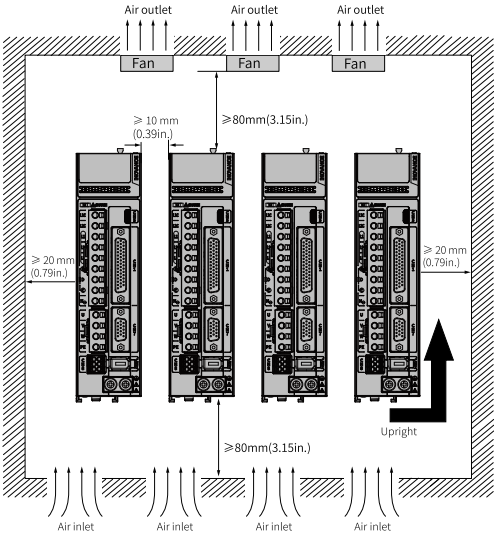


Figure 3-3 Clearance for side-by-side installation

Compact installation

Servo drives in size A support compact installation, in which a clearance of at least 1 mm (0.04 in.) must be reserved between every two drives. When adopting compact installation, derate the load to 75%.

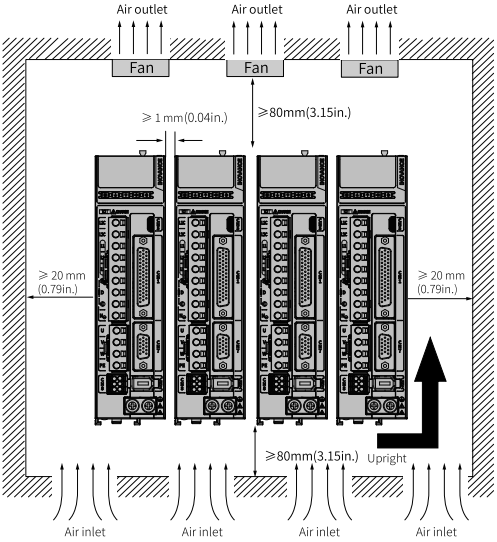


Figure 3-4 Clearance for compact installation

Zero-clearance installation

Servo drives in sizes C and D support zero-clearance installation without derating.

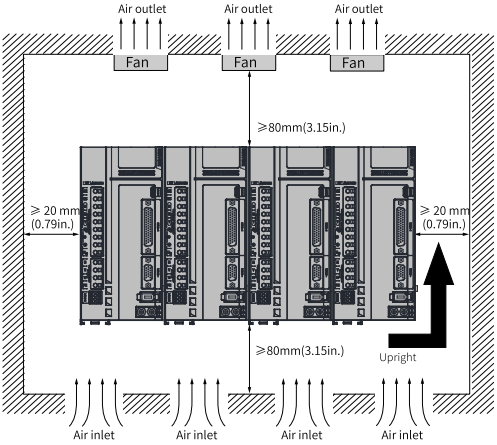


Figure 3-5 Zero-clearance installation

3.3.3 Installation Dimensions [Standard P]

Servo drives in size A (rated power: 0.2 kW to 0.4 kW)

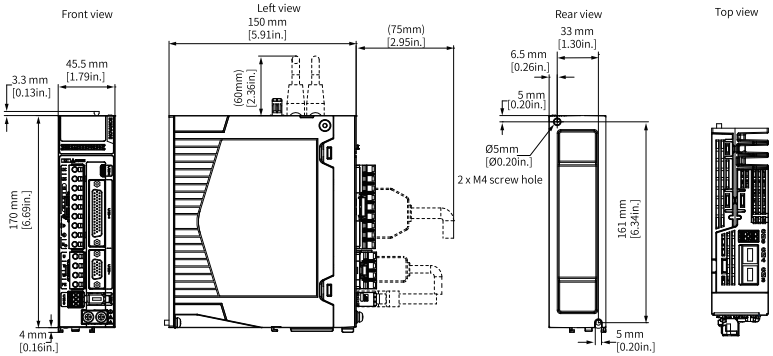


Figure 3-6 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 0.96 kg

Servo drives in size C (rated power: 0.75 kW to 1.5 kW)

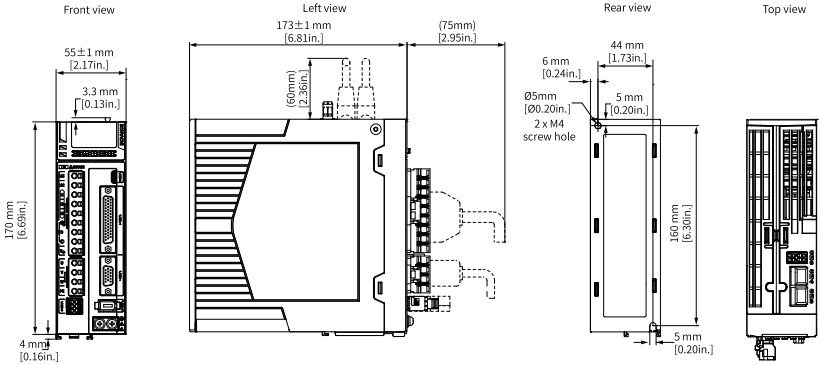


Figure 3-7 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.3 kg

Servo drives in size D (rated power: 1.5 kW to 3.0 kW)

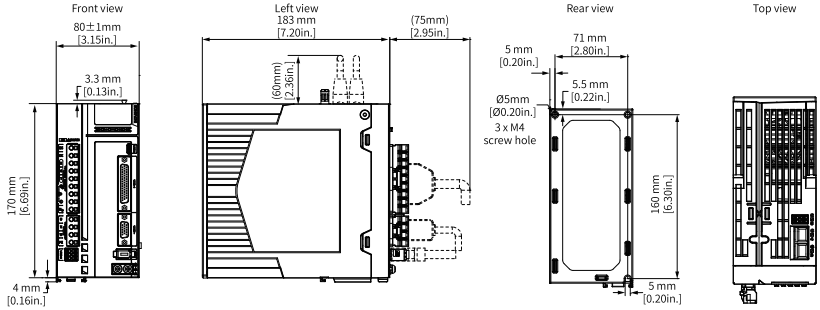


Figure 3-8 Dimensions

Fixing screw: 3 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.8 kg

Servo drives in size E (rated power: 2.0 kW to 7.5 kW)

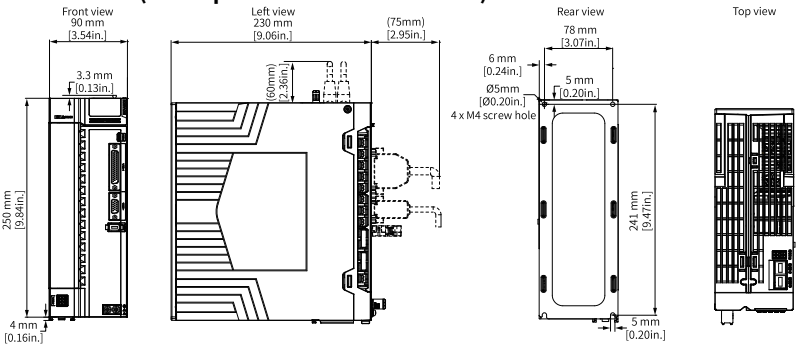


Figure 3-9 Dimensions

Fixing screw: 4 × M4; recommended tightening torque: 1.2 N·m

Weigh: 3.6 kg

3.3.4 Installation Dimensions [Standard N]

Servo drives in size A (rated power: 0.2 kW to 0.4 kW)

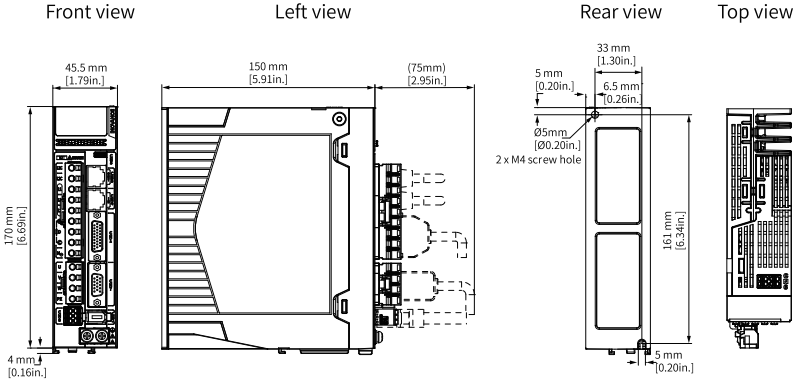


Figure 3-10 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 0.96 kg

Servo drives in size C (rated power: 0.75 kW to 1.5 kW)

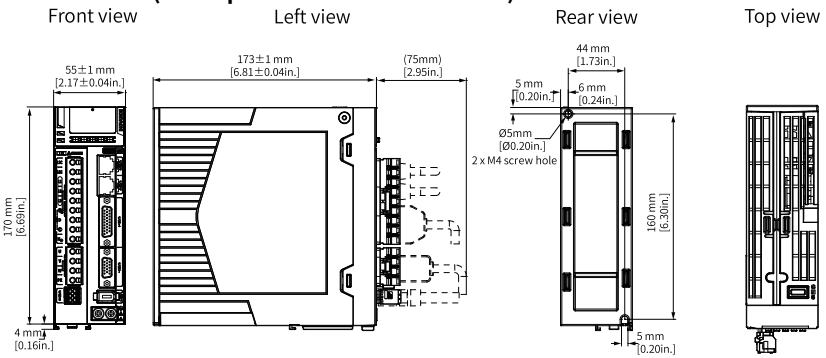


Figure 3-11 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.3 kg

Servo drives in size D (rated power: 1.5 kW to 3.0 kW)

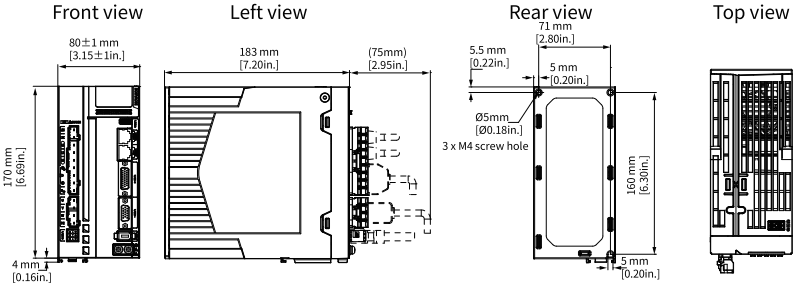


Figure 3-12 Dimensions

Fixing screw: 3 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.8 kg

Servo drives in size E (rated power: 2.0 kW to 7.5 kW)

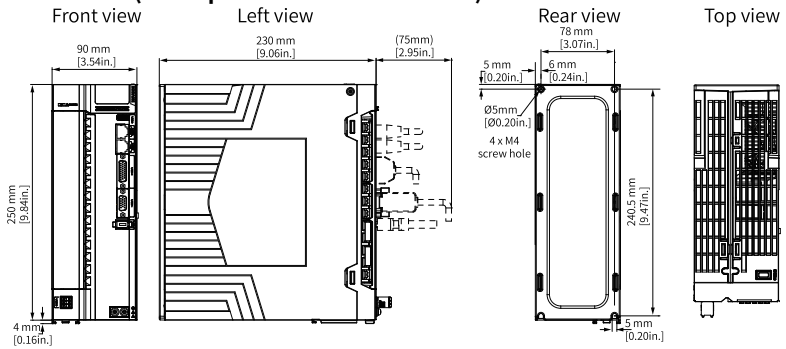


Figure 3-13 Dimensions

Fixing screw: 4 × M4; recommended tightening torque: 1.2 N·m

Weigh: 3.6 kg

3.3.5 Standby Power Supply Type - Installation Dimensions [Standard P]

Servo drives in size A (rated power: 0.2 kW to 0.4 kW)

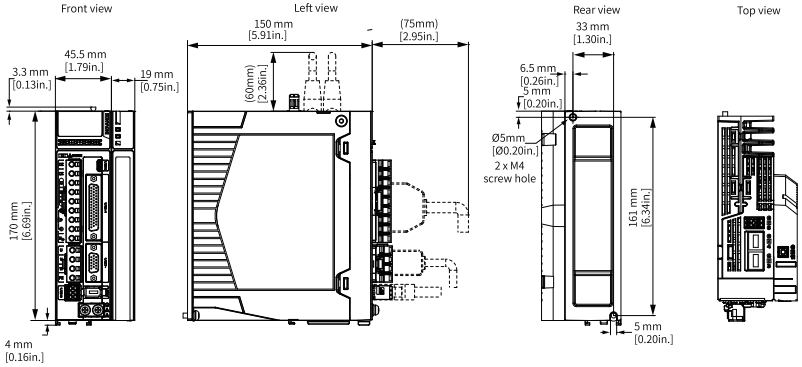


Figure 3-14 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.11 kg

Servo drives in size C (rated power: 0.75 kW to 1.5 kW)

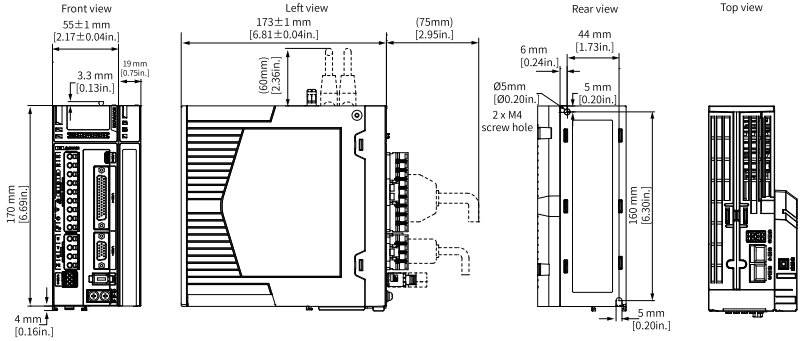


Figure 3-15 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.45 kg

Servo Drives in Size D (rated power: 1.5 kW to 3.0 kW)

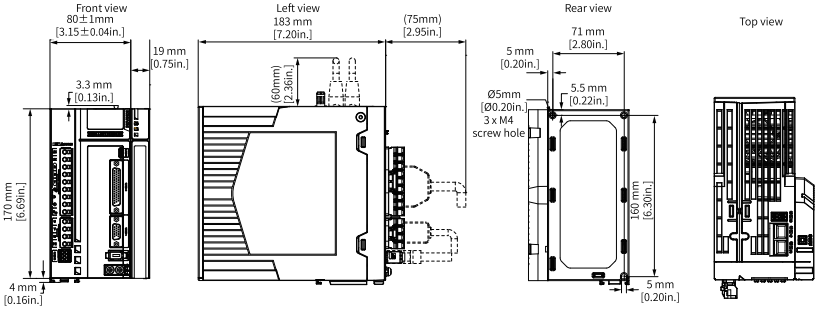


Figure 3-16 Dimensions

Fixing screw: 3 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.95 kg

Servo drives in size E (rated power: 2.0 kW to 7.5 kW)

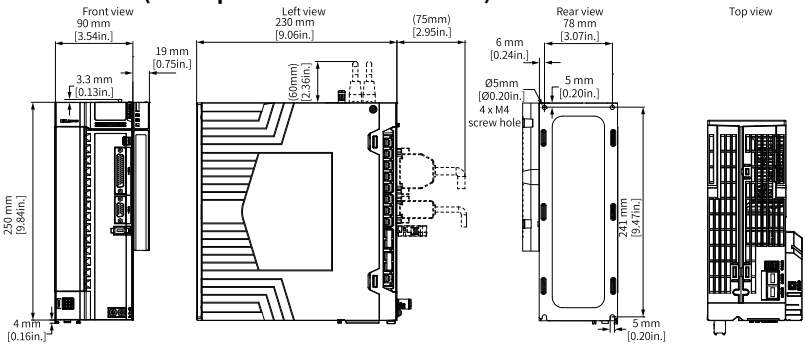


Figure 3-17 Dimensions

Fixing screw: 4 × M4; recommended tightening torque: 1.2 N·m

Weigh: 3.75 kg

3.3.6 Standby Power Supply Type - Installation Dimensions [Standard N]

Servo drives in size A (rated power: 0.2 kW to 0.4 kW)

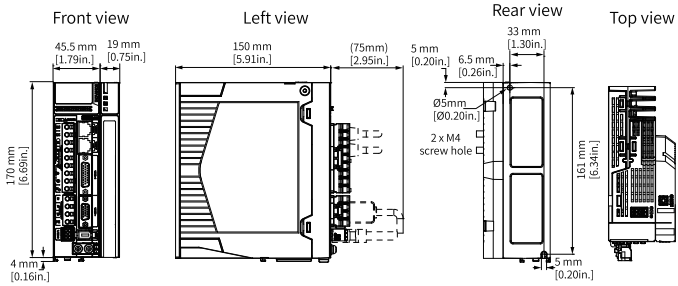


Figure 3-18 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.11 kg

Servo drives in size C (rated power: 0.75 kW to 1.5 kW)

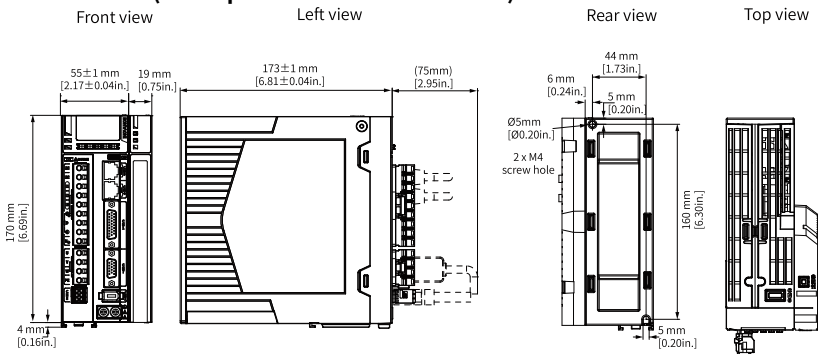


Figure 3-19 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.45 kg

Servo Drives in Size D (rated power: 1.5 kW to 3.0 kW)

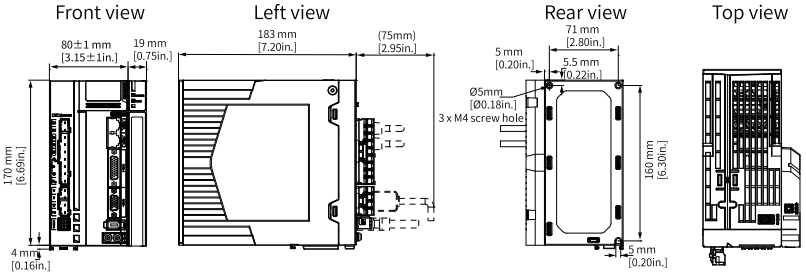


Figure 3-20 Dimensions

Fixing screw: 3 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.95 kg

Servo drives in size E (rated power: 2.0 kW to 7.5 kW)

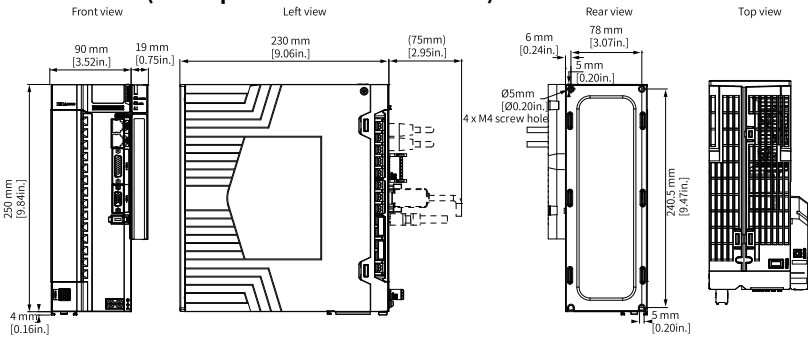


Figure 3-21 Dimensions

Fixing screw: 4 × M4; recommended tightening torque: 1.2 N·m

Weigh: 3.75 kg

3.3.7 Installation Dimensions [Functional Safety P]

Servo drives in size A (rated power: 0.2 kW to 0.4 kW)

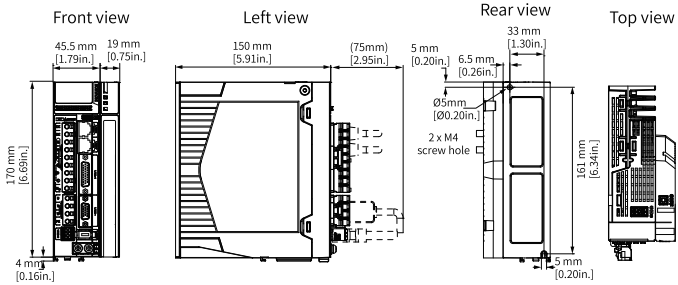


Figure 3-22 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.11 kg

Servo drives in size C (rated power: 0.75 kW to 1.5 kW)

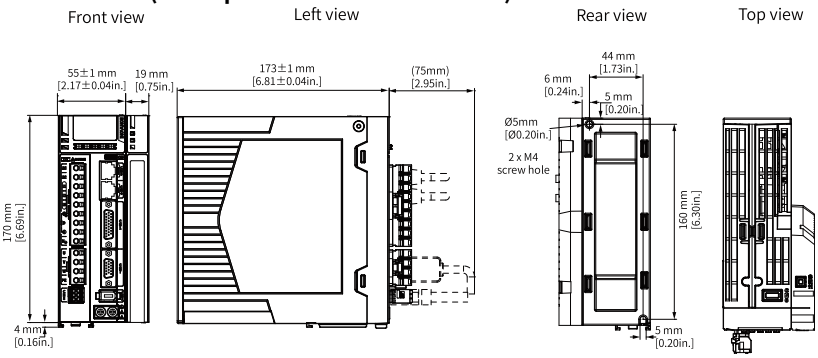


Figure 3-23 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.45 kg

Servo Drives in Size D (rated power: 1.5 kW to 3.0 kW)

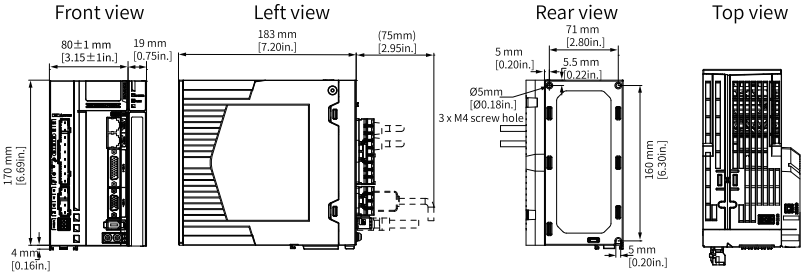


Figure 3-24 Dimensions

Fixing screw: 3 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.95 kg

Servo drives in size E (rated power: 2.0 kW to 7.5 kW)

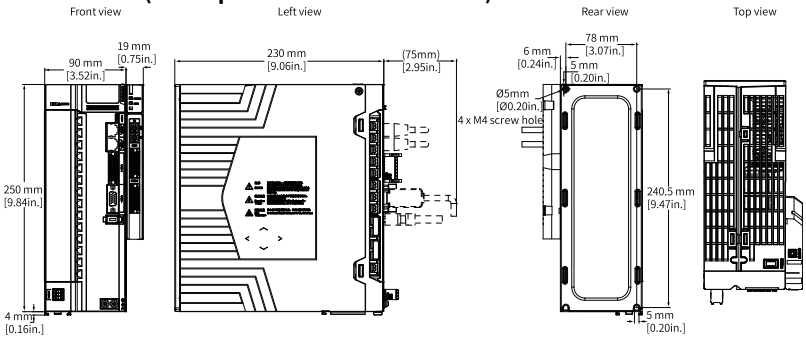


Figure 3-25 Dimensions

Fixing screw: 4 × M4; recommended tightening torque: 1.2 N·m

Weigh: 3.75 kg

3.3.8 Installation Dimensions [Functional Safety N]

Servo drives in size A (rated power: 0.2 kW to 0.4 kW)

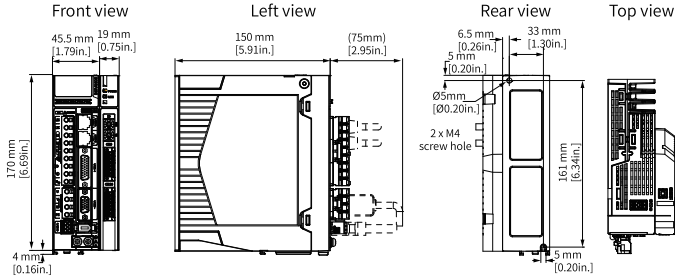


Figure 3-26 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.11 kg

Servo drives in size C (rated power: 0.75 kW to 1.5 kW)

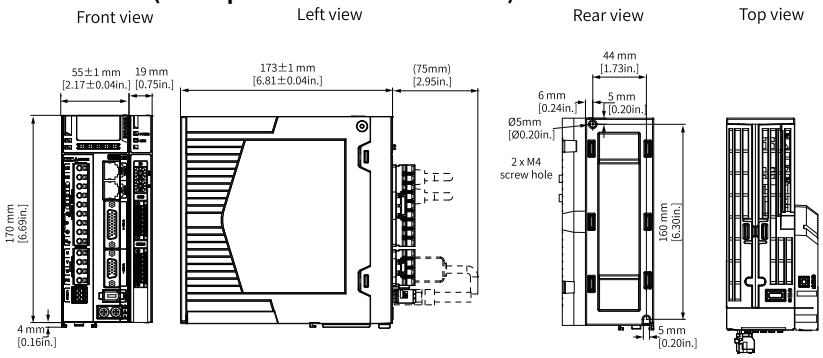


Figure 3-27 Dimensions

Fixing screw: 2 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.45 kg

Servo drives in size D (rated power: 1.5 kW to 3.0 kW)

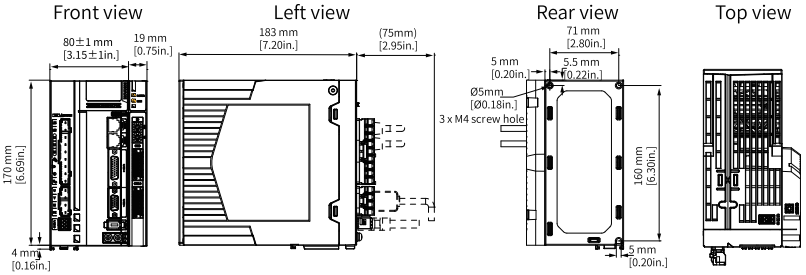


Figure 3-28 Dimensions

Fixing screw: 3 × M4; recommended tightening torque: 1.2 N·m

Weigh: 1.95 kg

Servo drives in size E (rated power: 2.0 kW to 7.5 kW)

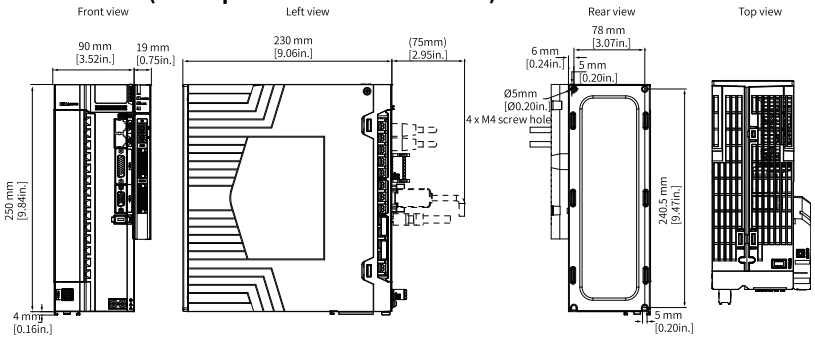


Figure 3-29 Dimensions

Fixing screw: 4 × M4; recommended tightening torque: 1.2 N·m

Weigh: 3.75 kg

3.3.9 Pre-installation Check

Table 3–7 Pre-inspection checklist

No.	Item	Checked
1	The delivered product is consistent with your order.	☐
2	No deformation or cracks are present on the casing.	☐
3	All screws are in position and tightened.	☐
4	The signal terminal is free from fracture, foreign objects and bent pins.	☐

3.3.10Installing the Drive

The drive supports backplate mounting only.

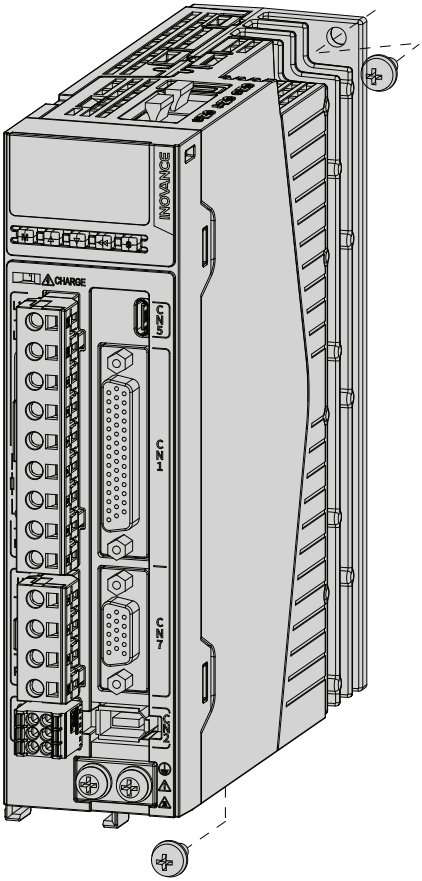


Figure 3-30 Backplate mounting

Note

- Servo drives in sizes A and C are secured by two screws, with one screw on the top and the other one at the bottom.
- Servo drives in size D are secured by three screws, with two screws on the top and another one at the bottom.
- Servo drives in size E are secured by four screws, with two screws on the top and the other two at the bottom.

3.3.11Post-Inspection

Table 3–8 Inspection Checklist

No.	Description	Yes
1	Terminal screws are tightened to the specified torque and marked.	☐
2	The servo drive and the external braking resistor are placed on incombustible objects.	☐
3	There are no unwanted objects (such as cable terminals and metal chippings) that may cause short circuit of the signal cable and power cable inside or outside the servo drive.	☐
4	The servo motor is installed properly. The motor shaft is connected to the machine securely.	☐
5	The servo motor and the connected machine are in good condition and ready to run.	☐
6	The connector of the main circuit cable is crimped and installed firmly.	☐

3.4 Installation of Optional Parts

3.4.1 Instructions for Installing the Fuse and Circuit Breaker



To prevent electric shocks, when the fuse is blown or the circuit breaker trips, wait for at least the time designated on the warning label before powering on the drive or operating peripheral devices. Failure to comply will result in death, severe personal injury, or equipment damage.

3.4.2 Instructions for Installing the AC Input Reactor

The AC input reactor is an option used to suppress the harmonics in the input current. In applications where harmonics need to be suppressed, install an external AC input reactor.

The following figure shows the connection of the AC input reactor.

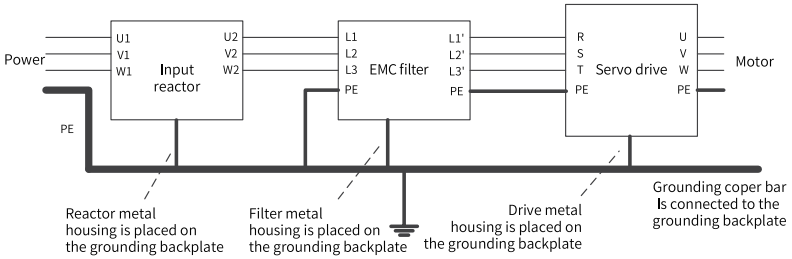


Figure 3-31 Connection of the AC input reactor

3.4.3 Instructions for Installing the EMC Filter

Note

- The connecting cable between the filter and the controller must be as short as possible (should be less than 30 cm).
- Ensure that the filter and controller are connected to the same grounding reference plane, and ensure that the filter is reliably grounded, otherwise the filtering effect of the filter cannot be achieved.

The following figure shows the connection of the EMC filter.

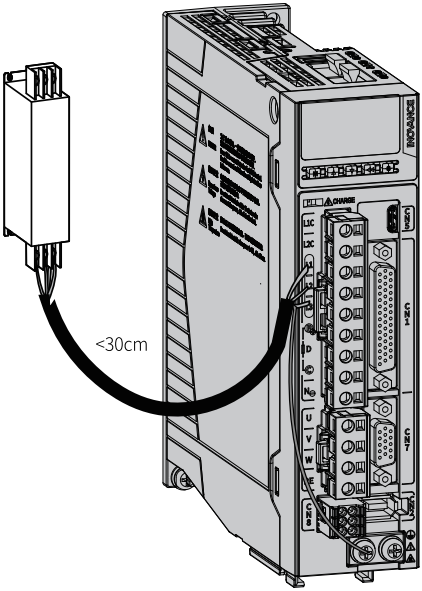


Figure 3-32 Connection of the EMC filter

3.4.4 Instructions for Installing the Magnetic Ring and Ferrite Clamp

The drive generates very strong interference during operation. The drive may interfere with or be interfered with by other devices due to improper routing or grounding. Wind the drive output U/V/W cable onto a magnetic ring for two to four turns. Wind the signal cable onto a ferrite clamp or magnetic ring for one to two turns.

- An amorphous magnetic ring has a high magnetic conductivity when the frequency is within 1 MHz and can efficiently suppress interference of the servo drive, but is expensive.
- A ferrite clamp has a high magnetic conductivity when the frequency is above 1 MHz and can efficiently suppress interference of various signal cables and low-power servo drives at a low cost.

The following figure shows the connection of the magnetic ring and ferrite clamp.

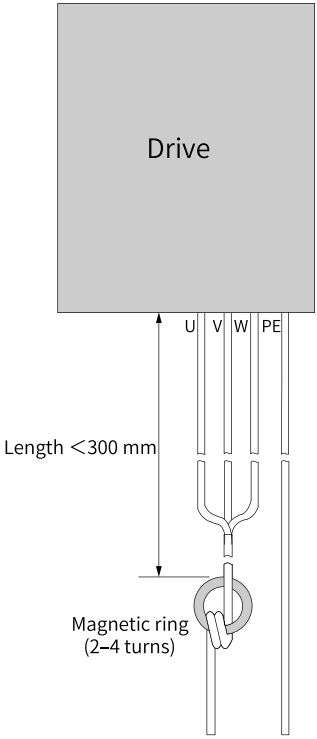


Figure 3-33 Installing the magnetic ring

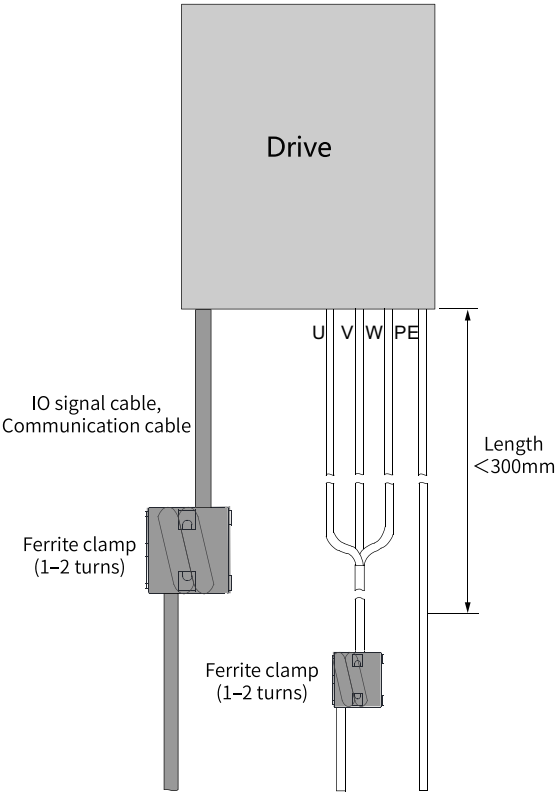


Figure 3-34 Installation of the ferrite clamp

3.4.5 Instructions for Installing the Shield Bracket

To reduce electromagnetic interference, an EMC bracket and clamp are used with the drive cables.

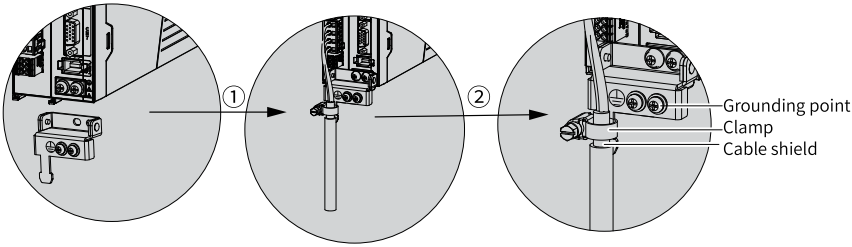


Figure 3-35 Installation of the shield bracket

- ①: Fix the shielding bracket to the drive with two M4 screws. The recommended tightening torque is 1.2 N·m.

- 2. Put the clamp on the cable shield and the shielding bracket and tighten the screw to fix the cable shield on the shielding bracket. Wire motor power cables and brake cables according to the wiring drawings.

4 system Connection

4.1 System Composition

- The servo drive is directly connected to an industrial power supply, with no isolation such as a transformer. A fuse or circuit breaker therefore must be connected to the input power supply to prevent electric shock in the servo system. For the sake of safety, install a residual current device (RCD) to provide protections against overload and short circuit or a specialized RCD to protect the grounding cable.
- Do not start or stop the motor by using the electromagnetic contactor. As a high-inductance device, the motor may generate transient high voltage that may break down the contactor.
- When connecting an external power supply to the control circuit or a 24 VDC power supply, pay attention to the power capacity as insufficient power capacity will lead to insufficient supply current, resulting in failure of the servo drive or the brake. This is especially true when the power supply is used to power up multiple servo drives or brakes. The brake must be powered up by a 24 VDC power supply that matches the motor model and meets the brake power requirements.



Observe the following precautions when connecting the external braking resistor:

- The built-in braking resistor or jumper bar is not available in models S1R6 and S2R8. If an external braking resistor is needed for these models, connect it between terminals P ⊕ and C.
- Remove the jumper between terminals P⊕ and D before using the external braking resistor. Failure to comply will result in overcurrent and damage the braking transistor.
- Do not connect the external braking resistor to the positive or negative pole of the bus directly. Failure to comply will damage the servo drive and result in a fire.
- Select a resistor with resistance higher than or equal to the minimum permissible value. Failure to comply will result in Er.201 (Overcurrent) or damage the servo drive.
- Make sure parameters H02.25 (Braking resistor setting), H02.26 (Power of external braking resistor) and H02.27 (Resistance of external braking resistor) are set properly before operating the servo drive.
- Install the external braking resistor on incombustible matters (such as metal).

4.2 System Wiring Diagram [P]

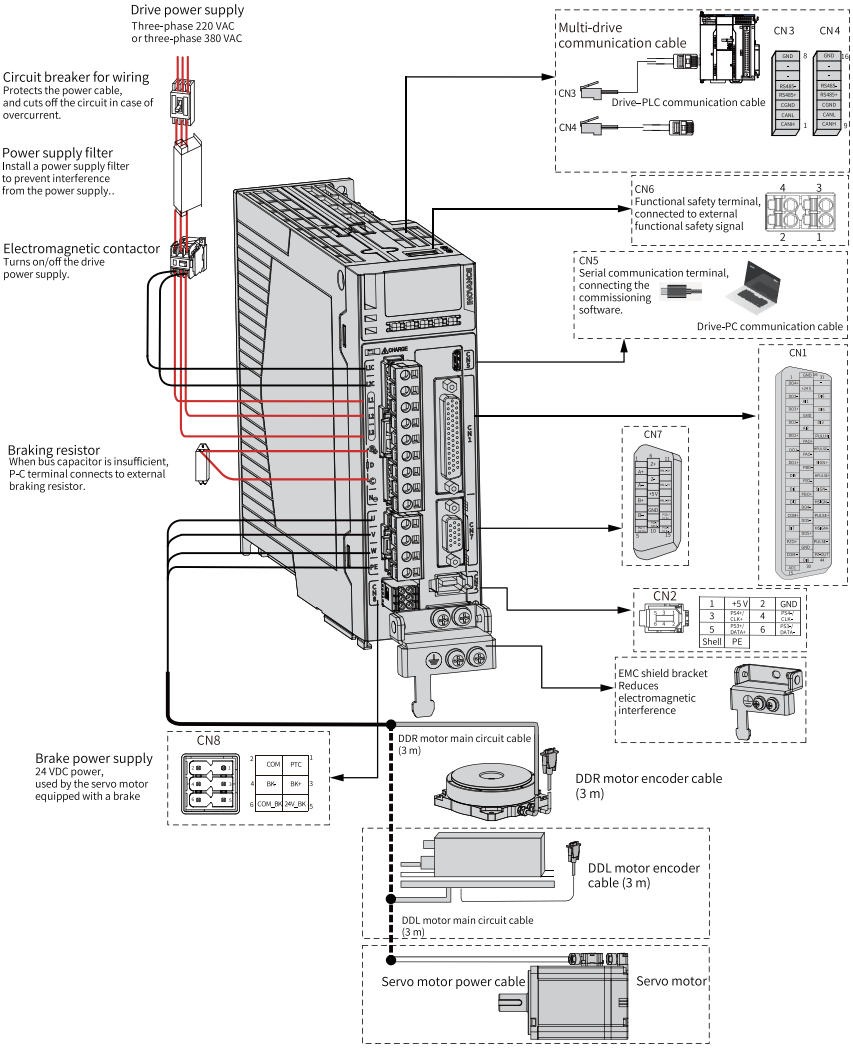


Figure 4-1 System wiring example

Note

- CN2 is used as the encoder terminal when an Inovance rotary servo motor is connected. CN7 is used when a direct drive or purchased motor is connected.
- When you need to use an external braking resistor, first remove the jumper between terminals P ⊕ and D and connect it between P ⊕ and C. If you do not need the resistor, keep the jumper as is. Note that only size A does not come standard with a built-in resistor and PD jumper. Before use the resistor, ensure that you have set H02.25，H02.26 and H02.27 correctly.

4.3 System Wiring Diagram [N]

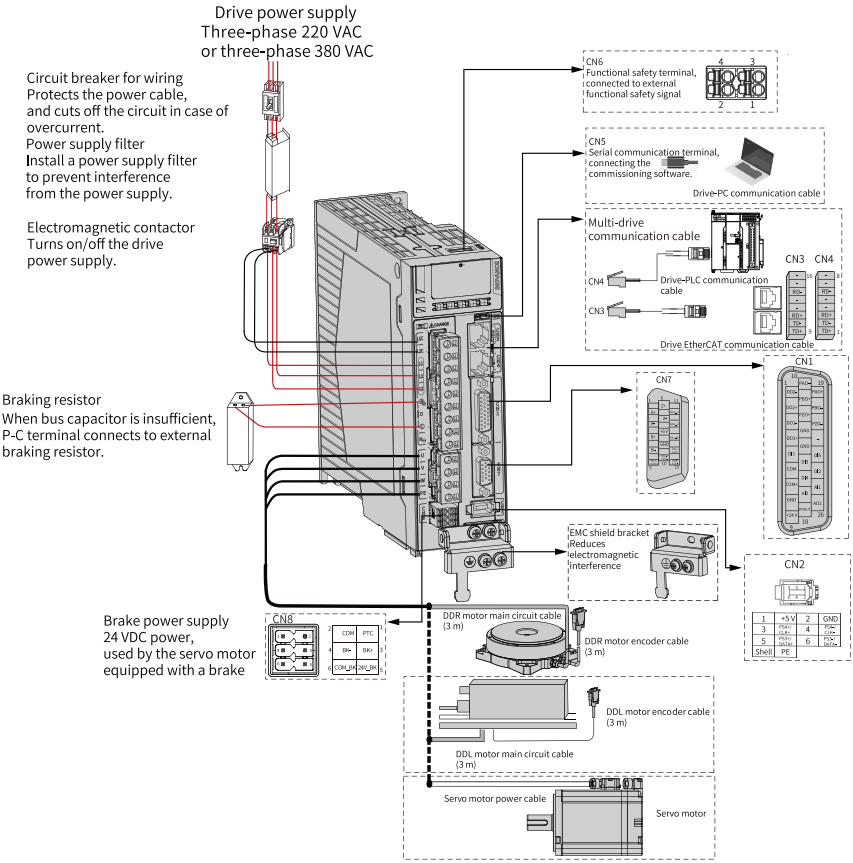


Figure 4-2 System wiring example

Note

- CN2 is used as the encoder terminal when an Inovance rotary servo motor is connected. CN7 is used when a direct drive or purchased motor is connected.
- When you need to use an external braking resistor, first remove the jumper between terminals P ⊕ and D and connect it between P ⊕ and C. If you do not need the resistor, keep the jumper as is. Note that only size A does not come standard with a built-in resistor and PD jumper. Before use the resistor, ensure that you have set H02.25，H02.26 and H02.27 correctly.

5 Electrical Wiring Diagram

5.1 Electrical Wiring Diagram [P]

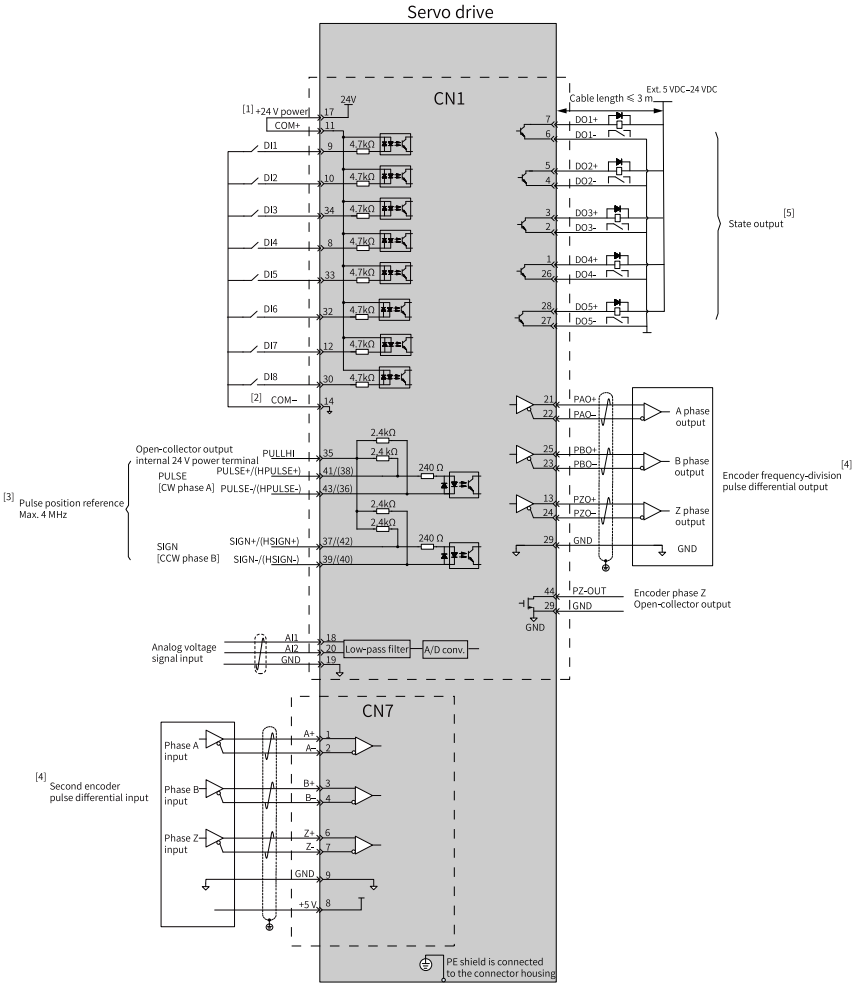


Figure 5-1 Electrical Wiring Diagram

Note

-  indicates shielded twisted pairs.
- [1] The range of the internal +24 V power supply is 20 V to 30 V, with maximum operating current being 150 mA.
- [2] DI7 and DI8 are high-speed DIs that must be used according to their functions assigned. DI allows external power supplies.
- [3] Use the shielded twisted pairs for pulse terminals, with both ends of the shield connected to PE. Connect GND and signal GND of the host controller properly. Pins 41, 43, 37 and 39 or 38, 36, 42, and 40 can be used for both low-speed and high-speed pulses.
- [4] Use shielded twisted pairs as frequency-division output cables and full closed-loop input cables, with both ends of the cable shield connected to PE. Connect GND to the signal ground of the host controller properly.
- [5] The DO power supply (voltage range: 5 V to 24 V) needs to be prepared by users. The DO terminals support 30 VDC voltage and 50 mA current to the maximum. You can enable optocoupler input on the affiliated device through an additional current limiting resistor.

5.2 Electrical Wiring Diagram [N]

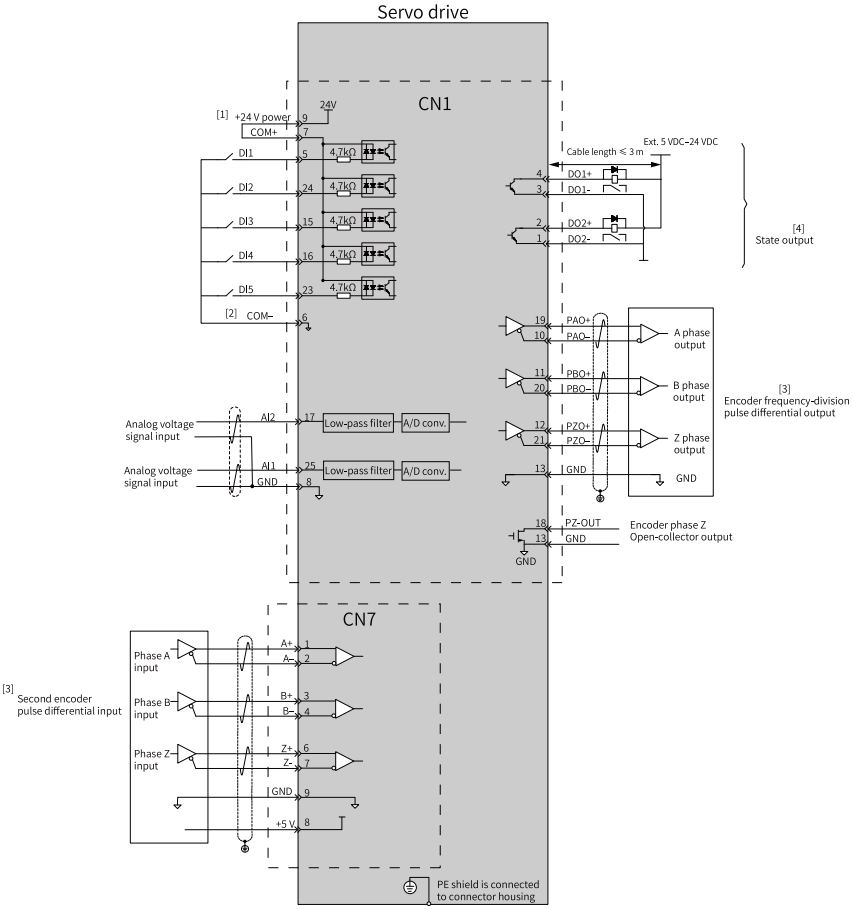


Figure 5-2 Electrical Wiring Diagram

Note

-  indicates shielded twisted pairs.
- [1] The range of the internal +24 V power supply is 20 V to 30 V, with maximum operating current being 150 mA.
- [2] DI4 and DI5 are high-speed DIs that must be used according to their functions assigned. DI allows external power supplies.
- [3] Use shielded twisted pairs as frequency-division output cables and full closed-loop input cables, with both ends of the cable shield connected to PE. Connect GND to the signal ground of the host controller properly.
- [4] The DO power supply (voltage range: 5 V to 24 V) needs to be prepared by users. The DO terminals support 30 VDC voltage and 50 mA current to the maximum. You can enable optocoupler input on the affiliated device through an additional current limiting resistor.

6 Wiring Terminals

6.1 Main Circuit Terminals

6.1.1 Terminal Arrangement

Servo drives in sizes A, C and D (rated power: 0.2 kW to 3.0 kW)

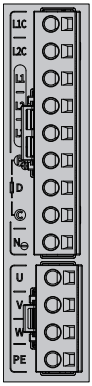


Figure 6-1 Main circuit terminals

Table 6–1 Description of main circuit terminals

Name	Description
L1C, L2C (control circuit power input terminals)	See the nameplate for the rated voltage class.
L1, L2, L3 (main circuit power input terminals)[1]	Power input terminals of the servo drive. See the nameplate for the rated voltage class.
P ⊕ , D, and C (terminals for connecting an external braking resistor)[2]	Remove the jumper bar between terminals P⊕ and C before connecting an external braking resistor between terminals P ⊕ and D.
P ⊕ , N ⊖ (servo bus terminals)	Used by the common DC bus for multiple servo drives.
U, V, W and PE (terminals for connecting the servo motor)	Connected to U, V, and W phases and the grounding terminal of the servo motor.

Note

- [1]: The power input terminals of the 200V servo drive's main circuit are L1, L2, and L3, you can use any two of which for single-phase input; and the power input terminals of the 400V servo drive's main circuit are R, S, and T.
- [2] The built-in braking resistor or jumper bar is not available in models S1R6 and S2R8. If an external braking resistor is needed for these models, connect it between terminals P ⊕ and C.

Servo drives in size E (rated power: 2.0 kW to 7.5 kW)

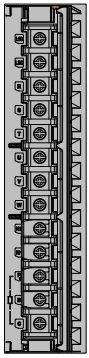


Figure 6-2 Main circuit terminals

Table 6–2 Description of main circuit terminals

Name	Description
L1C, L2C (control circuit power input terminals)	See the nameplate for the rated voltage class.
R, S, and T (main circuit power input terminals)[1]	Power input terminals of the servo drive. See the nameplate for the rated voltage class.
P ⊕ , D, C (terminals for connecting external braking resistor)	Remove the jumper bar between terminals P⊕ and C before connecting an external braking resistor between terminals P ⊕ and D.
N2, N1 (terminals for connecting external reactor)	Terminals N1 and N2 are jumpered by default. To suppress harmonics in the power supply, remove the jumper between terminals N1 and N2 first and connect an external DC reactor between terminals N1 and N2.
U, V, W (terminals for connecting the servo motor)	Connected to U, V, and W phases of the servo motor.

Note

[1]: The power input terminals of the 200V servo drive's main circuit are L1, L2, and L3, you can use any two of which for single-phase input; and the power input terminals of the 400V servo drive's main circuit are R, S, and T.

6.1.2 Wiring Precautions and Requirements



- Do not connect the output terminals U, V, and W of the drive to a three-phase power supply. Failure to comply may result in physical injury or a fire.
- Do not connect the motor terminals U, V, and W to a mains power supply. Failure to comply may result in physical injury or a fire.
- The main circuit cable must be away from the motor so that its insulation will not be damaged by high temperature of the motor surface.
- Connect the servo drive to the motor directly. Do not use an electromagnetic contactor during wiring. Failure to comply may result in equipment fault.



- Do not use the power from IT system for the drive. Use the power from TN/TT system for the drive. Failure to comply may result in an electric shock.
- Connect a electromagnetic contactor between the input power supply and the main circuit power supply of the servo drive (R, S and T) to form a structure which allows independent power cutoff on the servo drive power side. This is to prevent fire accident caused by continuous high current generated upon fault.
- Check that the input power supply of the drive is within the specified voltage range. Failure to comply may result in faults.
- The main circuit cable must be away from the motor so that its insulation will not be damaged by high temperature of the motor surface.
- Use the ALM (fault) signal to cut off the main circuit power supply. A faulty braking transistor may overheat the regenerative resistor and lead to a fire.
- Connect the PE terminal of the drive to the PE terminal of the control cabinet. Failure to comply may result in an electric shock.
- Ground the entire system properly. Failure to comply may result in equipment malfunction.
- After the power supply is cut off, residual voltage is still present in the internal capacitor of the drive, wait for at least 15 min before further operations. Failure to comply may result in an electric shock.
- The specifications and installation method of external cables must comply with the applicable local regulations.
- Observe the following requirements when the servo drive is used on a vertical axis.
  - Set the safety device properly to prevent the workpiece from falling upon warning or overtravel.
  - Ensure the positive/negative polarity of the 24 V power supply is correct. Otherwise, the axis may fall and cause personal injury or equipment damage.
- It is recommended to use Teflon cables featuring a higher temperature limit when the temperature inside the cabinet exceeds the temperature limit of regular cables. As the surface of regular cables may be easily hardened and cracked under low temperature, take thermal insulation measures for cables laid in environments with low temperature.
- The servo drive must be grounded properly. Failure to comply may result in device malfunction or damage.



- Observe the following requirements during wiring of the power supply and main circuit:
  - When the main circuit terminal is a connector, remove the connector from the servo drive before wiring.
  - Insert one cable into one cable terminal of the connector. Do not insert multiple cables into one cable terminal.
  - When inserting cables, take enough care to prevent the cable conductor burrs from being short circuited to the neighboring cable.
  - Insulate the connecting part of the power supply terminals to prevent electric shock.
  - Do not connect a 220 V servo drive to a 380 V power supply directly.
  - Install safety devices such as a circuit breaker to prevent short circuit in external circuits. Failure to comply may result in a fire.
  - Cut off the main circuit power supply and switch off the S-ON signal after an alarm signal is detected.
  - After all cables are connected, it is recommended to tie them at the point 10cm–20cm away from the connector end.
- Do not put heavy objects onto cables or pull cables with excessive force. Failure to comply may result in cable damage, leading to an electric shock.
- Use a power supply filter to reduce the electromagnetic interference on electronic devices surrounding the servo drive.



- The DDR motor has been matched with the encoder adapter before it is shipped. Do not replace it yourself, otherwise there is a danger of runaway. Inovance is not liable for any personal injury and property damage incurred.
- During wiring, strictly follow the phase sequence of the DDR motor. Otherwise, there is a danger of runaway. Inovance is not liable for any personal injury and property damage incurred.



- Ensure that the motor power cable is securely connected to the drive grounding terminal. Ensure that the cables are properly and securely installed. Failure to comply will result in motor malfunction or damage.
- Fasten the screws on the power side and motor output side. Failure to comply will result in a fire. Use the motor within the rated voltage range. Failure to comply will result in a fire.
- Reduce the routing length and cable length as possible. For cable diameters, see the instructions in this manual about the precautions for wiring the signal cable. Keep the power cable away from the signal cable at least 30 cm. Interference on the signal cables will cause vibration or malfunction.
- Cables of the standard specifications are recommended. If cables of other specifications need to be used, select the cables properly based on the rated current of the equipment and the running environment. Use a twisted-pair or multi-core twisted pair as the encoder cable.
- Do not connect the commercial-use power directly to the motor. Risk of fire or malfunction.

6.1.3 Wiring Examples

6.1.3.1 Wiring of the Power Supply

Single-phase 200V Models

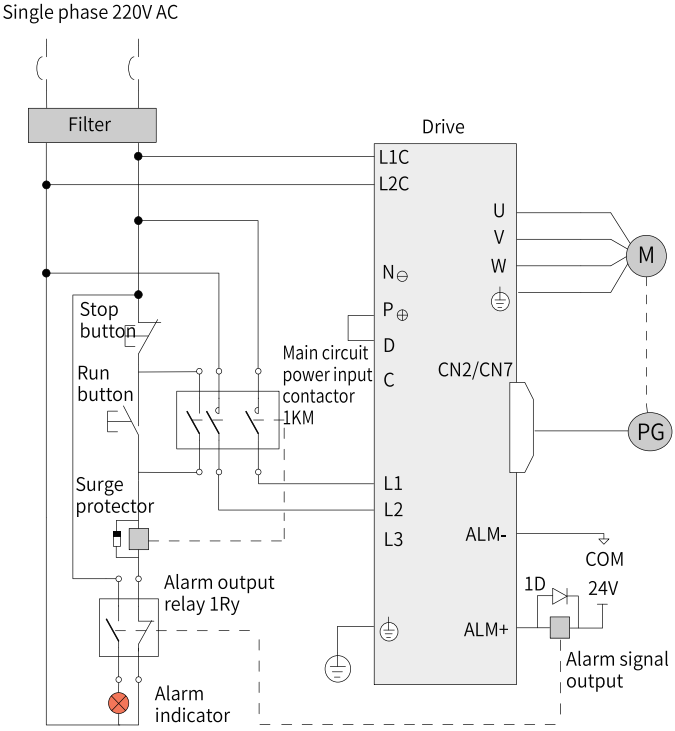


Figure 6-3 Main circuit wiring

Note

- 1KM: Electromagnetic contactor; 1Ry: Relay; 1D: Flywheel diode
- DO is set as alarm output (ALM+/-). When the servo drive alarms, the power supply will be cut off automatically. S1R6 and S2R8 are not configured with built-in regenerative resistors, if the regenerative resistor is needed, connect an external regenerative resistor between P⊕ and C.
- CN2 is used as the encoder terminal when an Inovance rotary servo motor is connected. CN7 is used when a direct drive or purchased motor is connected.

Three-phase 200V Models

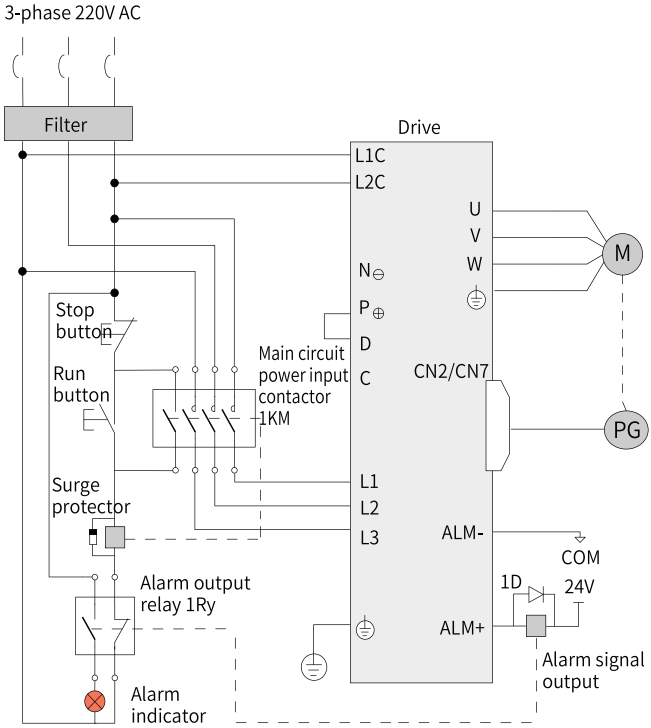


Figure 6-4 Main circuit wiring

Note

- 1KM: Electromagnetic contactor; 1Ry: Relay; 1D: Flywheel diode
- The DO is set as alarm output (ALM+/-). When the servo drive alarms, the power supply is cut off automatically and the alarm indicator lights up.
- CN2 is used as the encoder terminal when an Inovance rotary servo motor is connected. CN7 is used when a direct drive or purchased motor is connected.

Three-phase 400V Models

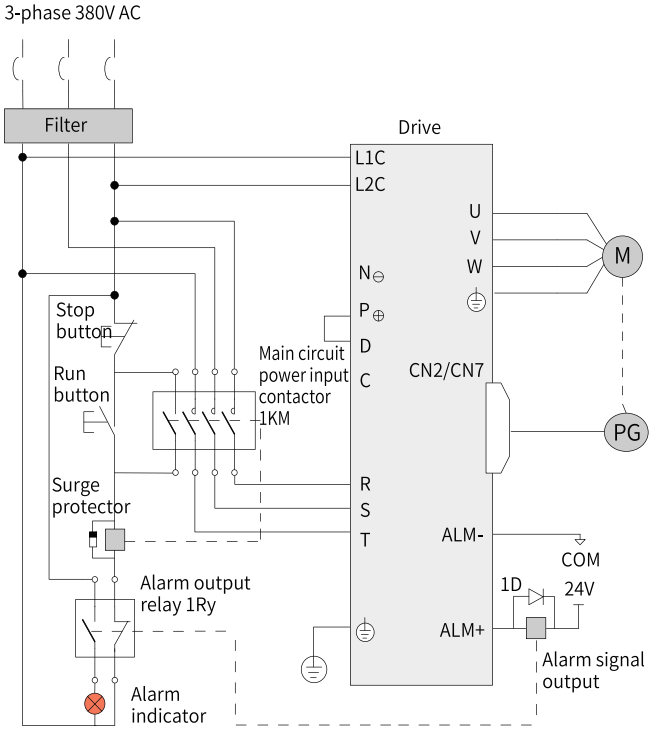


Figure 6-5 Main circuit wiring

Note

- 1KM: Electromagnetic contactor; 1Ry: Relay; 1D: Flywheel diode
- The DO is set as alarm output (ALM+/-). When the servo drive alarms, the power supply is cut off automatically and the alarm indicator lights up.
- CN2 is used as the encoder terminal when an Inovance rotary servo motor is connected. CN7 is used when a direct drive or purchased motor is connected.

6.1.3.2 Wiring of the Grounding Cable

Observe the following requirements to ensure a proper grounding of the servo drive.

Warning

- To prevent electric shocks, ground the grounding terminal properly. Observe related national or regional regulations during grounding.
- To prevent electric shocks, ensure the protective grounding conductor complies with technical specifications and local safety standards. Keep the length of the grounding cable as short as possible. As the leakage current of a single drive does not exceed AC 3.5 mA or DC 10 mA, the grounding cable of the drive must be has the same conductor cross-sectional area as the phase cable. On the other hand, the leakage current of multiple drives connected in parallel may exceed 3.5 mA, therefore, it is recommended to use a copper protective grounding conductor with a cross-sectional area of at least 10 mm^2, or use two protective grounding conductors with the same specification. The cross-sectional area of the grounding cable (except the motor grounding cable) must not be smaller than 2.5 mm^2.
- The dimensions of the grounding cable must comply with the electrical device technical standards. Keep the length of the grounding cable as short as possible. Failure to comply will lead to unstable potential in the grounding terminals away from the grounding point due to leakage current, resulting in an electric shock.

Caution

- For use of multiple servo drives, observe all the grounding instructions for the drive. Improper grounding of the device will lead to malfunction of the drive and the device.
- Do not share the same grounding cable with other devices (such as welding machines or high-current electrical devices). Improper grounding of the device will lead to drive or device faults caused by electrical interference.

Grounding requirements

Observe the following requirements to ensure a proper grounding of the drive.

- The protective grounding conductor must be a yellow/green cable comprised of copper conductors. Do not connect the protective grounding conductor to a switching device (such as a circuit breaker) in serial.
- Ground the grounding terminal properly. Improper grounding will lead to device malfunction or damage.
- Do not connect the grounding terminal to the N terminal of the neutral wire of the power supply.
- It is recommended to install the drive on a conductive metal surface. Ensure the whole conductive bottom of the drive is connected properly to the mounting face.

- Tighten the grounding screw with specified tightening torque to prevent the protective grounding conductor from being secured improperly.

Multi-drive grounding

Side-by-side installation of multiple drives:

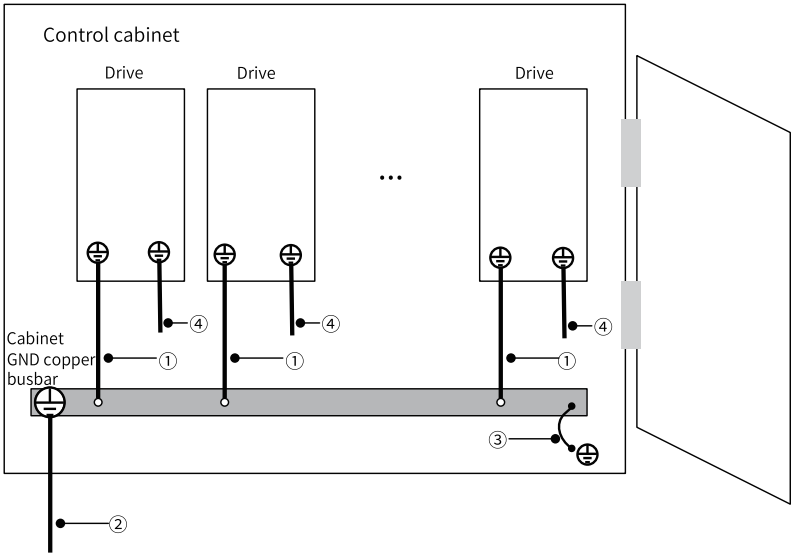


Table 6–3 Description for grounding of multiple drives installed in parallel

No.	Wiring
①	Connect the main circuit input PE terminal of the drive to the grounding copper busbar of the control cabinet through a protective grounding conductor.
②	Connect the PE cable on the input power supply side to the grounding copper busbar of the control cabinet.
③	Connect the grounding copper busbar of the control cabinet to the metal enclosure of the control cabinet through the protective grounding conductor.
④	Connect the motor output cable shield to the output PE terminal of the servo drive.

Grounding the control cabinet system

The most cost-effective method of suppressing interference in a control cabinet is to isolate the interference source from devices that may be interfered with. Divide the control cabinet into multiple EMC compartments or use multiple control cabinets

based on the intensity of interference sources, and install each device in accordance with the following wiring principles.

Table 6–4 Wiring requirements

No.	Wiring requirements
1	Place the control unit and the drive unit in two separate control cabinets.
2	If multiple control cabinets are used, connect the control cabinets by using a PE cable with a cross-sectional area of at least 16 mm^2 for equipotentiality between the control cabinets.
3	If only one control cabinet is used, place different devices in different compartments of the control cabinet based on signal intensity.
4	Apply equipotential bonding to devices in different compartments inside the control cabinet.
5	Shield all communication (such as RS485) and signal cables drawn from the control cabinet.
6	Place the power input filter in a position near the input interface of the control cabinet.
7	Apply spray coating to each grounding point in the control cabinet.

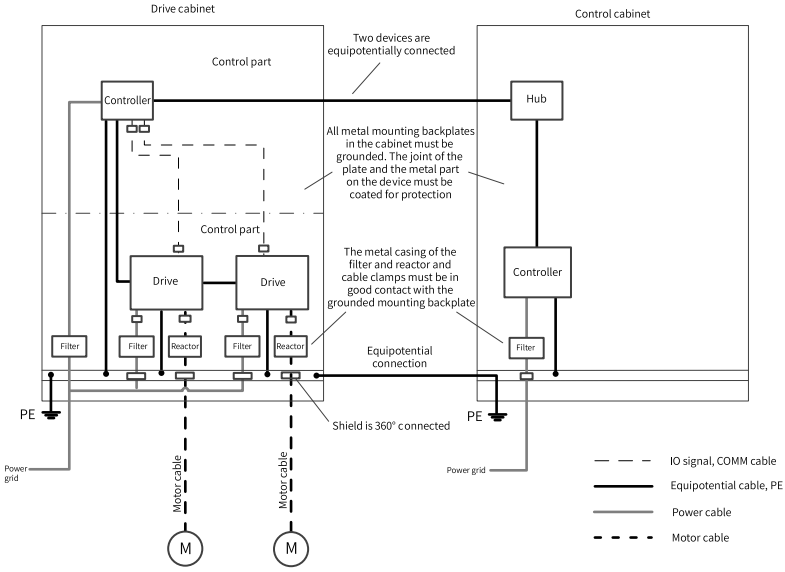


Figure 6-6 Recommended wiring for the control cabinet system

6.1.4 Cable Requirements

- To prevent the internal conductor from breaking due to long-time bending, the bending radius of a cable must be greater than 5D (fixed able) or 10D (drag chain cable).
- Use cables with a rated voltage above 600 VAC and rated temperature above 75°C. Under an ambient temperature of 30°C and normal cooling conditions, the permissible current density of the cable cannot exceed 8 A/mm2 when the total current is below 50 A, or 5 A/mm2 when the total current is above 50 A. The permissible current density (A/mm^2) can be adjusted based on the following formula in case of high ambient temperature or bundled cables.
  Allowable current density = 8 x Reduction coefficient of current-carrying density of the conductor x Current correction coefficient

  $$\text{Current correction coefficient} = \sqrt{(\text{Cable max. allowable temperature} - \text{Ambient temperature}) / 30}$$

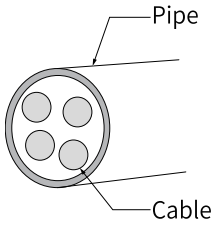


Table 6–5 Reduction coefficient of conductor current-carrying density

Number of Cables in a Duct	Current Reduction Coefficient
< 3	0.7
4	0.63
5–6	0.56
7–15	0.49

- It is recommended to route power cables and signal cables separately. To avoid EMC interference, the distance between them must be at least 30 cm.

To comply with the EMC standards, use shielded cables. See *"Figure 6–7 " on page 164*
.

Or use a four-core shielded cable, with one core being the PE wire. The shield of the shielded cable is comprised of coaxial cooper braids to suppress radio frequency interference. To enhance the shielding performance and conductivity, the braided density of the shield must be greater than or equal to 85%.

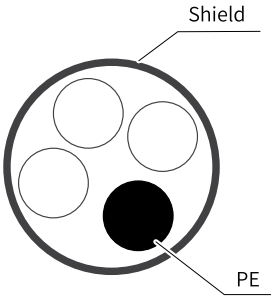


Figure 6-7 Recommended power cable

See the related section for the correct connection of the shielded power cable.

6.1.5 Cable Length

Table 6–6 Input/Output current specifications of the servo drive

Servo Drive Model		Rated input current (A)	Rated output current (A)	Maximum Output Current (A)
Single-phase 200 V				
Size A	S1R6	2.3	1.6	5.8
	S2R8	4.0	2.8	10.1
Size C	S5R5	7.9	5.5	16.9
	S7R6	9.6	7.6	23.0
Size D	S012	12.8	12.0	32.0
Three-phase 200 V				
Size A	S1R6	1.1	1.6	5.8
	S2R8	2.3	2.8	10.1
Size C	S5R5	4.4	5.5	16.9
	S7R6	5.1	7.6	23.0
Size D	S012	8.0	12.0	32.0
Size E	S018	8.7	18.0	45.0
	S022	11.0	22.0	55.0
	S027	23.8	27.0	67.5
Three-phase 400 V				
Size C	T3R5	2.4	3.5	11.0
	T5R4	3.6	5.4	14.0
Size D	T8R4	5.6	8.4	20.0
	T012	8.0	12.0	30.0
Size E	T017	12.0	17.0	42.5
	T021	16.0	21.0	52.5
	T026	21.0	26.0	65.0

Table 6–7 Recommended main circuit cables

Servo Drive Model			L1C, L2C		L1, L2, L3/R, S, T		P ⊕ , D, C, N ⊖ , N2, N1		U, V, W, PE		Grounding terminal	
Size	Model	Rated input current (A)	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG
Single-phase 200 V												
A	S1R6	2.3	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
	S2R8	4	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
C	S5R5	7.9	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
	S7R6	9.6	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
D	S012	12.8	2×1.31	16	3×1.31	16	2×1.31	16	4×1.31	16	1.31	16
Three-phase 200 V												
A	S1R6	1.1	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
	S2R8	2.3	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
C	S5R5	4.4	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
	S7R6	5.1	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
D	S012	8	2×1.31	16	3×1.31	16	2×1.31	16	4×1.31	16	0.81	18
E	S018	8.7	2×2.08	14	3×2.08	14	2×2.08	14	4×2.08	14	1.31	16
	S022	11	2×2.08	14	3×2.08	14	2×2.08	14	4×2.08	14	1.31	16
	S027	23.8	2×3.33	12	3×3.33	12	2×3.33	12	4×3.33	12	2.08	14
Three-phase 400 V												
C	T3R5	2.4	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
	T5R4	3.6	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
D	T8R4	5.6	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
	T012	8	2×1.31	16	3×1.31	16	2×1.31	16	4×1.31	16	0.81	18
E	T017	12	2×2.08	14	3×2.08	14	2×2.08	14	4×2.08	14	1.31	16
	T021	16	2×2.08	14	3×2.08	14	2×2.08	14	4×2.08	14	1.31	16
	T026	21	2×3.33	12	3×3.33	12	2×3.33	12	4×3.33	12	2.08	14

Note

Cable selection should be carried out in line with the standard EN60204-1 according to the circuit breaker current.

Table 6–8 Recommended Cable Specifications and Models

Cable Type	Cable Size	OD (mm)
Power cable	4×12AWG	12.2±0.4
	4×14AWG	10.5±0.3
	4×16AWG	9.5±0.4
	4×20AWG	6.5±0.2

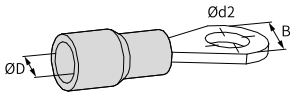
Cable Type	Cable Size	OD (mm)
Power cable shield	4×12AWG	12.9±0.4
	4×14AWG	11.2±0.4
	4×16AWG	10.1±0.4
	4×20AWG	6.5±0.2
Power cable + brake cable	4 × 20AWG + 2 × 24AWG	6.5±0.2
Brake cable	2×18AWG	5.8±0.2
	2×20AWG	5.0±0.2

Table 6–9 Main circuit cable lug model and tightening torque

Servo Drive Model			Recommended PVC Cable Model (at 40°C)			
Size	Model	Rated Input Current (A)	U, V, W, PE	Recommended Model of Brake Cable Lug	Recommended Model of Grounding Cable Lug	Tightening Torque (N·m)
Single-phase 200 V						
A	S1R6	2.3	GTVE10008	GTVE05008	TVR2–4	-
	S2R8	4				-
C	S5R5	7.9				-
	S7R6	9.6	GTVE15008	GTVE10008		-
D	S012	12.8				-
Three-phase 200 V						
A	S1R6	1.1	GTVE10008	GTVE05008	TVR2–4	-
	S2R8	2.3				-
C	S5R5	4.4				-
	S7R6	5.1				-
D	S012	8.0				-
E	S018	8.7				-
	S022	11.0	GTVE15008	GTVE10008		-
	S027	23.8	GTVE25010	GTVE15008		-
Three-phase 400 V						
C	T3R5	2.4	GTVE10008	GTVE05008	TVR2–4	-
	T5R4	3.6				-
D	T8R4	5.6				-
	T012	8.0				-
E	T017	12.0	TVS1.25–4	GTVE10008	TVR1.25–4	1.36
	T021	16.0	TVS2–4	GTVE10008	TNR2–4	1.36
	T026	21.0	TVS3.5–4	GTVE10008	TNR3.5–4	1.36

The following table lists the data for recommended cable lugs (manufacturer: Suzhou Yuanli Metal Enterprise Co., Ltd) for your reference.

Table 6–10 TVR2-4 cable lug

Lug Model		D (mm)	d2 (mm)	B (mm)	Dimension Drawing
TVR	2–4	4.5	4.3	8.5	

6.2 Description of Control Terminal (CN1)

6.2.1 Terminals [P]

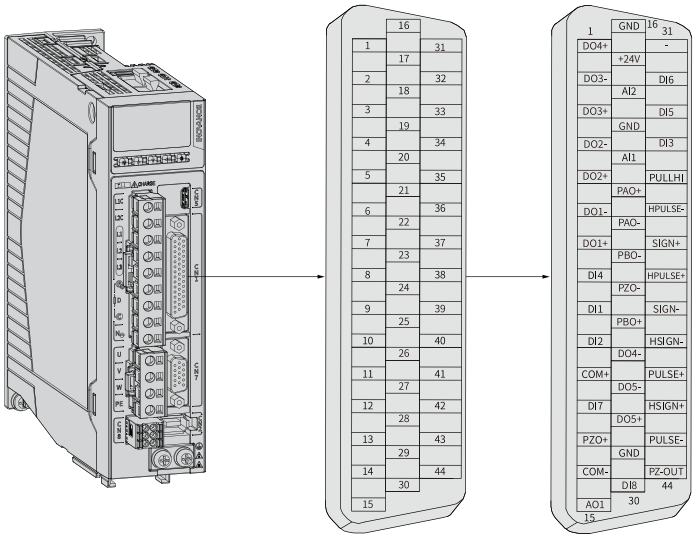


Figure 6-8 Control terminal pin layout of the servo drive

Note

- CN1 terminal: plastic cable connector; core: welded male connector.
- Use shielded cables as signal cables, with both ends of the shielded cable grounded.

Table 6–11 Position Reference Input Signals

Signal Name		Pin No.	Function
Position reference	PULSE+	41	Low-speed pulse reference input mode: • Differential drive input • Open-collector Pulse input form: • Direction+Pulse • Quadrature pulse of phases A and B • CW/CCW pulse
	PULSE–	43	
	SIGN+	37	
	SIGN–	39	
	PULLHI	35	
	HPULSE+	38	High-speed pulse input reference
	HPULSE–	36	
	HSIGN+	42	High-speed position reference symbols
	HSIGN–	40	

Table 6–12 Description of DI/DO signals

Signal Name		Default Function	Pin No.	Function
General	DI1	P-OT	9	Positive limit switch
	DI2	N-OT	10	Negative limit switch
	DI3	INHIBIT	34	Position reference inhibited
	DI4	ALM-RST	8	Alarm reset (edge-triggered)
	DI5	S-ON	33	Servo ON
	DI6	-	32	-
	DI7	XintStart	12	Interrupt positioning selection
	DI8	HomeSwitch	30	Home switch
	+24 V		17	Internal 24 V power supply; voltage range: 20 V to 30 V; maximum output current: 150 mA
	COM–		14	
	COM+		11	Common terminal of DI terminals
	DO1+	S-RDY+	7	Ready to switch on
	DO1-	S-RDY-	6	
	DO2+	COIN+	5	Positioning completed
	DO2-	COIN–	4	
	DO3+	-	3	-
	DO3-	-	2	
	DO4+	ALM+	1	Fault output
	DO4-	ALM-	26	
	DO5+	HomeAttain+	28	Home find
	DO5-	HomeAttain–	27	

Table 6–13 Encoder frequency-division output signals

Signal Name		Pin No.	Function	
General	PAO+	21	Phase A frequency-division output signal	Quadrature frequency-division pulse output signals of phases A and B
	PAO–	22		
	PBO+	25	Phase B frequency-division output signal	
	PBO–	23		
	PZO+	13	Phase Z frequency-division output signal	Home pulse output signal
	PZO–	24		
	PZ-OUT	44	Phase Z frequency-division output signal	Home pulse open-collector output signal
	GND	29	Home pulse open-collector output signal ground	
	PE	Housing	-	

Table 6–14 Specifications of AI/AO signals

Signal Name		Pin No.	Function
General	AO1	15	Analog Output Voltage range: –10 V to +10 V
	GND	19	Common terminal of AI/AO
	AI1	20	Voltage-type AI 1 16bit Voltage range: –10 V to +10 V Maximum allowable voltage: ±12 V
	AI2	18	Voltage-type AI 2 12bit Voltage range: –10 V to +10 V Maximum allowable voltage: ±12 V
	GND	16	Power ground
	PE	Housing	-

6.2.2 Terminals [N]

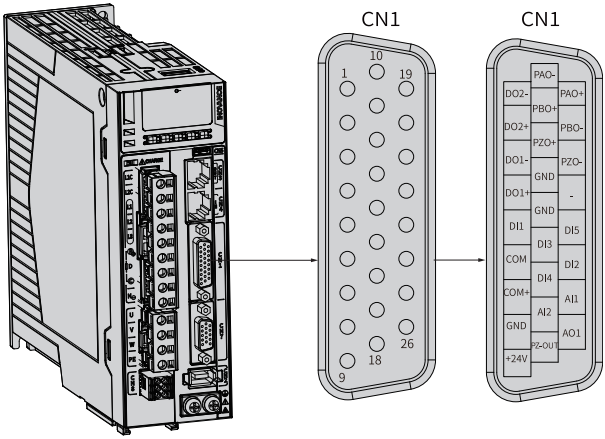


Figure 6-9 Arrangement of control terminal (CN1) pins

Note

Use shielded cables as signal cables, with both ends of the shielded cable grounded.

Table 6–15 DI/DO signals

Signal name		Default Function	Pin No.	Function
General	DI1	P-OT	5	Forward overtravel switch
	DI2	N-OT	24	Reverse overtravel switch
	DI3	HomeSwitch	15	Home switch
	DI4	Emergency Stop	16	Emergency stop
	DI5	TouchProbe1	23	Probe 1
	+24V		9	Int. 24V power, voltage range 20V–30V, max. output 150mA
	COM-		6	
	COM+		7	DI terminal common
	DO1+	S-RDY+	4	Servo ready
	DO1-	S-RDY-	3	
	DO2+	ALM+	2	Fault
	DO2-	ALM+	1	

Table 6–16 Encoder frequency division output signal specification

Signal name		Pin No.	Function	
General	PAO+	19	A-phase frequency division output signal	Orthogonal frequency division output signal of A and B
	PAO-	10		
	PBO+	11	B-phase frequency division output signal	
	PBO-	20		
	PZO+	12	Z-phase frequency division output signal	Home pulse output signal
	PZO-	21		
	PZ-OUT	18	Home pulse open collector output signal	
	GND	13	Home pulse open collector output signal ground	
	PE	Enclosure	-	

Table 6–17 Analog input and output terminal signal specifications

Signal name		Pin No.	Function
General	AO1	26	Analog output Voltage range：-10V to +10V
	GND	8	Analog input or output common terminal
	AI1	25	Voltage type analog input 1 16bit Voltage range:-10V to +10V Maximum allowable voltage：±12V
	AI2	17	Voltage type analog input 2 12bit Voltage range: -10V to +10V Maximum Allowable Voltage: ±12V
	PE	Enclosure	-

6.2.3 Wiring Precautions and Requirements

I/O signals include DI/DO signals and relay output signals.

Observe the following requirement during control circuit wiring:

Caution

- When connecting DO terminals to relays, ensure the polarity of the flywheel diode is correct. Wrong polarity will result in equipment damage or signal output failure.
- Keep a distance of at least 30 cm between main circuit cables (RST and UVW) and I/O signal cables/encoder cables. Otherwise equipment may malfunction due to disturbed I/O signals.
- Use twisted pairs or multi-conductor shielded twisted pairs as the I/O signal cable or encoder cable. Failure to comply may result in equipment malfunction.

6.2.4 Wiring Examples

6.2.4.1 DI/DO Signals

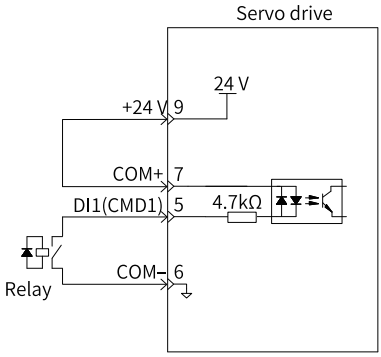
DI circuit

This section takes DI1 of SV680N-INT as an example.

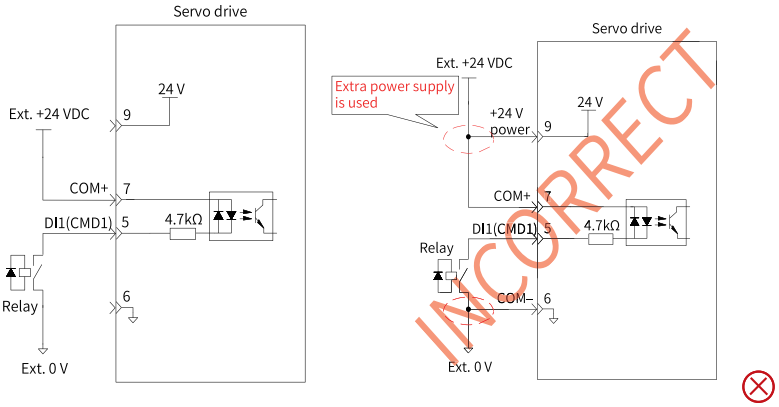
For pin assignment of the DI terminal of SV680P-INT, see the related section.

For pin assignment of the DI terminal of SV680N-INT, see the related section.

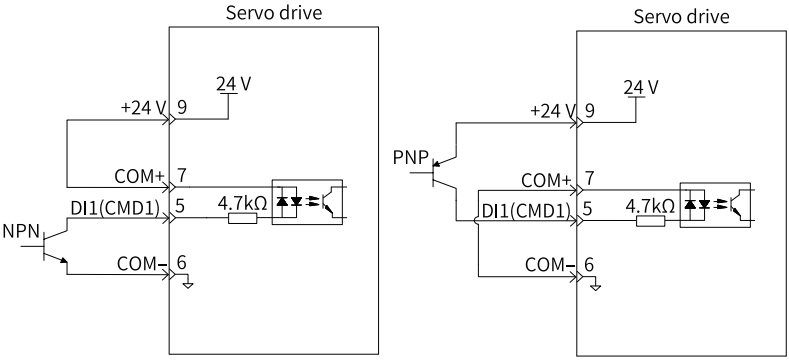
- The host controller provides relay output:
  - When you use the internal 24 V power supply:



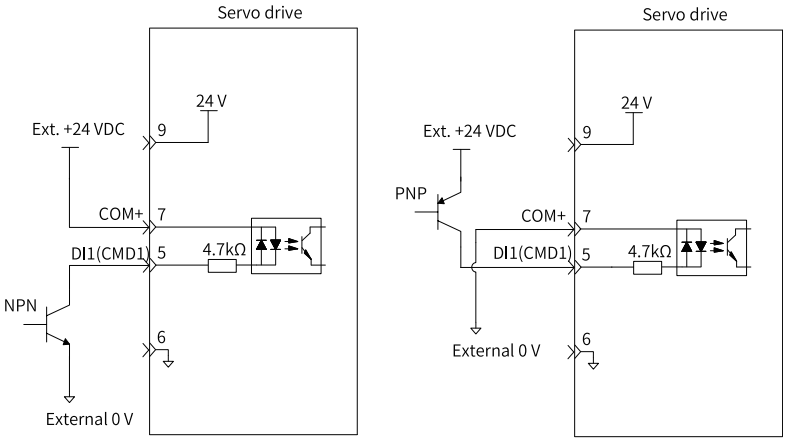
  - When you use an external power supply:



- The host controller provides open-collector output.
  - When you use the internal 24 V power supply:



  - When you use an external power supply:



Note

PNP and NPN input cannot be used together in the same circuit.

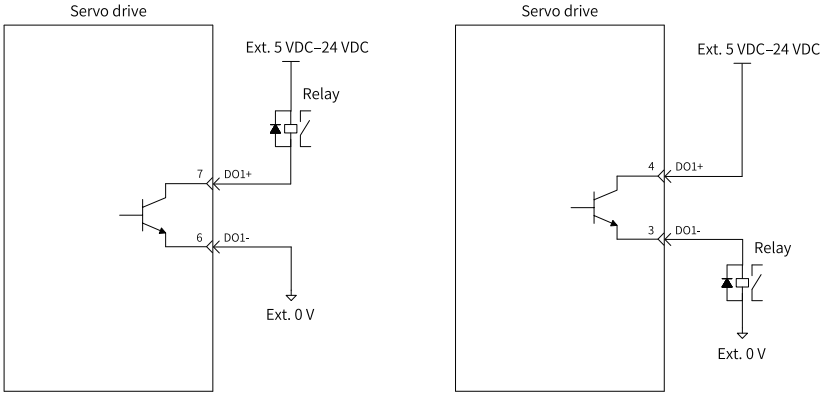
DO circuit

This section takes DO1 of SV680N-INT as an example.

For pin assignment of the DO terminal of SV680P-INT, see the related section.

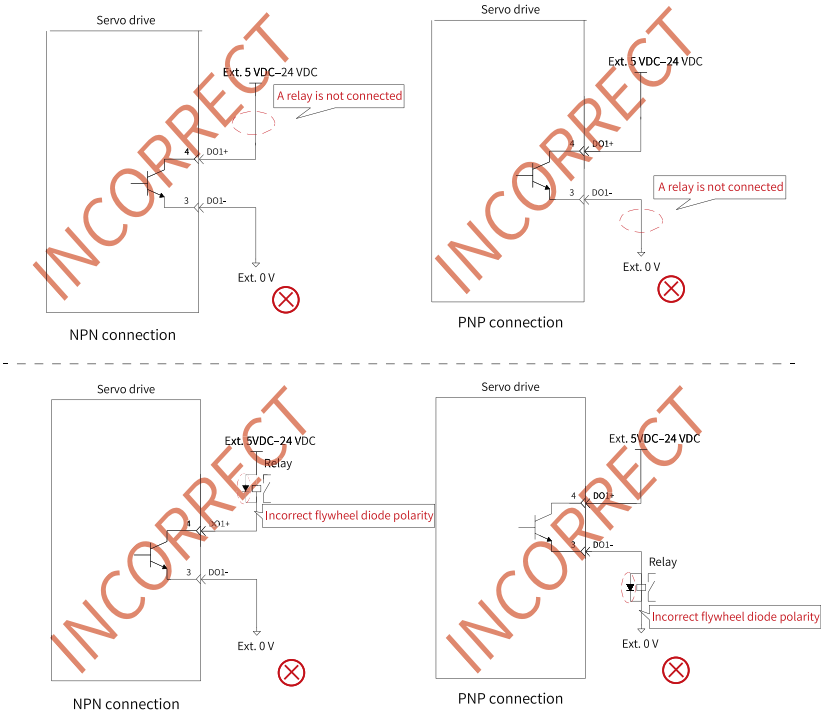
For pin assignment of the DO terminal of SV680N-INT, see the related section.

- The host controller provides relay input.

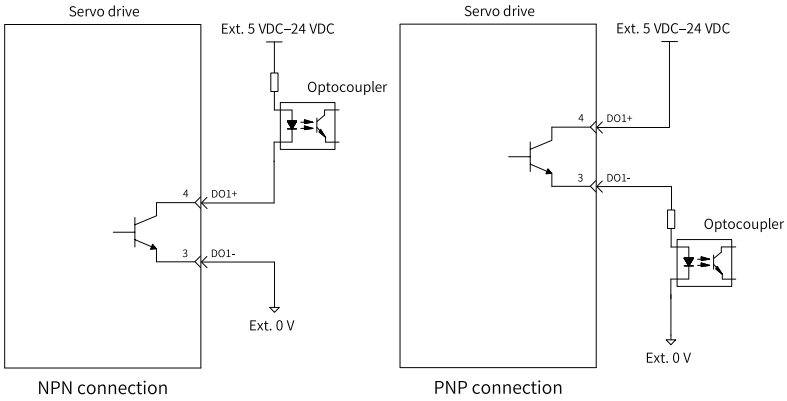


Note

When the host controller provides relay input, a flywheel diode must be installed. Otherwise, the DO terminals may be damaged.



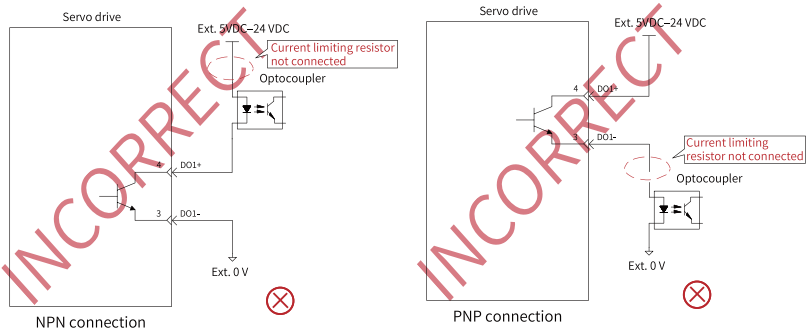
- The host controller provides optocoupler input:



Note

The maximum permissible voltage and current capacity of the optocoupler output circuit inside the servo drive are as follows:

- Max. voltage: 30 VDC
- Max. current: DC 50 mA

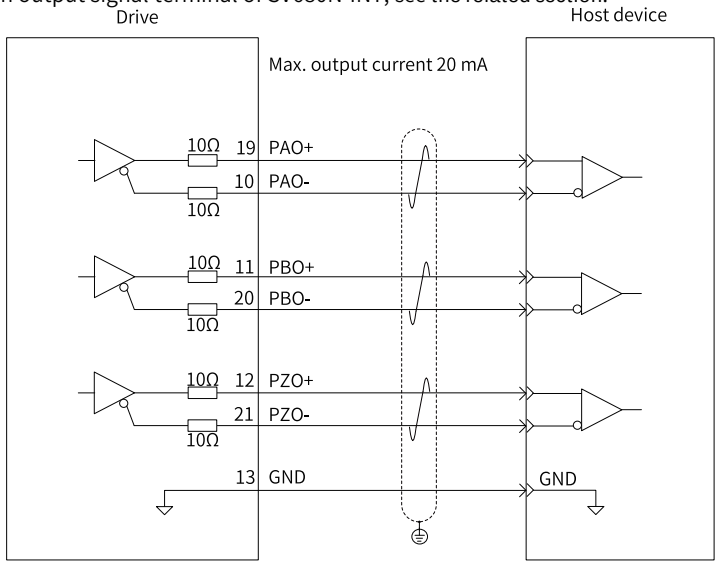


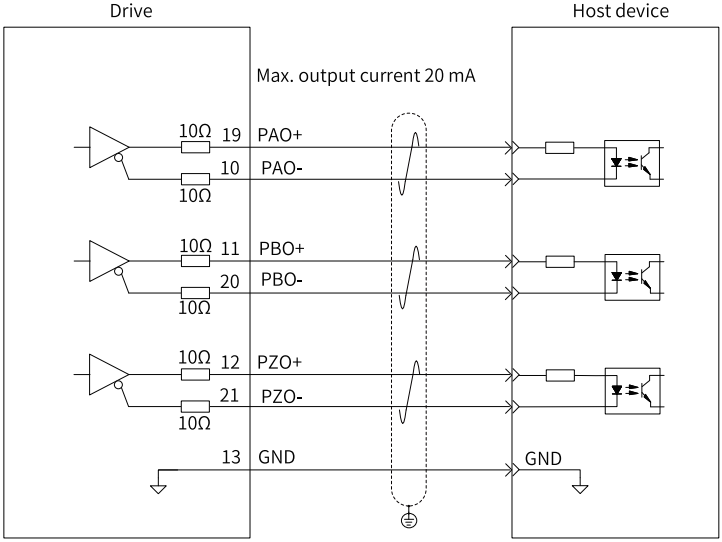
6.2.4.2 Encoder Frequency-Division Output Signals

Encoder frequency-division output circuit outputs differential signals via the differential drive. Typically, this circuit provides feedback signals to the host controller in a position control system. Use a differential or optocoupler receiving circuit on the host controller side to receive feedback signals. The maximum output current is 20 mA.

This section takes the encoder frequency-division output signal of SV680N-INT as an example.

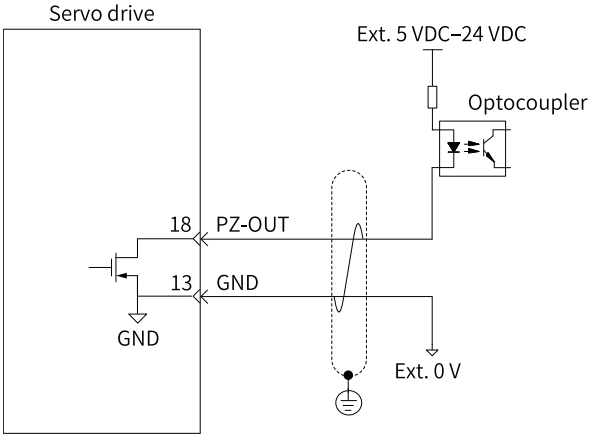
For pin assignment of the encoder frequency-division output signal terminal of SV680P-INT, see the related section. For pin assignment of the encoder frequency-division output signal terminal of SV680N-INT, see the related section.





Encoder phase Z output circuit outputs OC signals. Typically, this circuit provides feedback signals to the host controller in a position control system. An optocoupler

circuit, relay circuit, or bus receiver circuit shall be used in the host controller to receive feedback signals.



Caution

To reduce noise interference, use shielded twisted pairs to connect the 5V GND of the host controller to the GND of the servo drive.

6.2.4.3 AI/AO Signals

This section takes the analog signal of SV680N-INT as an example.
For pin assignment of the analog signal terminal of SV680P-INT, see the related section.

For pin assignment of the analog signal terminal of SV680N-INT, see the related section.

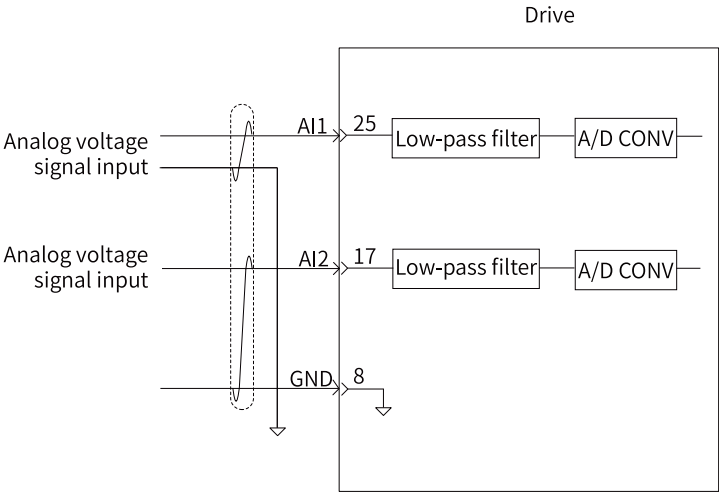
Analog input signal

The input terminal for analog speed and torque signals is AI1 and AI2.

AI1 is a voltage-type analog input terminal with a resolution of 16 bits. The voltage value is set in group H03.

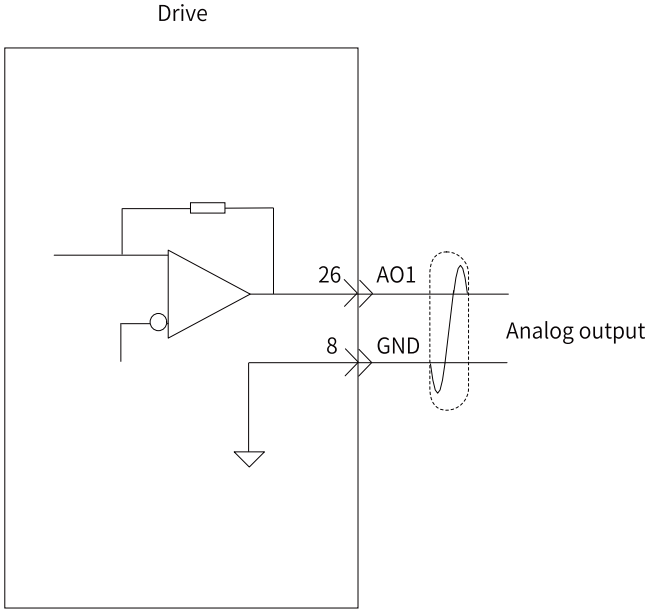
AI2 is a voltage-type analog input terminal with a resolution of 12 bits. The voltage value is set in group H03.

- Voltage-type input specification: –10 V to +10 V; maximum permissible voltage: ±12 V
- Input impedance: approx. 74 kΩ.



Analog output signal

The output terminal for analog speed and torque signals is AO1, supporting a voltage range of –10 V to +10 V. The voltage value is set in group H04.



6.2.4.4 Position Reference Input Signal [P]

For assignment of the position reference input signal terminal pins of SV680P-INT, see the related section.

The reference pulses and signs on the host controller side can be outputted through the differential drive or open-collector. The following table lists the maximum input frequency and minimum pulse width.

Table 6–18 Correspondence between pulse input frequency and pulse width

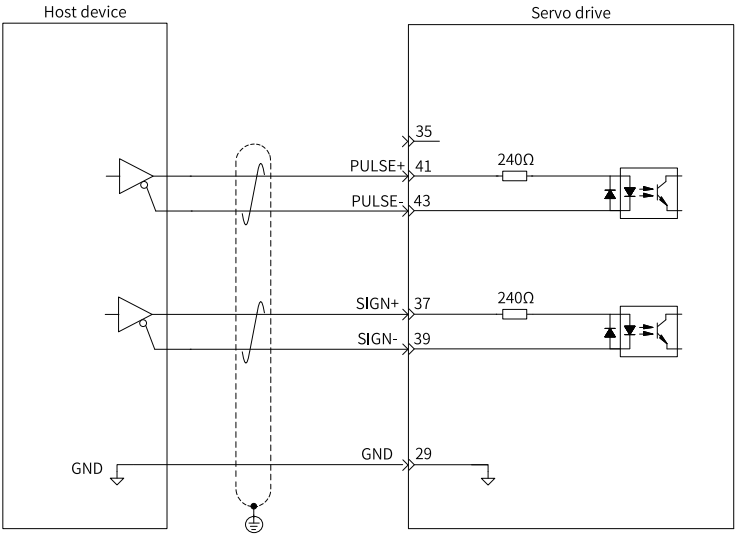
Pulse Mode		Max. Pulse Frequency (pps)	Min. Pulse Width (μs)	Voltage (V)
Low speed	Differential	200k	1	＞3.0
	Open-collector	200k	2.5	24
High-speed differential		4M	0.125	＞3.0

Note

- High-speed pulse and low-speed pulse cannot be used at the same time.
- If the output pulse width of the host controller is less than the minimum pulse width value, it will cause the drive receiving pulse error.
- The sign  Indicates a shielded twisted pair.

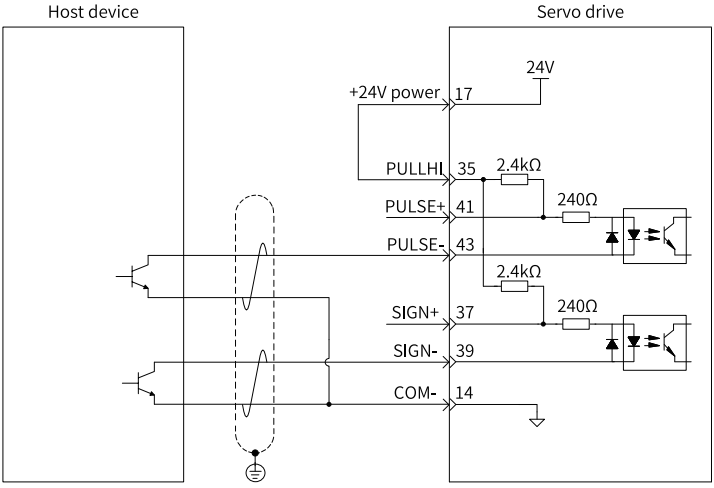
Low-speed pulse reference input

- Differential mode



- Open-collector mode

  ① For use of the internal 24 V power supply of the servo drive:



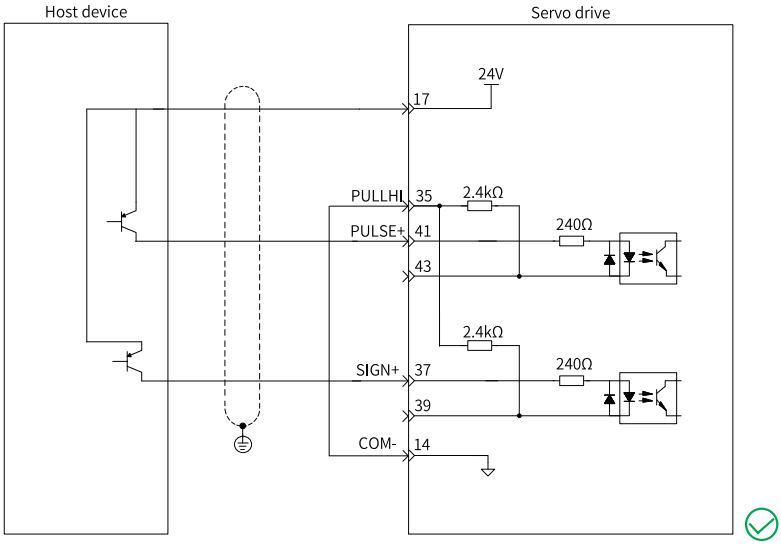


Figure 6-10 Correct: The internal 24 V power supply of the servo drive is used.

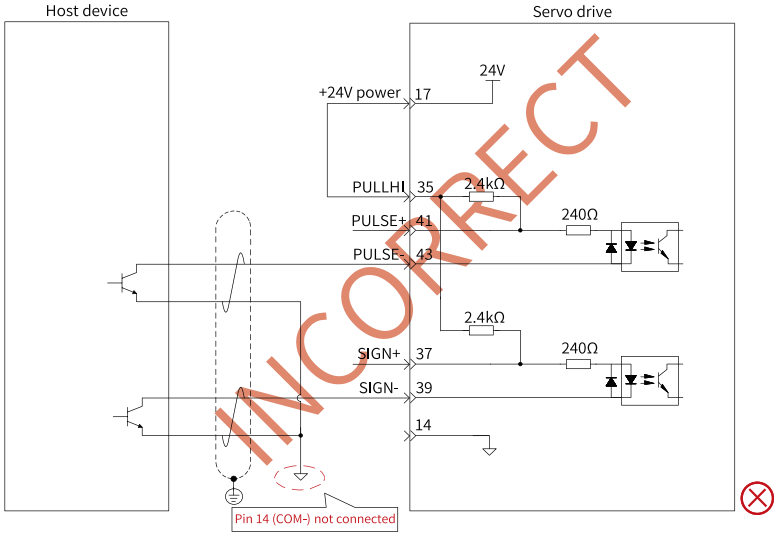
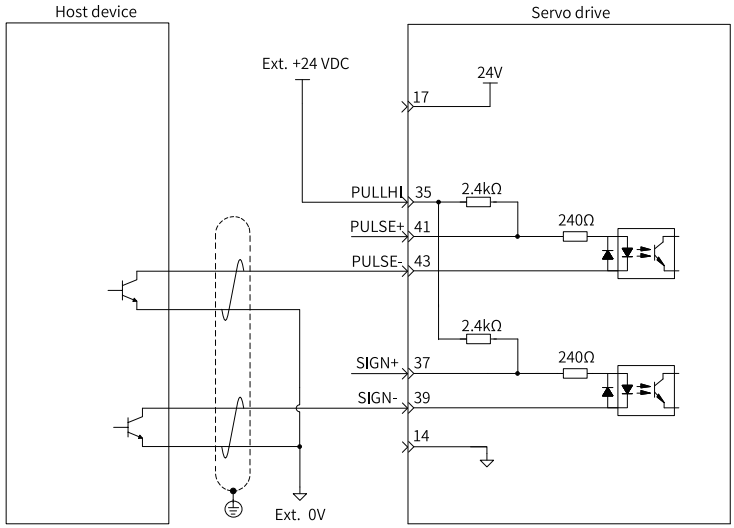
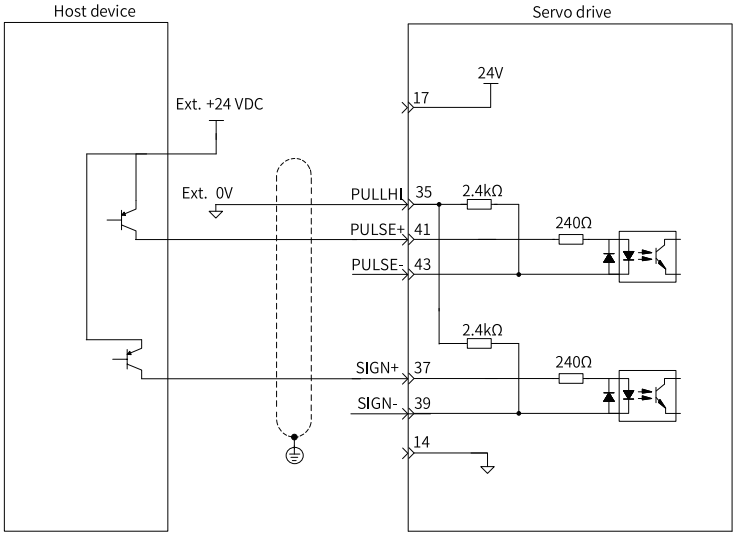


Figure 6-11 Incorrect: Pin 14 (COM–) is not connected, leading to failure in forming a closed-loop circuit.

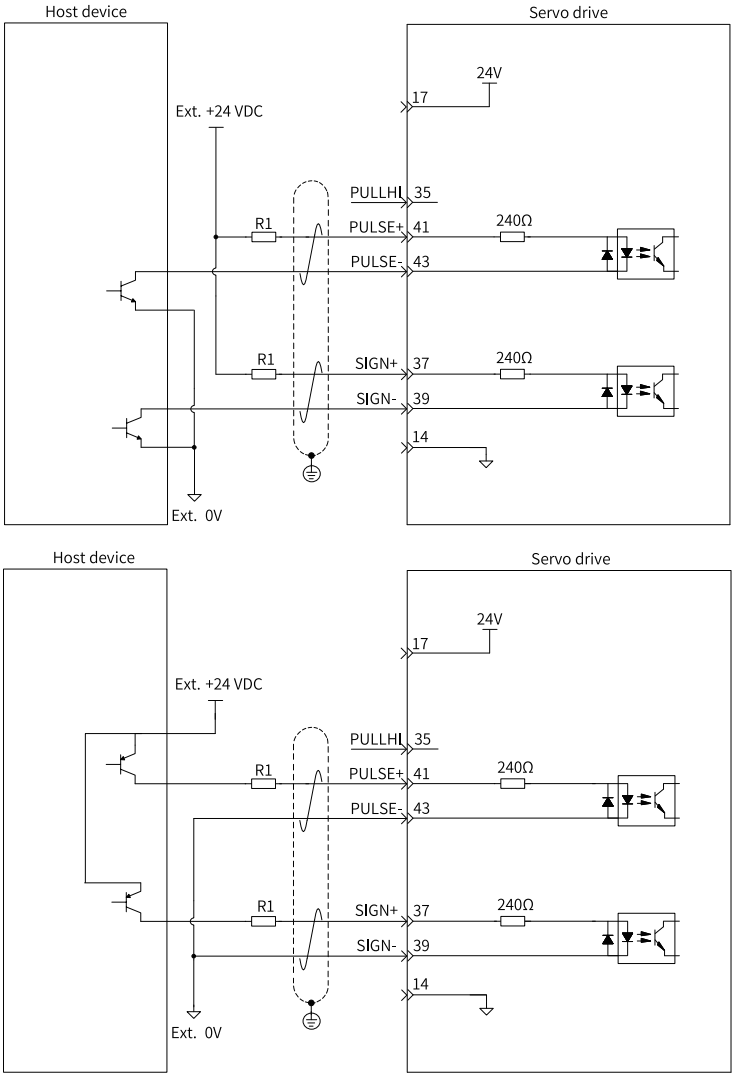
When the external power supply is used:

- Scheme 1: Using the built-in resistor (recommended)





■ Scheme 2: Using the external resistor



Select resistor R1 based on the following formula.

$$\frac{V_{CC} - 1.5}{R1 + 240} = 10\ mA$$

Table 6–19 Recommended resistance of R1

V_{CC} Voltage (V)	Resistance of R1 (kΩ)	Power of R1 (W)
24	2.4	0.5
12	1.5	0.5

- Examples of incorrect wiring
- 1: The current limiting resistor is not connected, resulting in terminal burnout.

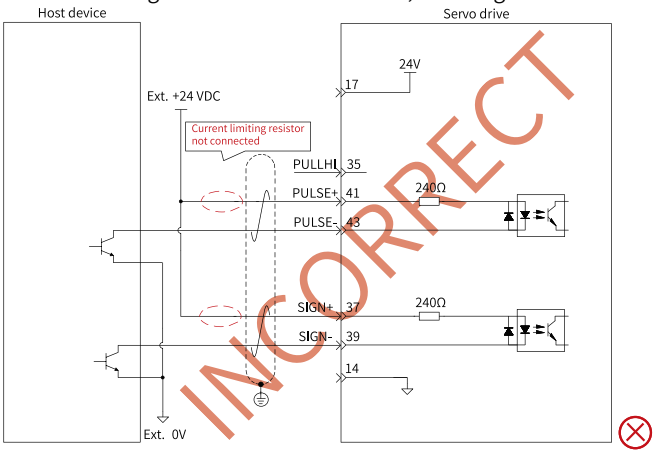


Figure 6-12 Example 1: The current limiting resistor is not connected, resulting in terminal burnout.

Note

- A detection feature is added on SIGN+ and SIGN- to detect if SIGN+ is connected to 24 V, SIGN- is connected to external 0 V, but no current limit resistor is connected. When this case is detected, the drive issues an E991.1 warning.
- In this case, check the wiring and then test the drive. Otherwise, the port may be damaged.
- This feature cannot detect polarity reversal.

- 2: Multiple terminals share the same current limiting resistor, resulting in pulse receiving error.

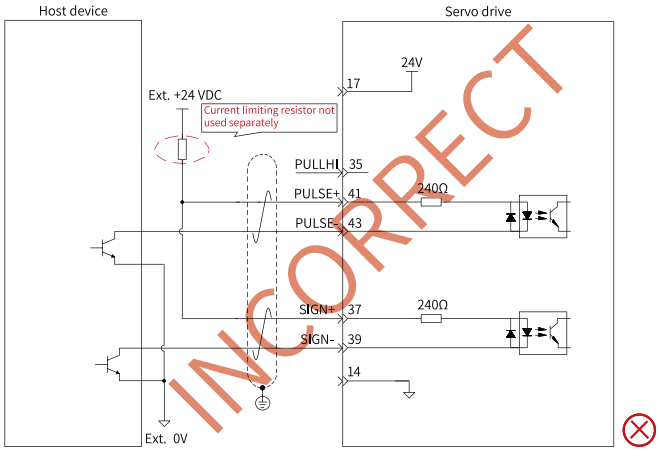


Figure 6-13 Example 2: Multiple terminals share the same current limiting resistor, resulting in pulse receiving error.

- Incorrect wiring 3: The SIGN port is not connected, preventing these two ports from receiving pulses.

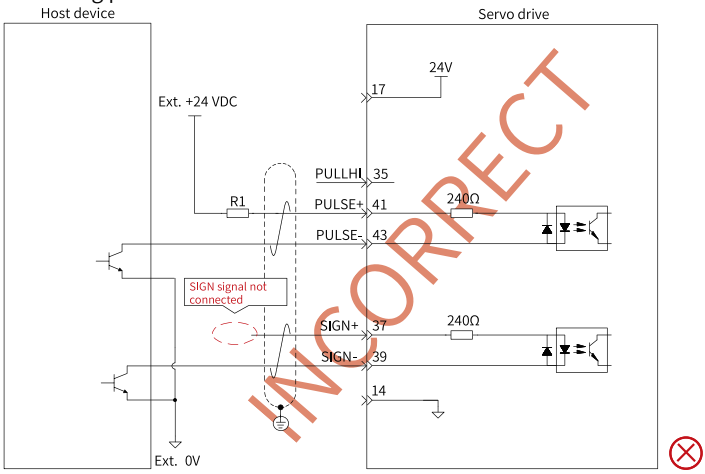


Figure 6-14 Example 3: The SIGN port is not connected, preventing these two ports from receiving pulses.

- Wrong wiring 4: Terminals are connected incorrectly, resulting in terminal burnout.

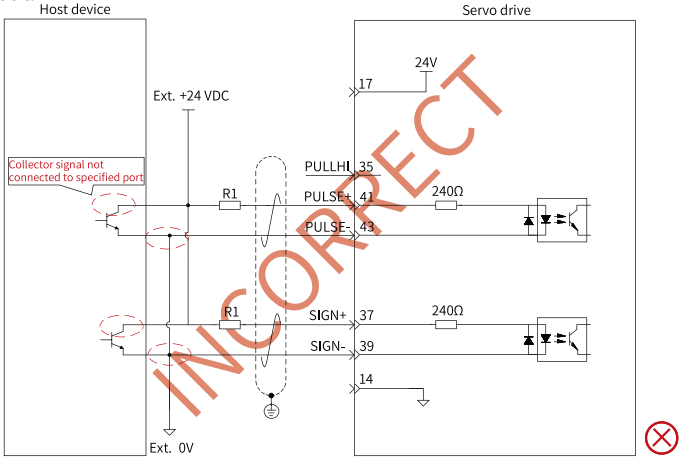


Figure 6-15 Example 4: Terminals are connected incorrectly, resulting in terminal burnout.

- Wrong wiring 5: Multiple terminals share the same current limiting resistor, resulting in pulse receiving error.

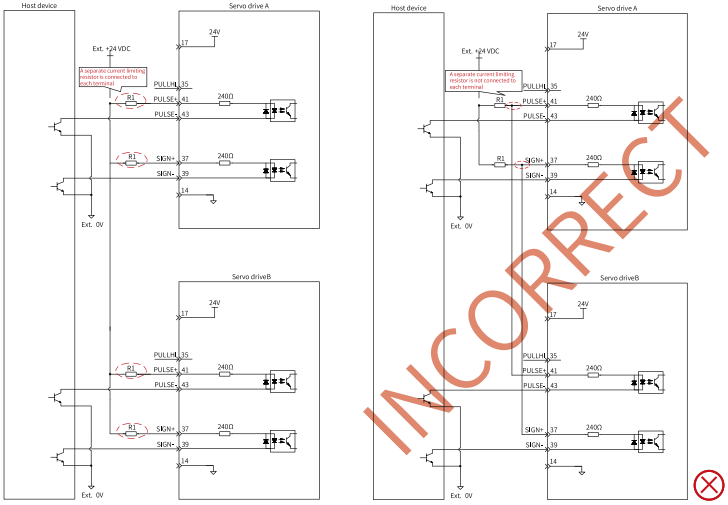
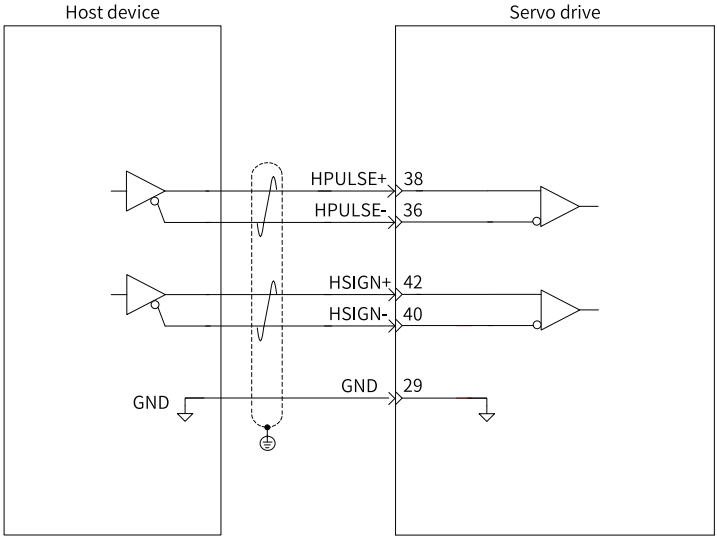


Figure 6-16 Example 5: Multiple terminals share one current limiting resistor, resulting in a pulse receiving error.

High-speed pulse reference input

High-speed reference pulses and signs on the host controller side can be outputted to the servo drive through the differential drive only.



Note

- This is a 5 V system. Do not input 24 V power.
- A detection feature is added on HSIGN+ and HSIGN- to detect if HSIGN+ is connected to 24 V, HSIGN- is connected to external 0 V, but no current limit resistor is connected. When this case is detected, the drive issues an E991.1 warning.
- In this case, check the wiring and then test the drive. Otherwise, the port may be damaged.
- This feature cannot detect polarity reversal.

Caution

The differential input must be 5 V. Otherwise, unstable pulse input will occur on the servo drive, resulting in the following situations:

- Pulse loss during pulse input
- When inputting reference direction, the direction will reverse.
- Connect 5V GND of the host controller to the GND of the servo drive to reduce noise interference.

6.2.5 Cable Requirements

Observe the requirements in standard EN 60204-1 during connecting control circuit cables.

I/O signal cable selection

It is recommended to use shielded signal cables to prevent I/O signal circuit from being disturbed by external noise. Use separate shielded cables for different analog signals. It is recommended to use shielded twisted pairs for digital signals.

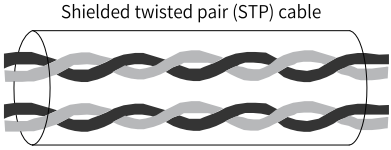


Figure 6-17 Diagram of shielded twisted pairs

Control Cable Specifications

Table 6–20 Recommended Control Cable Specifications

Control terminal	Drive Model	Connector Kit/Material No.	AWG
CN1	SV680P-INT series servo drive	DB44	24 to 30
	SV680N-INT series servo drive	DB26	26 to 16

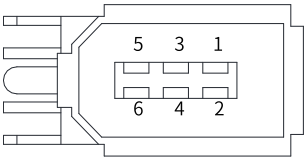
6.3 CN2 Encoder Terminal

6.3.1 Terminal Arrangement

Note

- Primary encoder: The main encoder.
- Secondary encoder: The slave encoder when the fully closed loop feature is used.

Terminal Arrangement



Encoder signal terminal CN2

Figure 6-18 Terminal pin arrangement

Table 6–21 Pin assignment

Pin No.	Name	Description
1	5 V	5 V power supply (load current lower than 200 mA)
2	GND	5 V power supply ground (load current lower than 200 mA)
3	PS4+/CLK+	1. PS± signal of the second encoder; 2. CLK± signal of the communication-type encoder
4	PS4-/CLK-	
5	PS3+/DATA+	1. PS± signal of the first encoder; 2. DATA± signal of the communication-type encoder; 3. Gantry synchronization signal
6	PS3-/DATA-	
Enclosure	PE	Shield

Note

It is recommended to use shielded twisted pair cables. Connect the shield layer to the CN2 terminal housing to reduce noise interference.

6.3.2 Wiring Precautions and Requirements

- Ground the shielded layers on both the servo drive side and the motor side. Otherwise, the servo drive will report a false alarm.
- Given the voltage drop caused by cable resistance and signal attenuation caused by distributed capacitance, it is recommended to use twisted-pair cables of 26AWG or above (as per UL20276 standard) with length no longer than 10 m as the encoder cable.

Note

It is recommended to use 22AWG to 26AWG cables and a matching terminal AMP170359-1 for 10B, 20B, 40B, and 75B series motors. If a longer cable is required, increase the cable diameter properly.

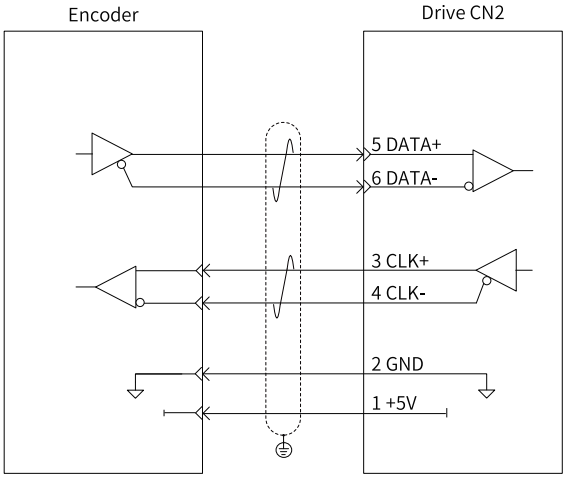
6.3.3 Wiring Examples

6.3.3.1 Communication with the First Encoder

Set H32.01 to 0 for an Inovance rotary motor, and 1 for a direct drive motor or third-party motor.

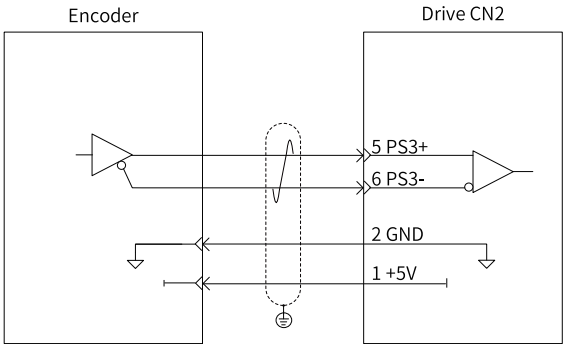
Wiring of Endat2.2/SSI/BISS-C master encoder

The drive sends a clock signal to the master encoder, which exchanges data with the servo drive through a DATA signal.



Wiring of Inovance/TAMAGAWA/Nikon master encoder

The master encoder interacts with the servo drive through PS3+ and PS3-.



Note

It is recommended to use 22AWG to 26AWG cables for 10B, 20B, 40B, and 75B series motors. If a longer cable is required, increase the cable diameter properly. See the following table for details.

Table 6–22 Recommended cables

Cable Size (AWG)	Line Resistance (Ω/km)	Allowable Length (m)
3P x 26	143	0 to 10
1P×22+2P×26	54.3	10 to 26.4
1P×20+2P×24	33.9	26.4 to 42.2
1P×18+2P×22	21.4	42.2 to 66.8
1P×16+2P×18	13.5	66.8 to 105.0

Note

- The above length allows an increase of 2 to 3 meters.
- If you need cables above 16AWG, please consult Inovance sales staff.
- P in the above table means a twisted pair. 1P: +5V/0V twisted pair; 2P: DC +/- twisted pair, PS+/-Twisted pair; 3P: +5V/0V twisted pair, DC+/- twisted pair, PS+/- twisted pair.

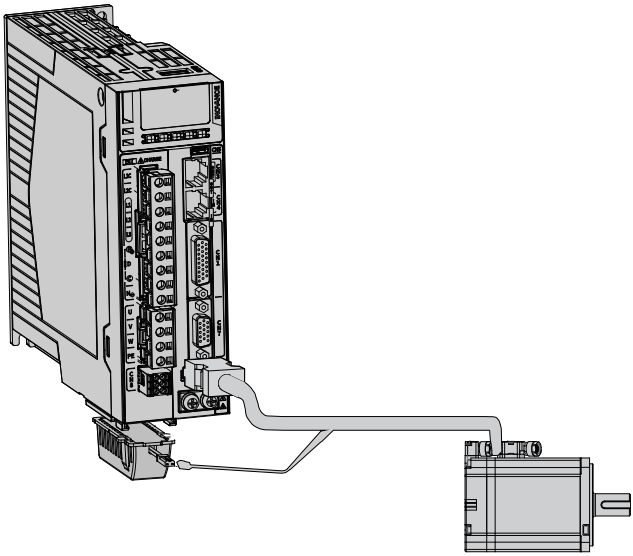
Suppose the current consumed by the motor encoder is higher than 200 mA,

you can select the cable based on the following formula.

$$L2=\frac{\triangle U_{max2}}{I_{Encoder}x2R_{Unit}}$$

△U is 0.5 V, $I_{encoder}$ represents the current consumed by the encoder (see the encoder user guide for details), and R_{unit} represents the unit resistance (Ω/km) of the cable. L2 is the allowable cable length (in m).

Wiring of Inovance rotary motor



6.3.3.2 Communication with the Second Encoder

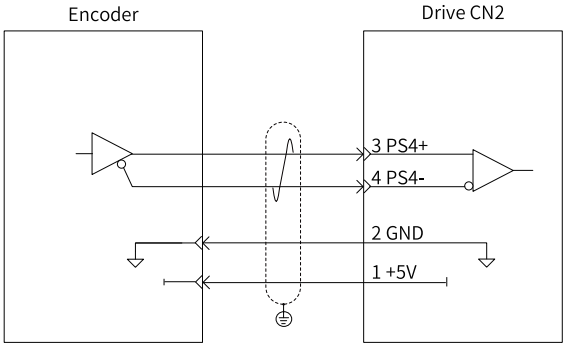
Set H0F.06 = 0, and change the port for the second encoder to CN2. It is connected to CN7 by default (H0F.06 = 1).

Wiring of Endat2.2/SSI/BISS-C second encoder

The drive communicates with the first encoder normally, that is, the first encoder exists all the time. In the case of the Endat2.2/SSI/BISS-C second encoder, the drive sends clock signals to the encoder and the encoder exchanges data with the drive through DATA signals.

Wiring of Inovance/TAMAGAWA/Nikon second encoder

The drive communicates with the first encoder normally, that is, the first encoder exists all the time. In the case of the Inovance/TAMAGAWA/Nikon second encoder, the encoder exchanges data with the drive through PS4+ and PS4- signals.



Suppose the current consumed by the motor encoder is 200 mA, you can select the cable based on the following recommendations.

Table 6–23 Recommended cable between the servo drive and linear motor encoder

Cable Size	Line Resistance	Allowable Length
26AWG (0.13 mm^2)	143 Ω/km	8.0 m
25AWG (0.15 mm^2)	89.4 Ω/km	14.0 m
24AWG (0.21 mm^2)	79.6 Ω/km	15.0 m
23AWG (0.26 mm^2)	68.5 Ω/km	18.0 m
22AWG (0.32 mm^2)	54.3 Ω/km	23.0 m
21AWG (0.41 mm^2)	42.7 Ω/km	29.0 m

Suppose the current consumed by the motor encoder is higher than 200 mA,

You can calculate the allowable cable length L2 according to the following formula.

$$L2=\frac{\triangle U_{max2}}{I_{Encoder} x 2R_{Unit}}$$

△U is 0.5 V, $I_{encoder}$ represents the current consumed by the encoder (see the encoder user guide for details), and R_{unit} represents the unit resistance (Ω/km) of the cable. L2 is the allowable cable length (in m).

6.3.4 Cable Requirements

Note

It is recommended to use 22AWG to 26AWG cables for 10B, 20B, 40B, and 75B series motors. If a longer cable is required, increase the cable diameter properly. See the following table for details.

Table 6–24 Recommended cables

Cable Size (AWG)	Line Resistance (Ω/km)	Allowable Length (m)
3P x 26	143	0 to 10
1P×22+2P×26	54.3	10 to 26.4
1P×20+2P×24	33.9	26.4 to 42.2
1P×18+2P×22	21.4	42.2 to 66.8
1P×16+2P×18	13.5	66.8 to 105.0

Note

- The above length allows an increase of 2 to 3 meters.
- If you need cables above 16AWG, please consult Inovance sales staff.
- P in the above table means a twisted pair. 1P: +5V/0V twisted pair; 2P: DC +/- twisted pair, PS+/-Twisted pair; 3P: +5V/0V twisted pair, DC+/- twisted pair, PS+/- twisted pair.

6.3.5 Adapters of Power Cables and Encoder Cables

Recommended power cable connectors are Molex-39039062 and Molex-469990295. The recommended encoder cable is TE-1-172169-9. See the following figure.

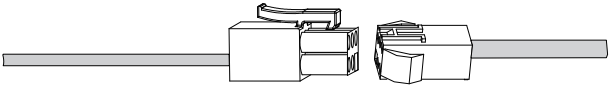


Figure 6-19 Power cable adapter

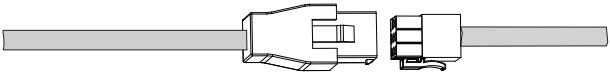


Figure 6-20 Encoder cable adapter

6.4 Communication Terminals CN3 and CN4 [P]

6.4.1 Terminal Arrangement

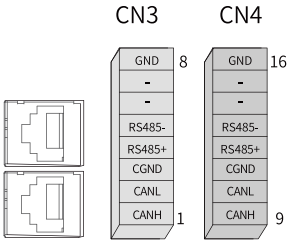


Figure 6-21 Communication Terminal pin layout of the servo drive

Table 6–25 Description of communication terminal pins

Pin No.	Description	Description
1 and 9	CANH	CAN communication port
2 and 10	CANL	
3 and 11	CGND	CAN communication GND
4 and 12	RS485+	Modbus communication interface
5 and 13	RS485-	
6 and 14	-	-
7 and 15	-	-
8 and 16	GND	Signal reference ground
Enclosure	PE	Shield

6.4.2 Wiring Precautions and Requirements

Rules

When using CAN communication, connect the CGND terminal of the host controller device to the CGND terminal of the servo driver, as shown in the following figure.

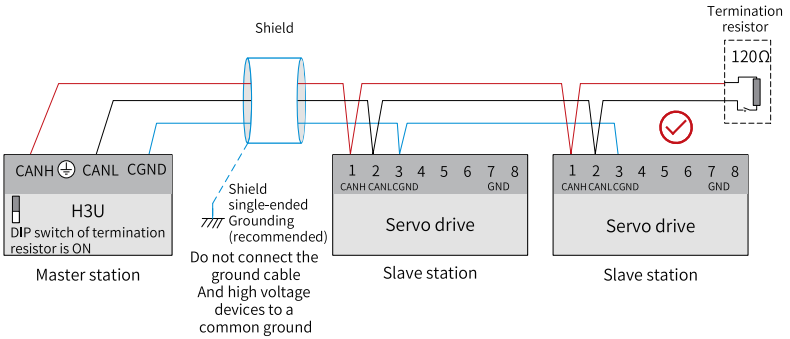


Figure 6-22 Correct CAN connection way

Caution

- The PLC carries built-in communication termination resistor and the corresponding DIP switch must be set to "ON".
- It is recommended to ground the shield at single end.
- Do not connect the CGND terminal of the host controller to the GND terminal of the servo drive. Otherwise, the servo drive may be damaged.

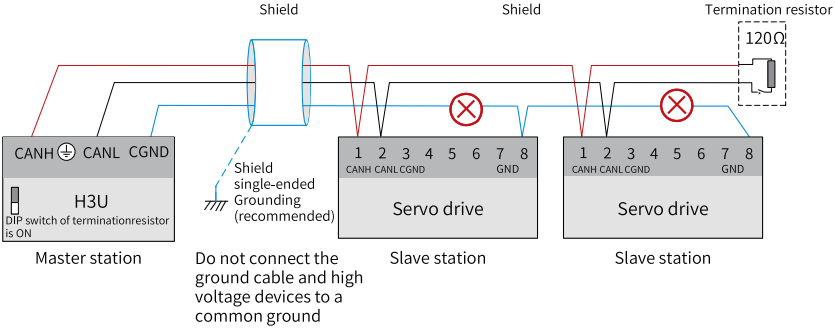


Figure 6-23 Incorrect CAN connection way

CAN communication bus and multi-node connection

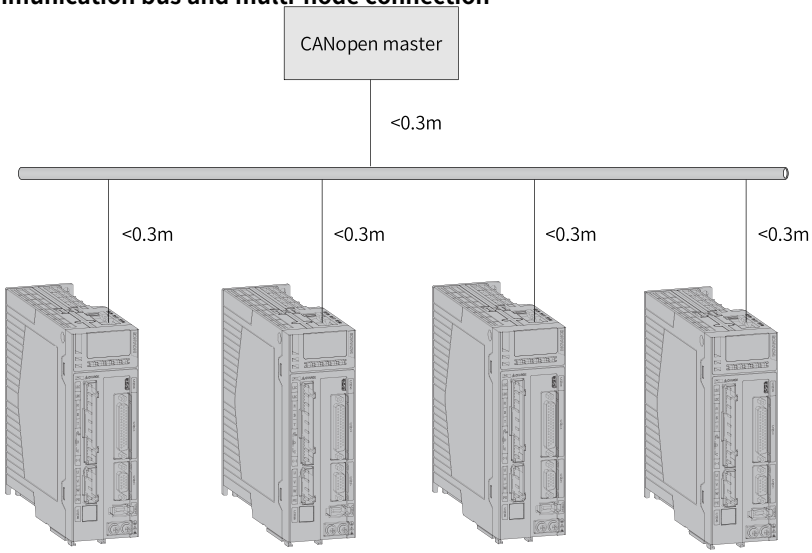


Figure 6-24 CAN communication network topology

Connect the CAN communication network in the bus topology, as shown in *"Figure 6-24 " on page 198* .

Connect each CAN transceiving device to the bus by using a branch cable shorter than 0.3 m. Otherwise, reflection may occur and cause communication problems.

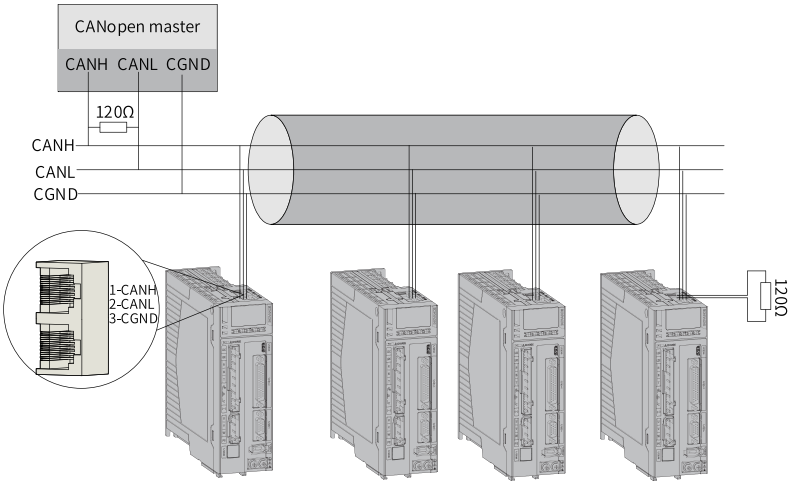


Figure 6-25 CANopen wiring diagram

It is recommended to use shielded twisted pairs. Connect two 120 Ω termination resistors at each end of the bus to prevent signal reflection. Typically, ground the shield in the single-point grounding mode. Using a multimeter to measure the resistance between CANH and CANL helps to confirm whether the junction resistance on the field is correct. The normal resistance value is about 60 Ω (with two resistors in parallel connection). Up to 64 devices can be connected.

When CAN devices communicate over a long distance, CGND of different CAN circuits must be mutually connected to ensure the reference potential of different communication devices is the same.

Recommended Connection Modes of Different Cables

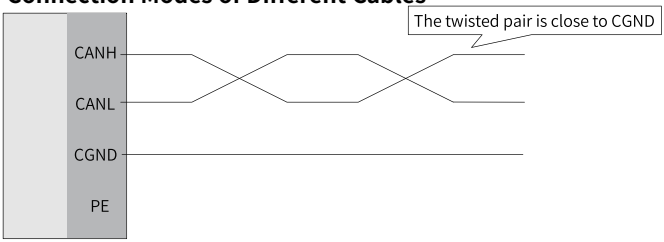


Figure 6-26 Recommended connection mode 1

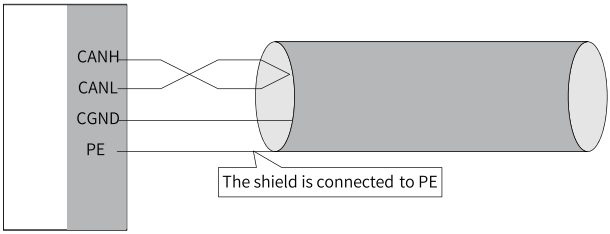


Figure 6-27 Recommended connection mode 2

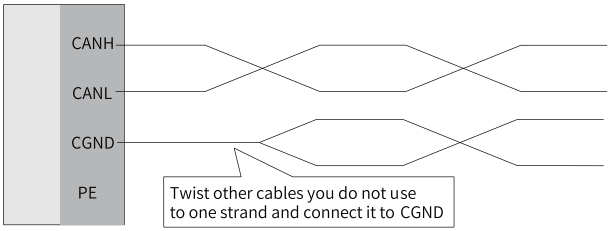


Figure 6-28 Recommended connection mode 3

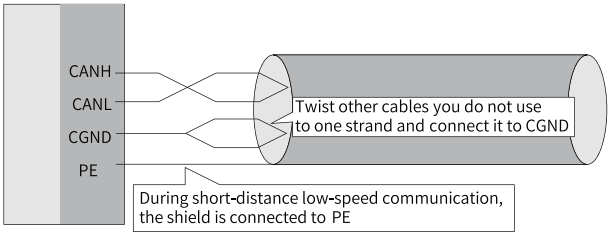


Figure 6-29 Recommended connection mode 4

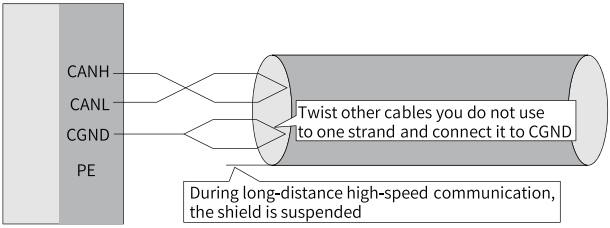


Figure 6-30 Recommended connection mode 5

Wiring for other devices without external CGND ports

- **The device is a non-isolated CAN device and shares the GND or COM port with other signals.**
  Connect the GND or COM port of the device with the CGND port of the drive, as shown in the following figure.

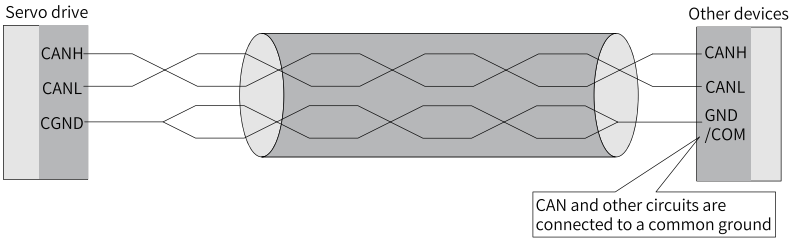


Figure 6-31 Connection mode for sharing the ground with other circuits

- **The CAN terminal of the device has no common ground with other ports.**
  Do not connect the CGND port to any cable. Use a cable of at least 12AWG to connect the PE of each device. Separate the cable from the CAN communication cable by a distance greater than 5 cm, as shown in the following figure.

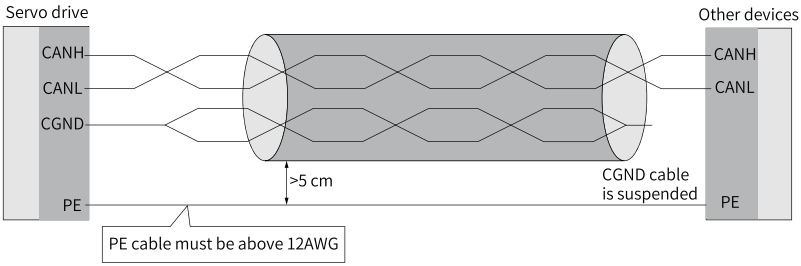


Figure 6-32 The CAN terminals of other devices have no external ground ports.

Recommended CAN communication cable layout

CAN communication is susceptible to interference. Route the CAN communication cables away from interference sources to prevent interference.

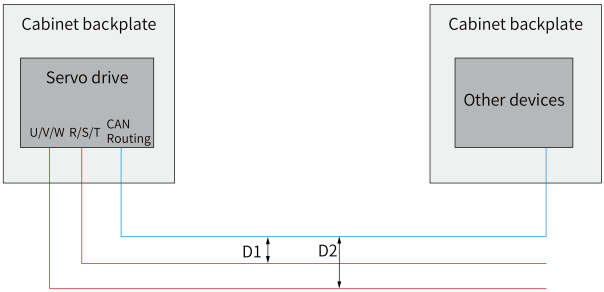


Figure 6-33 Recommended routing modes

Route the CAN cable and any interfering cable perpendicularly to each other. For parallel routing, keep a distance D1 greater than 20 cm between the CAN cable and an R/S/T cable, or keep a distance D2 greater than 50 cm between the CAN cable and a U/V/W cable. If interference cables are routed closely along the backplate of the cabinet, the distance between the CAN communication cable and the cabinet backplate must be longer than 1 cm.

The R/S/T power cable, U/V/W power cable, and CAN communication cables, after passing through the cabinet, are routed in three cable troughs respectively. The distance L3 among the cable troughs must be longer than 20 cm. The preceding principle also applies when interference cables and CAN communication cables are routed in the same cable trough.

6.4.3 Wiring Examples

6.4.3.1 CAN Communication Connection Example

CAN communication with PLC

The following figure shows the cable used for the communication between the servo drive and PLC in CAN communication networking.



Figure 6-34 Outline drawing of cable used for CAN communication between the servo drive and PLC

Use a three-conductor shielded cable to connect the CAN bus, with the three conductors connected to CANH, CANL, and CGND (CGND represents isolated RS485 circuit signal reference ground) respectively. Connect CANH and CANL with twisted pairs. Connect CGND to the CAN reference ground. Connect the shield to the device ground. Connect a 120Ω termination resistor on each end of the bus to prevent CAN signal reflection.

Table 6–26 Pin connection relation of the cable used for CAN communication between the servo drive and PLC

RJ45 on the Drive Side (A)			PLC Side (B)		
Communication Type	Pin No.	Description	Communication Type	Pin No.	Description
CAN	1	CANH	CAN	1	CANH
	2	CANL		2	CANL
	3	CGND		3	CGND
-	Shell	PE (shield layer)	-	Shell	PE (shield layer)

CAN communication connection for multi-CAN applications

The following figure shows the cable used for parallel connection of multiple servo drives during CAN communication.

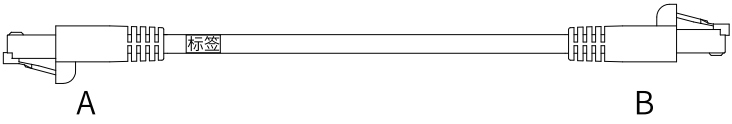


Figure 6-35 Outline drawing of multi-drive communication cable

Table 6–27 Pin connection relation of multi-drive communication cable (pins in CAN group used only)

RJ45 on the Drive Side (A)			RJ45 on Servo Drive Side (Side B)		
Communication Type	Pin No.	Description	Communication Type	Pin No.	Description
CAN	1	CANH	CAN	1	CANH
	2	CANL		2	CANL
	3	CGND		3	CGND
-	Shell	PE (shield layer)	-	Shell	PE (shield layer)

Use the daisy chain mode for CAN bus, as shown in the following figure.

- Shielded twisted pair cables are recommended for connecting the CAN bus. Twisted pairs are recommended for connecting CANH and CANL.
- Connect a 120Ω termination resistor on each end of the bus to prevent signal reflection.
- Connect the reference grounds of CAN signals of all the nodes together.
- Up to 127 nodes can be connected.

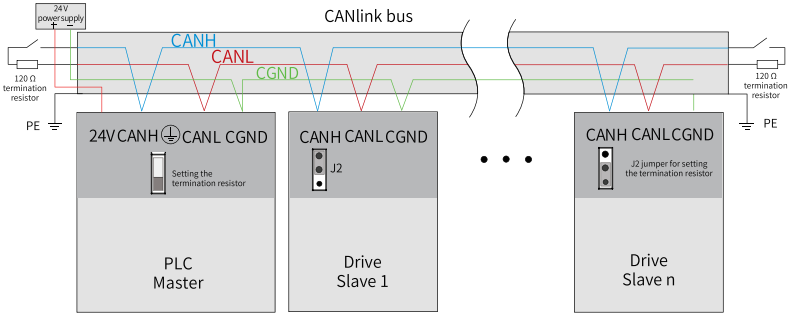


Figure 6-36 CAN bus topology

Caution

Do not connect the CGND terminal of the host controller to the GND terminal of the servo drive. Otherwise, the servo drive may be damaged.

6.4.3.2 RS485 Communication Connection Example

RS485 communication connection with PLC

The following figure shows the cable used for 485 communication between the servo drive and PLC.

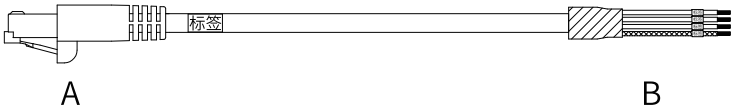


Figure 6-37 Outline drawing of cable used for CAN communication between the servo drive and PLC

Use a three-conductor shielded cable to connect the RS485 bus, with three conductors connected to 485+, 485-, and GND (GND represents non-isolated RS485 signal reference ground) respectively. Connect RS485+ and RS485- with two conductors twisted together and connect the remaining conductor to the RS485 reference ground (GND). Connect the shield to the device ground (PE). Connect a 120Ω termination resistor on each end of the bus to prevent RS485 signal reflection.

Table 6–28 Pin connection relation of the cable used for CAN communication between the servo drive and PLC

RJ45 on the Drive Side (A)			PLC Side (B)		
Communication Type	Pin No.	Description	Communication Type	Pin No.	Description
RS485	4	485+	RS485	4	485+
	5	485-		5	485-
	8	GND		8	GND
-	Shell	PE (shield layer)	-	Shell	PE (shield layer)

RS485 communication connection for multi-CAN applications

The following figure shows the cable used for parallel connection of multiple servo drives during RS485 communication.

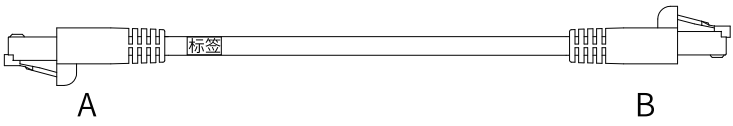


Figure 6-38 Outline drawing of multi-drive communication cable

Table 6–29 Pin connection relation of multi-drive communication cable (pins in RS485 group used only)

RJ45 on the Drive Side (A)			RJ45 on Servo Drive Side (Side B)		
Communication Type	Pin No.	Description	Communication Type	Pin No.	Description
RS485	4	485+	RS485	4	485+
	5	485-		5	485-
	8	GND		8	GND
-	Shell	PE (shield layer)	-	Shell	PE (shield layer)

In case of a large number of nodes, use the daisy chain mode for RS485 communication. Connect the reference grounds of RS485 signals of all the nodes (up to 128 nodes) together.

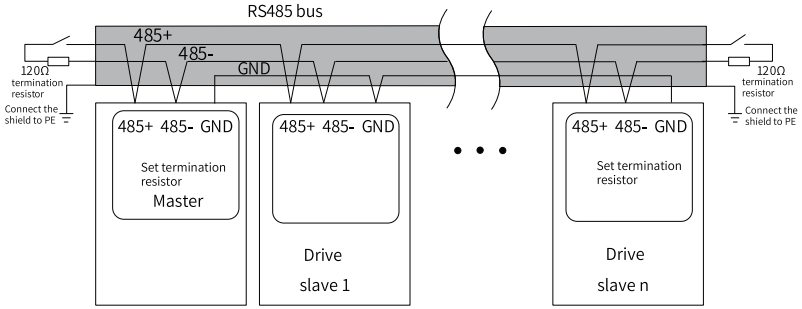


Figure 6-39 RS485 bus topology

Caution

Do not connect the GND terminal () of the host controller to the CGND terminal of the servo drive. Failure to comply will damage the device.

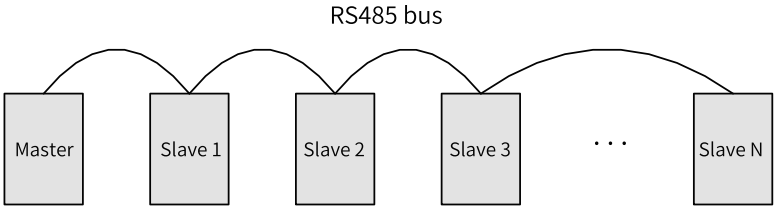


Figure 6-40 Daisy chain mode

The maximum number of nodes and transmission distance of standard RS485 circuit vary with the baud rate, as listed in the following figure:

Table 6–30 Transmission distance and number of nodes

No.	Transmission Rate (kbps)	Transmission Distance (m)	Number of Nodes	Cable Size (AWG)
1	115.2	100	128	26
2	19.2	1000	128	26

6.5 Communication Terminals CN3 and CN4 [N]

6.5.1 Terminal Arrangement

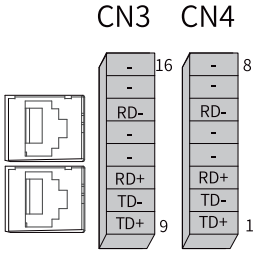


Figure 6-41 Communication Terminal pin layout of the servo drive

Table 6–31 EtherCAT communication terminal pins

Pin No.	Name	Description
1	TD+	Data transmit positive
2	TD-	Data transmit negative
3	RD+	Data reception+
4 and 5	-	-
6	RD-	Data reception–
7 and 8	-	-

Pin No.	Name	Description
9	TD+	Data transmit positive
10	TD-	Data transmit negative
11	RD+	Data reception+
12 and 13	-	-
14	RD-	Data reception–
15 and 16	-	-

6.5.2 EtherCAT Communication Connection Example

CN3 and CN4 are EtherCAT connectors. Connect CN4 (IN) to the communication port of the master and CN3 (OUT) to the next slave. For assignment of CN3/CN4 terminal pins, see the related section.

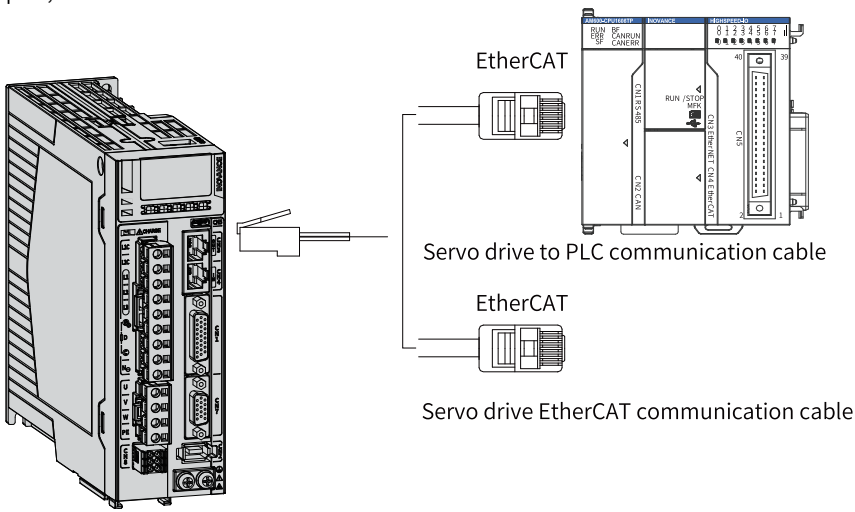


Figure 6-42 Wiring of communication cables

Topology

The communication topology of EtherCAT is flexible without any limit, as shown in *"Figure 6–43 Communication network topology" on page 208*. The drive carries IN and OUT ports.

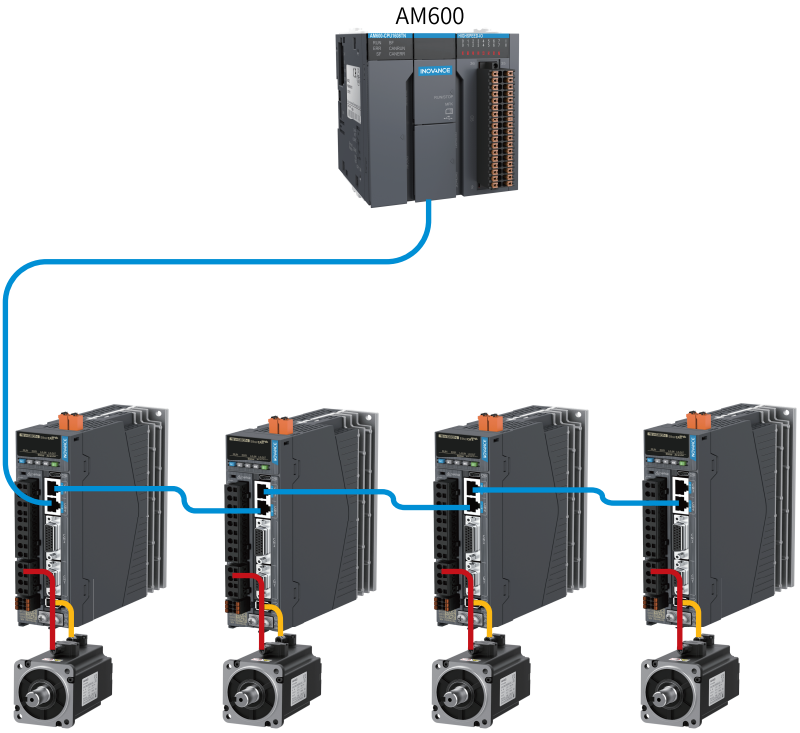
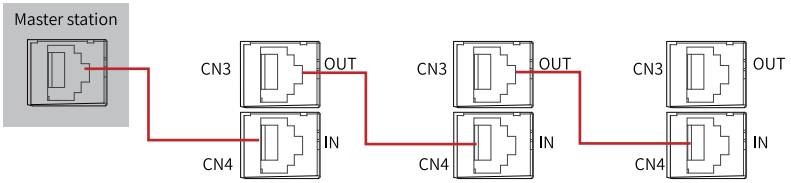
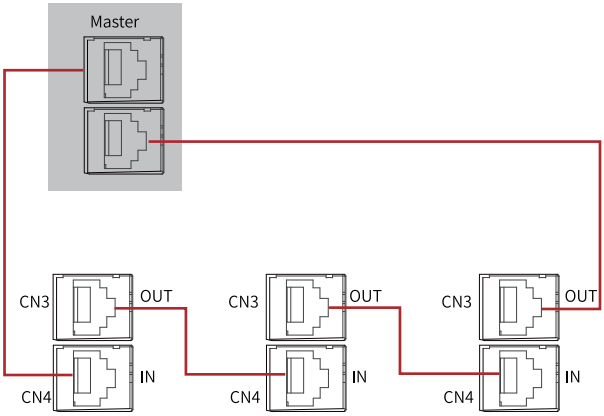


Figure 6-43 Communication network topology

Linear



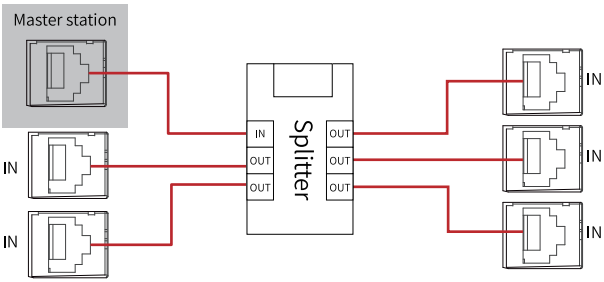
Ring



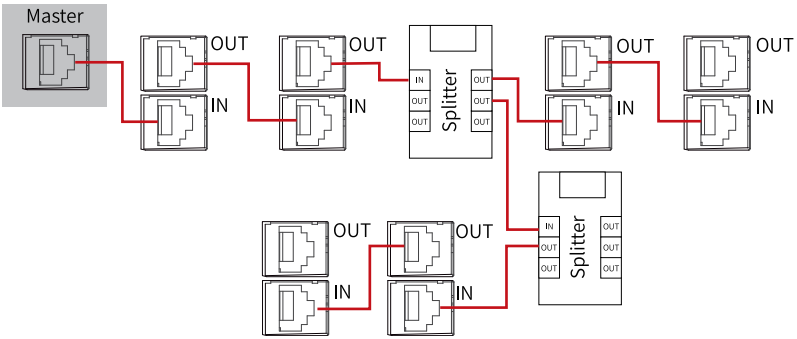
Note

When using the redundant ring, set H0E.36 (EtherCAT AL enhanced link) to 1 (Enable). Power on the drive so that the setting become effective.

Star



Tree



6.5.3 FSoE Connection and Enabling [Functional Safety P]

6.5.3.1 FSoE Connection and Setting

The hardware connection with Beckhoff safety master station is shown in *"Figure 6–44 " on page 210* . Various topologies such as ring and linear topologies can be achieved.

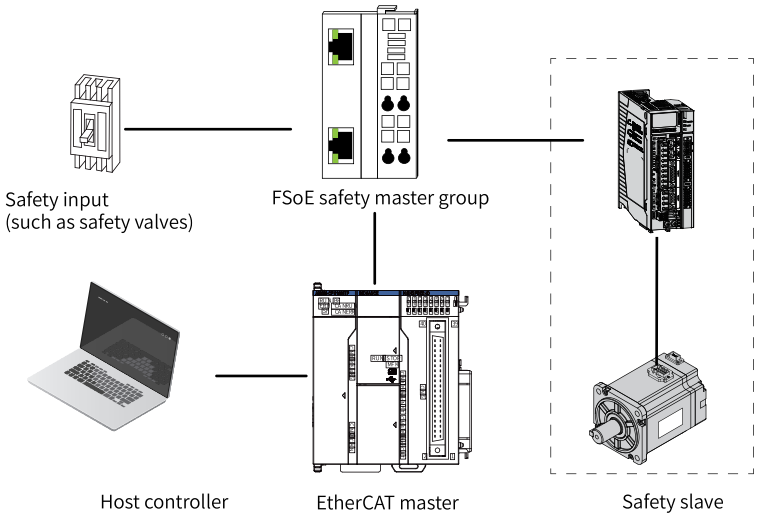


Figure 6-44 System network diagram

Note

Recommended master model: The safety drives can be used together with masters that support EL6900/EL6910. All Beckhoff PLCs support the safety drives.

6.5.3.2 Knob Operating Method

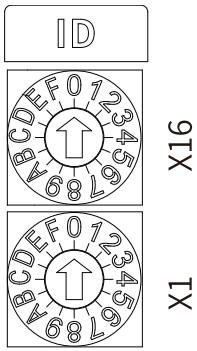


Figure 6-45 Detail view of the knob

Effective mode: Take effect upon next power-on.

Address setting method: The number of the upper knob*16 + the number of the lower knob.

6.5.4 Cable Requirements

Rules

EtherCAT cables are connected to the network ports (IN and OUT) equipped with the metal shield. The electric characters are compliant with IEEE 802.3 and ISO 8877 standards.

Communication cable types

Table 6–32 Cable data

Material Code	Cable Model	Cable Length (m)	Cable Length
15040261	S6-L-T04-0.3	0.3	CAT.5E 4-core cable
15040262	S6-L-T04-3.0	3.0	
15041960	S6-L-T04-0.2	0.2	
15041961	S6-L-T04-0.5	0.5	
15041962	S6-L-T04-1.0	1.0	
15041963	S6-L-T04-2.0	2.0	

Material Code	Cable Model	Cable Length (m)	Cable Length
15041964	S6-L-T04-5.0	5.0	
15041965	S6-L-T04-10.0	10.0	
1504QV45	S6-L-T07-0.3	0.3	CAT6A 8-core cable
1504QV46	S6-L-T07-1.0	1.0	
1504QV47	S6-L-T07-3.0	3.0	
1504QV49	S6-L-T08-0.3	0.3	CAT7 8-core cable
1504QV50	S6-L-T08-1.0	1.0	
1504QV51	S6-L-T08-3.0	3.0	

Communication cable specifications

Table 6–33 Specifications

Item	Description
UL	Compliant with UL certification
CAT.5E cable	CAT.5E 4-core cable
CAT6A cable	CAT6A 8-core cable
CAT7 cable	CAT7 8-core cable
Double shield	Braided shield (coverage: 85%), aluminum foil shield (coverage: 100%)
Ambient temperature	-40°C to +60°C.

Communication cable selection

The EtherCAT communication cable must be EtherNet Category 5 (100Base) network cable or high-strength shielded network cable. The cable for the servo drive must be the shielded network cable with the length no longer than 100 m. The shielded network cable enhances the anti-interference capacity of the system.

If you want to choose the EtherCAT communication cable yourself, you can refer to the related specifications provided by Beckhoff.

In the planning stage, always refer to the measurement data provided by the cable manufacturer. If the connection between the devices is moving, use flexible cables to avoid damage. If connectors are installed in a chemically corrosive environment, use cables with special coatings to avoid damage. If other environmental restrictions exist in the application, customized cables must be used according to the specific information provided by the cable manufacturer.

Selection of link cables (recommended by Beckhoff):

For permanent links, the cables must meet the angle value described in *"Table 6–34 References for fixed cables of a permanent link" on page 213* and *"Table 6–35 References for flexible cables of a permanent link" on page 213*.

Table 6–34 References for fixed cables of a permanent link

Characteristics	Type **A** cable (fixed)
Cable nominal impedance (tolerance)	100 Ω ± 15 Ω (IEC 61156-5)
Non-balanced or balanced	Balanced
DC round-trip resistance a	⩽ 115 Ω/km
Number of lead wires	4 (2 pairs)
Shield	S/FTQ
Transmission impedance	< 50 mΩ/m at 10 MHz
Installation type	Stationary, no movement after installation
Delay deviation	⩽ 20 ns/100 m
The DC round-trip resistance a (also called DC circuit resistance) is calculated by measuring the DC resistance of the two-way cable. That is, you connect two pairs of wires at one side of the cable and measure the resistance between the same wires at the other side. If the measured resistance between two ends of a single cable is about half of the value of the round-trip resistance, the corresponding reference value should also be ⩽ 57.5 Ω/km.	

Table 6–35 References for flexible cables of a permanent link

Characteristics	Type **B** cable (flexible)
Cable nominal impedance (tolerance)	100 Ω ± 15 Ω (IEC 61156-5)
Non-balanced or balanced	Balanced
DC round-trip resistance a	⩽ 115 Ω/km
Number of lead wires	4 (2 pairs)
Shield	S/FTQ
Transmission impedance	< 50 mΩ/m at 10 MHz
Installation type	Flexible, occasional movement or vibration
Delay deviation	⩽ 20 ns/100 m
The DC round-trip resistance a (also called DC circuit resistance) is calculated by measuring the DC resistance of the two-way cable. That is, you connect two pairs of wires at one side of the cable and measure the resistance between the same wires at the other side. If the measured resistance between two ends of a single cable is about half of the value of the round-trip resistance, the corresponding reference value should also be ⩽ 57.5 Ω/km.	

Table 6–36 Cable example for a permanent link

	Fixed	Flexible
Shield	S/FTQ	S/FTQ
Round-trip resistance	⩽ 115 Ω/km	⩽ 115 Ω/km

	Fixed	Flexible
Insertion loss (@100 MHz)	19.5 dB/100 m	21.3 dB/100 m
Near-end crosstalk (@100 MHz)	50 dB/100 m	50 dB/100 m

Only four cables are used for EtherCAT communication. Therefore, it is recommended to use four-conductor (two pairs) balanced Ethernet cables. You can also use four pairs of cables, provided that their performance in IL and NEXT is consistent with that of the four-conductor cables and does not exceed the angle value of the worst case reported in *"Table 6–34 References for fixed cables of a permanent link" on page 213* and *"Table 6–35 References for flexible cables of a permanent link" on page 213*. The unused cable pairs (especially if these cable pairs are not connected correctly to devices) will actually increase the signal crosstalk between adjacent cable pairs and reduce the cable performance.

6.6 Description of Communication Terminal (CN5)

Terminal Arrangement

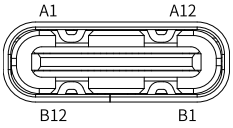


Table 6–37 Pin assignment of communication terminal (CN5)

Pin No.	Description	Description
A1 B1	GND	Signal reference ground
A4 B4	VBUS	USB power supply
A5 B5	-	-
A6 B6	DP	Differential data transmission
A7 B7	DN	Differential data transmission
A8 B8	-	-
A9 B9	VBUS	USB power supply
A12 B12	GND	Signal reference ground

Description

This terminal is a commissioning port connected with the PC. The communication cable must be of fast-charging Type-C with a magnetic ring. It must be equipped with a grounding wire, aluminum foil and metal shielding layer. Its length can be up to 3 m.

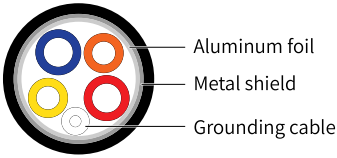


Figure 6-46 Recommended cables

Note

- Supports online upgrade and background commissioning when the drive is powered on.
- In USB mode, the terminal only supports download and upload of parameters, and driver firmware update.
- The terminal uses USB power supply. If there is a fault that cannot be completely reset, disconnect the USB power supply and drive control power, and then power on again.
- If you need more USB ports on the computer, use a properly-branded USB expansion module. In USB mode, to prevent power failure, it is recommended to use a USB expansion module with independent power supply.

6.7 CN6 STO Safety Terminal

6.7.1 CN6 STO Safety Terminal

Terminal Arrangement

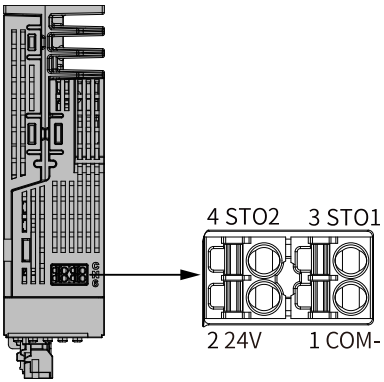


Table 6–38 Pin assignment

Pin No.	Description	Description
1	COM–	STO reference ground
2	24 V	Internal 24V power supply
3	STO1	Control input for STO1
4	STO2	Control input for STO2

Two isolated inputs are configured to dual-channel inputs of the STO function: STO1/ STO2.

To facilitate commissioning, additional pin with supply voltage (+24V) is integrated. The bridging of the 24 V terminal to STO1/STO2 is needed in case the safety circuit is installed but no STO function is needed.

Description

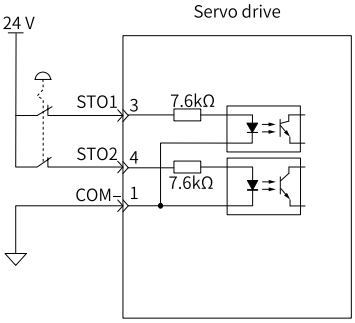
- **Electrical specifications and connection of the input circuit**
  This section describes the characteristics of the input signals assigned to the CN6 connectors.
  - Specifications
    The servo drive operates normally only when the input states of STO1 and STO2 are both "High" ("1" or "H").

    The servo drive does not operate when the input states of STO1 or STO2 are different or are both "Low" ("0" or "L").

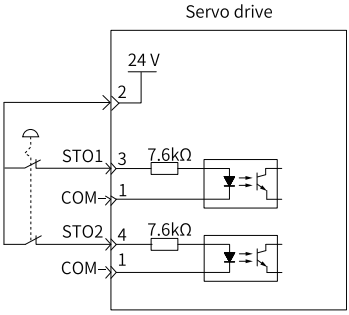
- Electrical characteristics of Safety Request Input Signal are as follows:

Item	Characteristics	Description
Voltage range	24 VDC (±15%)	-
Input current	3.6 mA (Typ.)	The input current of STO1 and STO2.
Standards of logic levels	“0” < 5 V, “1” > 15 V	-
Digital input impedance	6.6 kΩ	-

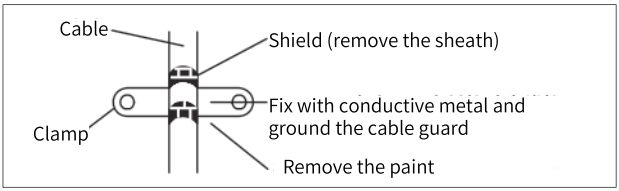
- Connection example of external 24 V



- Connection example of internal 24 V



- **EMC requirements**
  - To avoid short circuit between two adjacent conductors, either use cable with shield connected to the protective bonding circuit on each separate conductor, or use flat cables with one earthed conductor between each signal conductor.
  - Double-shielded or single-shielded twisted multi-pair cable is strongly recommended.
  - Fix and ground the cable shield using a piece of conductive metal.
    Example of cable clamp:



- The maximum allowable cable length between the drive and the activation switch is 30 m.

- **Other requirements**
  - All wiring must be well protected, routed and clamped where practicable.
  - It must be assured that there is no pulling or pinching on the cable when installing.
  - For cabling the DI inputs of the STO, to avoid common cause failure in the cables, the two channels must be routed through two well-apart routes, or the cable must be protected with double-shielded methods.

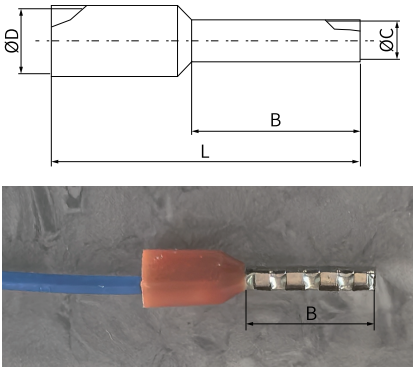
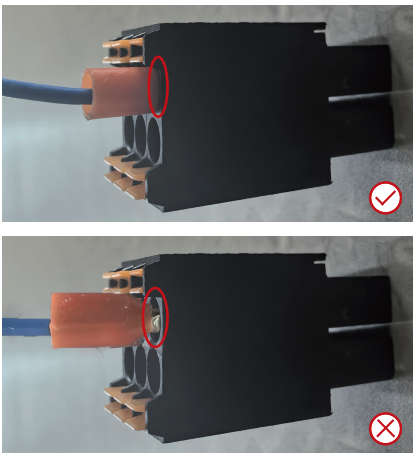
Cable	Description
Category	Low voltage, double-shielded or single-shielded twisted multi-pair cable
Maximum size	0.8 mm^2 (18AWG)
Minimum size	0.3 mm^2 (28AWG)
Maximum length	The max. distance between STO input and the operating contact is 30 m

Applicable servo drives

STO applies to the following servo drives:

Size	Power Range (kW)	Structure	W×H×D (mm^3)
A	0.2 to 0.4	Split-type structure	45.5 x 170 x 150
C	0.75 to 1.5	Split-type structure	55 x 170 x 173
D	1.5 to 3	Split-type structure	80 x 170 x 183
E	2 to 7.5	Split-type structure	90 x 250 x 230

6.7.2 Wiring Precautions and Requirements

Pre-Inspection	Installation
	
Tubular terminal contact area (B) ⩽ 8 mm	Connect the terminal in place so that the contact area is not exposed.

6.8 CN7 Encoder Terminal

6.8.1 Terminal Arrangement

Note

- First encoder: The master encoder.
- Second encoder: The slave encoder when the fully closed loop feature is used.

Terminal Arrangement



Pin No.	Terminal Definition	Description	Pin No.	Terminal Definition	Description
1	A+	Encoder pulse phase A±	9	GND	Power supply reference ground
2	A–		10	PS1-/DATA-	• PS- signal of the first encoder • DATA- signal of the communication encoder • Gantry synchronization signal
3	B+	Encoder pulse phase B±	11	HALL_U+	Hall signal U
4	B–		12	HALL_V+	Hall signal V
5	PS1+/DATA+	• PS+ signal of the first encoder • DATA+ signal of the communication encoder • Gantry synchronization signal	13	HALL_W+	Hall signal W
6	Z+	Encoder pulse phase Z±	14	PS2+/CLK+	• PS+/- signals of the second encoder • CLK+/- signals of the communication encoder
7	Z-		15	PS2-/CLK-	
8	+5 V	Encoder 5 V power supply (load current lower than 200 mA)	Enclosure	PE	Shield

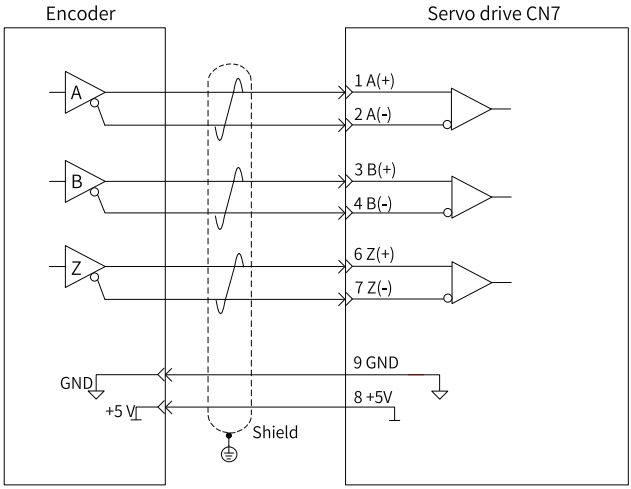
6.8.2 Wiring Examples

6.8.2.1 Communication with the First Encoder

Set H32.01 to 1 for an Inovance rotary motor, and 0 for a direct drive motor or third-party motor.

Wiring of a pulse encoder

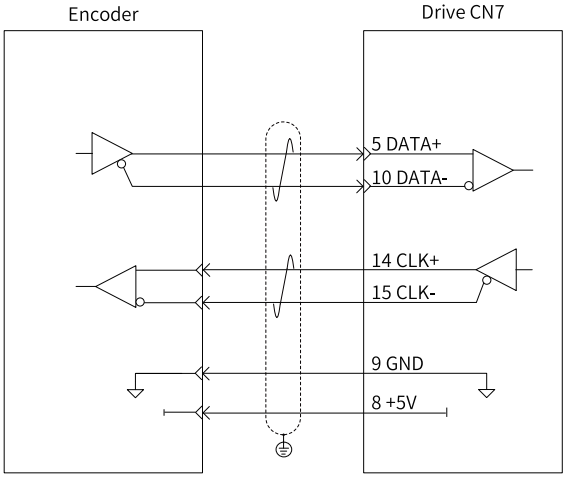
Use shielded twisted pairs to match the high input frequency.



- To reduce noise interference, connect the reference ground of the external encoder to the GND of the drive. Use shielded cables and connect the shield to the CN7 terminal enclosure.
- The input mode of the external encoder is differential input.
- The maximum pulse frequency supported by a phase A/B linear encoder is 4 Mpps.
- The pulse input terminal of a phase A/B encoder supports open circuit detection.

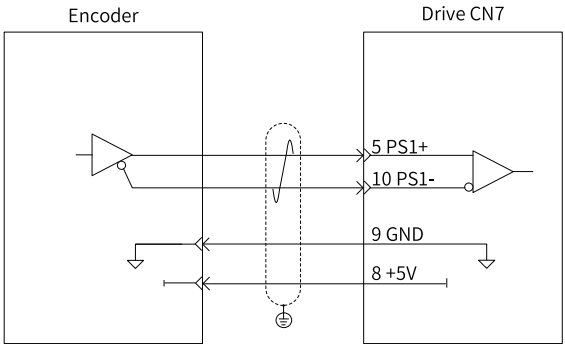
Wiring of Endat2.2/SSI/BiSS-C master encoder

The drive sends a clock signal to the master encoder, which exchanges data with the servo drive through a DATA signal.



Wiring of Inovance/TAMAGAWA/Nikon master encoder

The master encoder interacts with the servo drive through PS1+ and PS1-.



Suppose the current consumed by the motor encoder is 200 mA, you can select the cable based on the following recommendations.

Table 6–39 Recommended cable between the servo drive and linear motor encoder

Cable Size	Line Resistance	Allowable Length
26AWG (0.13 mm^2)	143 Ω/km	8.0 m
25AWG (0.15 mm^2)	89.4 Ω/km	14.0 m
24AWG (0.21 mm^2)	79.6 Ω/km	15.0 m
23AWG (0.26 mm^2)	68.5 Ω/km	18.0 m
22AWG (0.32 mm^2)	54.3 Ω/km	23.0 m
21AWG (0.41 mm^2)	42.7 Ω/km	29.0 m

If the consumption current of the motor encoder is higher than 200 mA, you can calculate the allowable cable length according to the following formula.

$$L2=\frac{\triangle U_{max2}}{I_{Encoder} x 2R_{Unit}}$$

△U is 0.5 V, $I_{encoder}$ represents the current consumed by the encoder (see the encoder user guide for details), and R_{unit} represents the unit resistance (Ω/km) of the cable. L2 is the allowable cable length (in m).

6.8.2.2 Communication with the Second Encoder

The second encoder is connected to the CN7 port (H0F.06 = 1) by default.

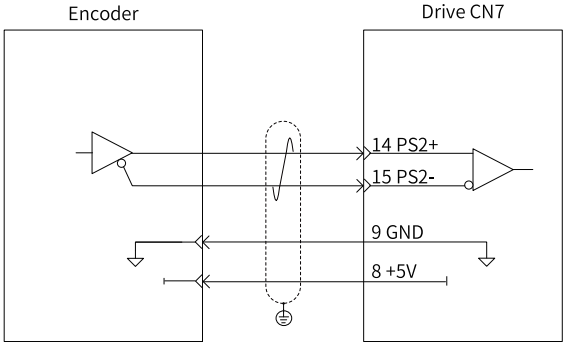
Wiring of ABZ incremental encoder (TTL signal)

Wiring of Endat2.2/SSI/BiSS-C second encoder

The drive communicates with the first encoder normally, that is, the first encoder exists all the time. In the case of the Endat2.2/SSI/BiSS-C second encoder, the drive sends clock signals to the encoder and the encoder exchanges data with the drive through DATA signals.

Wiring of Inovance/TAMAGAWA/Nikon second encoder

The drive communicates with the first encoder normally, that is, the first encoder exists all the time. In the case of the Inovance/TAMAGAWA/Nikon second encoder, the encoder exchanges data with the drive through PS2+ and PS2- signals.



Suppose the current consumed by the motor encoder is 200 mA, you can select the cable based on the following recommendations.

Table 6–40 Recommended cable between the servo drive and linear motor encoder

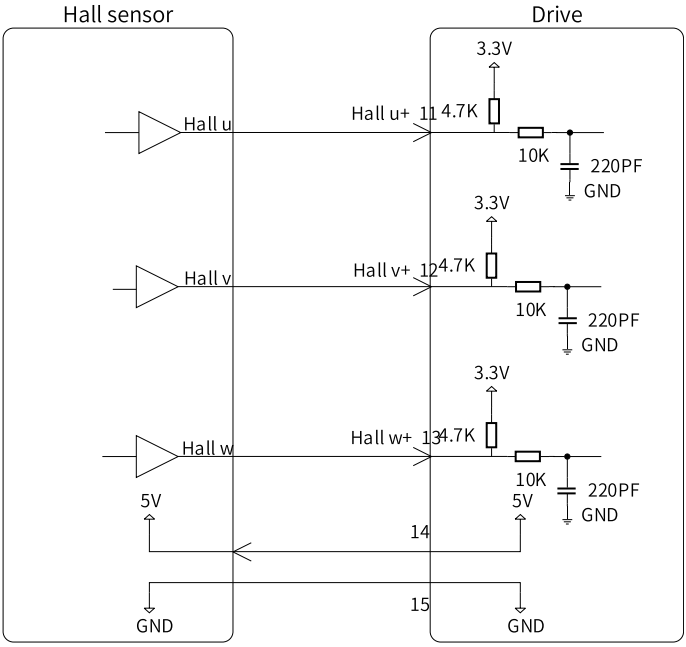
Cable Size	Line Resistance	Allowable Length
26AWG (0.13 mm^2)	143 Ω/km	8.0 m
25AWG (0.15 mm^2)	89.4 Ω/km	14.0 m
24AWG (0.21 mm^2)	79.6 Ω/km	15.0 m
23AWG (0.26 mm^2)	68.5 Ω/km	18.0 m
22AWG (0.32 mm^2)	54.3 Ω/km	23.0 m
21AWG (0.41 mm^2)	42.7 Ω/km	29.0 m

If the consumption current of the motor encoder is higher than 200 mA, you can calculate the allowable cable length according to the following formula.

$$L2=\frac{\triangle U_{max2}}{I_{Encoder} \times 2R_{LINE}}$$

△U is 0.5 V, $I_{encoder}$ represents the current consumed by the encoder (see the encoder user guide for details), and R_{unit} represents the unit resistance (Ω/km) of the cable. L2 is the allowable cable length (in m).

6.8.2.3 Connection with the Hall Sensor

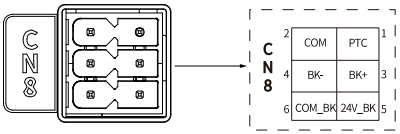


Note

1. To reduce noise interference, connect the reference ground of the sensor to the GND of the drive. Use shielded cables and connect the shield to the CN7 terminal enclosure.
2. The input mode of the Hall sensor is single ended input.
3. The total load current cannot exceed 200 mA when No. 8 and No. 14 pins are used together.
4. When the input mode of the external Hall sensor is differential input, see the instructions of the encoder signal adapter box.

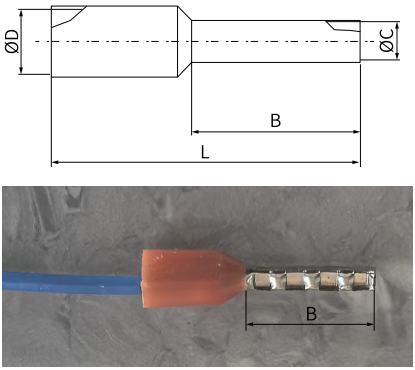
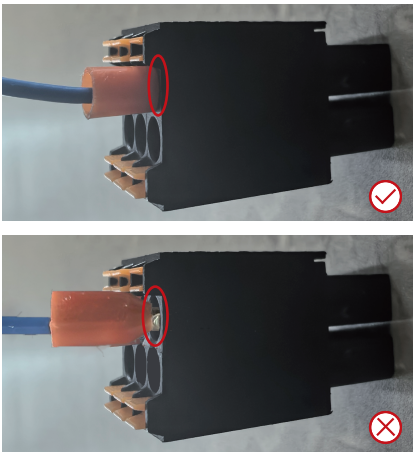
6.9 Description of Brake and PTC Input Terminal (CN8)

6.9.1 Terminal Arrangement



Pin No.	Description	Description	Pin No.	Description	Description
1	PTC	Motor temperature feedback input	2	COM–	Onboard 24V, COM
3	BK+	Brake+	4	BK-	Brake–
5	24V_BK	External power supply for the brake	6	COM_BK	Brake 24V, COM

6.9.2 Wiring Precautions and Requirements

Pre-Inspection	Installation
	
Tubular terminal contact area (B) ⩽ 8 mm	Connect the terminal in place so that the contact area is not exposed.

6.9.3 Wiring Examples

6.9.3.1 PTC Wiring Example

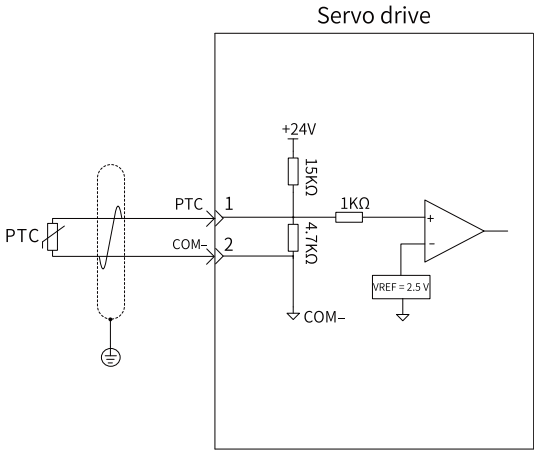


Figure 6-47 PTC wiring diagram

Note

- The resistance range triggering PTC circuit overtemperature operation is 1.8 kΩ to 3.85 kΩ. When selecting PTC, note that the PTC resistance value must be less than 1.8 kΩ when the PTC does not operate, and larger than 3.85 kΩ when the PTC operates for overtemperature.
- Only switching thermistors are supported. Connect the shielded cable between the servo drive and the motor properly during wiring.

6.9.3.2 Brake Wiring Examples

The brake is used to prevent the motor shaft from moving and lock the position of the motor and the motion part when the drive is in the non-operational status.

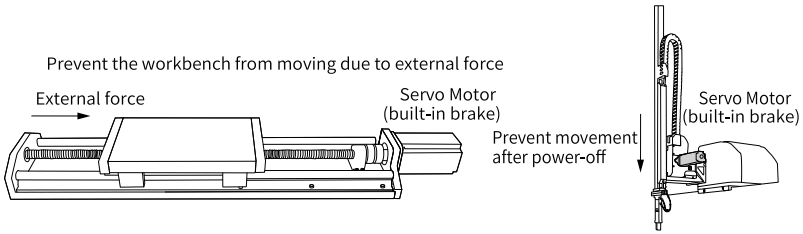
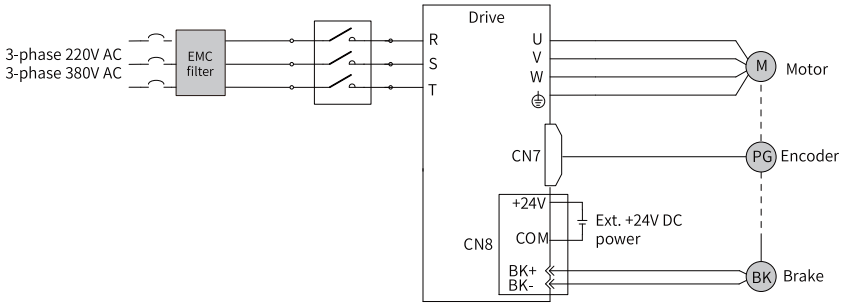


Figure 6-48 Application of the brake

Caution

- Use the built-in brake for position-lock purpose only. Do not use this brake for any other purposes (such as braking) other than position-lock in the stop state.
- The brake coil has no polarity.
- Switch off the S-ON signal after the motor stops.
- When the motor with brake runs, the brake may generate a click sound, which does not affect its function.
- When brake coils are energized (the brake is released), flux leakage may occur on the shaft end.
- Keep away from the area around the motor when using a magnetic sensor.

The connection of the motor brake input signal has no polarity. You need to prepare a separate 24 V power supply to ensure that the control power supply is separate from the brake power supply. The following figure shows the standard wiring of the brake signals (BK) and the brake power supply.



Pay attention to the following precautions during wiring:

When determining the length of the motor brake cable, take full account the voltage drop caused by cable resistance. The input voltage must be 24 V±10% to enable the brake to work properly.

Note

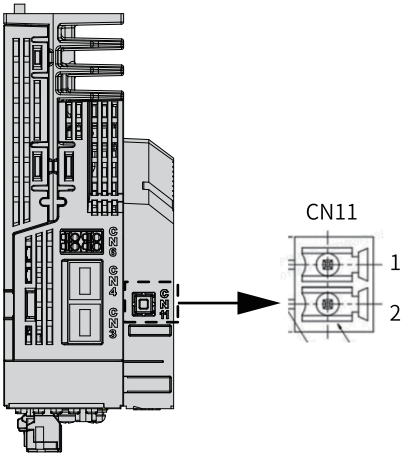
- In the standard environment, the number of brake outputs at the drive side can reach at least 5 million.
- The brake must not share the power supply with other electrical devices. This is to revent a malfunction of the brake due to a drop in the voltage or current when other electrical devices work in tandem.
- Use cables with a cross-sectional area above 0.5 mm^2.

6.10 CN11 24V Terminal

Note

The CN11 24 V standby power input terminal is only available in functional safety and standby power-enabled products.

Terminal Arrangement



Pin No.	Description	Description	Pin No.	Description	Description
1	GND_BP	0 V input of the backup power supply	2	24V_BP	24 V input of the backup power supply

Description

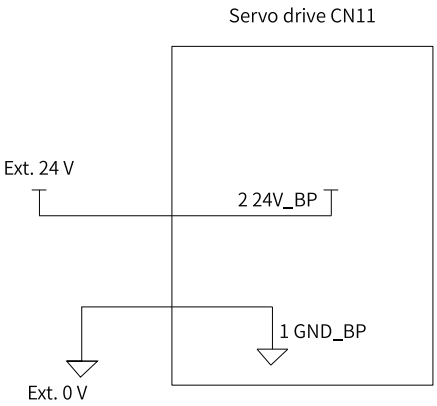
Models with backup power can have separate power supply to the control circuit. When the main circuit is not energized, 24V BP supplies power to the control circuit to maintain functions like programming, parameter configuration in the software tool, and communication. The operating panel of the drive shows "nrd.1" under this circumstance.

Table 6–41 Power input specifications

Item	Specification
Power input range	Voltage: 24 V DC±15% (must be SELV/PELV power supply)
Power of the external power supply	⩾ 50 W

Wiring

As shown in the following figure.



6.11 Wiring and Setting of the Braking Resistor

When the capacitance of the bus is insufficient, the extra energy can be consumed by connecting an external braking resistor to the P ⊕ -C terminal.

When the motor torque direction is opposite to the direction of rotation, the energy is fed back to the servo drive from the motor side, leading to bus voltage rise. Once the bus voltage rises to the braking threshold, the excessive energy must be consumed by a braking resistor. Otherwise, the servo drive will be damaged. The braking resistor can be a built-in or an external one. The internal and built-in braking resistors must not be used together.

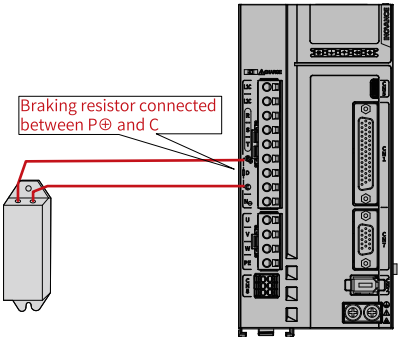


Figure 6-49 Wiring of external braking resistor

Recommended cables for terminals P ⊕ and C: For CE, see the related section.

For UL, see the related section.



Observe the following precautions when connecting the external braking resistor:

- The built-in braking resistor or jumper bar is not available in models S1R6 and S2R8. If an external braking resistor is needed for these models, connect it between terminals P ⊕ and C.
- Remove the jumper between terminals P ⊕ and D when you use the external braking resistor. Failure to comply will result in overcurrent and damage the braking transistor. After you stop using the external braking resistor, remember to jump the two terminals again.
- Do not connect the external braking resistor to the positive or negative pole of the bus directly. Failure to comply will damage the servo drive and result in a fire.
- Select a resistor with resistance higher than or equal to the minimum permissible value. Failure to comply will result in Er.201 (Overcurrent) or damage the servo drive.
- Make sure parameters H02.25 (Braking resistor setting), H02.26 (Power of external braking resistor) and H02.27 (Resistance of external braking resistor) are set properly before operating the servo drive.
- Install the external braking resistor on incombustible matters (such as metal).

7 Terminals [functional safety]

7.1 Expansion Safety Function Terminals CN9&CN10

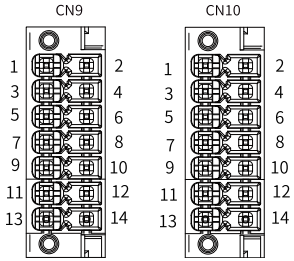


Figure 7-1 Description of pins of CN90 and CN10

Table 7–1 Description of CN9 pins

No.	Description	Function	No.	Description	Function
1	DO3-	Common DO3 output (-)	2	DO3+	Common DO3 output (+)
3	DO2	Safety DO2 output	4	DO1	Safety DO1 output
5	DO24VA	24 V power supply of DO1 and DO2	6	DO0VA	Output reference ground of DO1 and DO2
7	COM	DIA reference ground	8	DI5A_IN	Safety DI5A input
9	DI4A_IN	Safety DI4A input	10	DI3A_IN	Safety DI3A input
11	DI2A_IN	Safety DI2A input	12	DI1A_IN	Safety DI1A input
13	PE	Grounding	14	-	-

Table 7–2 Description of CN10 pins

No.	Description	Function	No.	Description	Function
1	DO6-	Common DO6 output (-)	2	DO6+	Common DO6 output (+)
3	DO5	Safety DO5 output	4	DO4	Safety DO4 output
5	DO24VB	24 V power supply of DO4 and DO5	6	DO0VB	Output reference ground of DO4 and DO5
7	COM	DIB reference ground	8	DI5B_IN	Safety DI5B input
9	DI4B_IN	Safety DI4B input	10	DI3B_IN	Safety DI3B input
11	DI2B_IN	Safety DI2B input	12	DI1B_IN	Safety DI1B input
13	PE	Grounding	14	-	-

Basic DI information

Item	Description
Five dual-channel digital inputs	Voltage: 24 V DC±15% (must be powered by SELV/PELV power supply)
Assignment of logic levels	low level: "0" < 3 V High level: "1" > 15 V
Switches contact	Only supports normally closed switch contact
Current consumption of single DI	10 mA max (dual channel)
Maximum allowable cable length between drive and safety switch	30 m

Basic DO information

Item	Description
Four single-channel digital outputs	Maximum output current: 50 mA per channel Voltage: 24 V DC±15% (must be powered by SELV/PELV power supply)
Two common DO outputs	Maximum output current: DC 50 mA Maximum allowable external voltage: DC 30 V
Safe state	OFF
DO open circuit/OFF	Maximum output voltage: 2.4 V
Maximum allowable cable length between drive and safety switch	30 m
The status of SSM can be indicated by predefined parameters using DO1, DO2, DO4, and DO5	

Note

Open/OFF means the DO is in open circuit state, and closed/ON means the DO can conduct output current.

Wiring Precautions

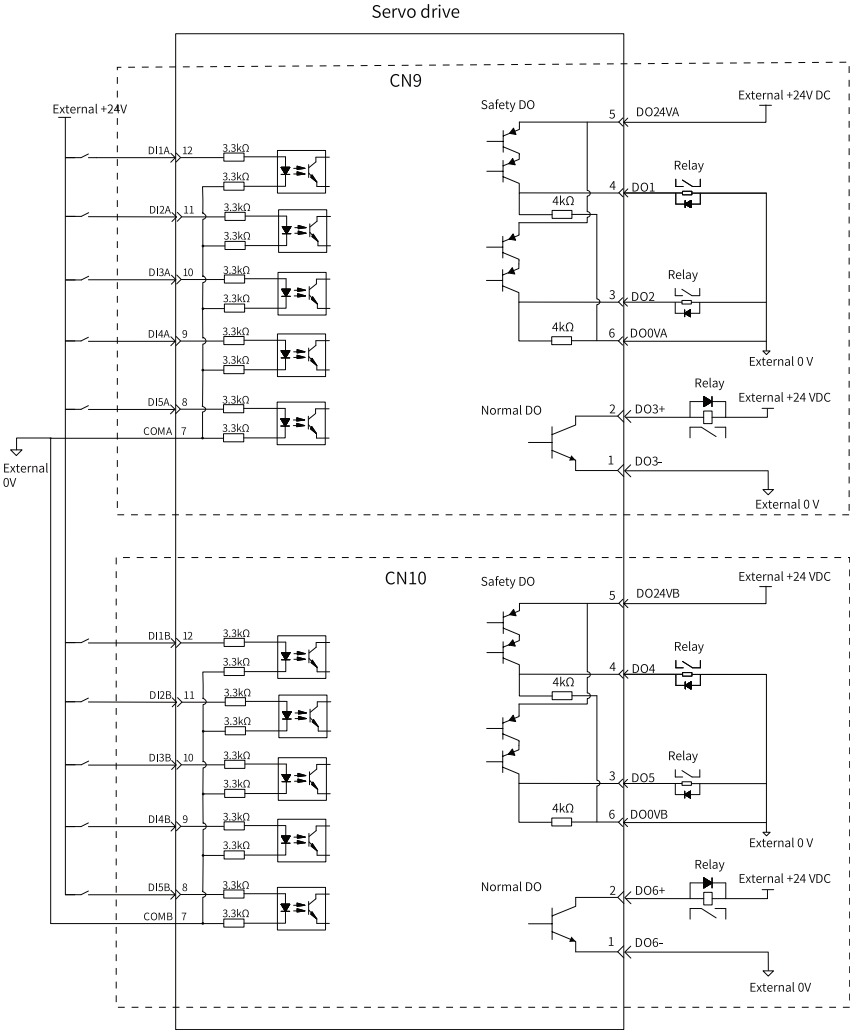
DI Wiring Requirements
Care must be taken in wiring to avoid introducing 24V and DI short circuit failures. The following recommended method or method with equivalent effect may be used. Do as follows: • Insert 0 V between 24 V and DI signal line using a flat cable. • Use shielded wires for 24 V and DI respectively, with the shield connected to PE.
Care must be taken in wiring to avoid introducing short circuit failure between the dual channels (DIxA and DIxB) of the same DI. The following recommended method or method with equivalent effect may be used. Do as follows: • Insert 0 V between DIxA and DIxB signal lines using a flat cable. • Use shielded wires for DIxA and DIxB respectively, with the shield connected to PE.
Care must be taken in wiring to avoid introducing short circuit failure between different DIs (DIx and DIy). The following recommended method or method with equivalent effect may be used. Do as follows: • Insert 0 V between 24 V and DI signal line using a flat cable. • Use shielded wires for DIx and DIy respectively, with the shield connected to PE.

DO Wiring Requirements
Care must be taken in wiring to avoid introducing 24V and DO short circuit failures. The following recommended method or method with equivalent effect may be used. Do as follows: • Insert 0 V between 24 V and DO signal line using a flat cable. • Use shielded wires for 24 V and DO respectively, with the shield connected to PE.
Care must be taken in wiring to avoid introducing short circuit failure between different DOs (DOx and DOy). The following recommended method or method with equivalent effect may be used. Do as follows: • Insert 0 V between DOx and DOy signal lines using a flat cable. • Use shielded wires for DOx and DOy respectively, with the shield connected to PE.

Note

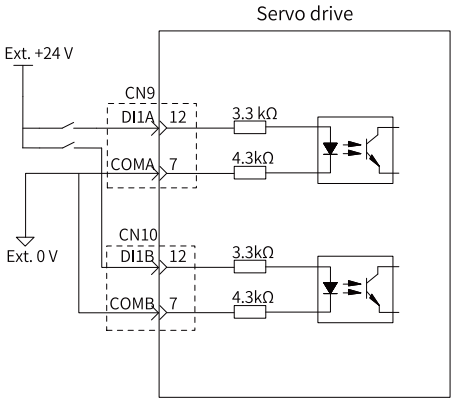
For detailed basic information about DI/DO, see *" Basic DI information" on page 232* and *" Basic DO information" on page 232*.

System wiring diagram of CN9 and CN10



Safety Digital Input

The circuits for DI1 to DI5 are the same. When DI1A and DI1B are connected at the same time, a safety DI is formed. The following description takes DI1 circuit as an example.

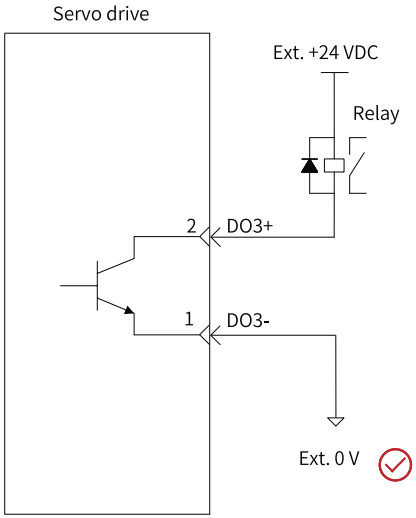


The safety DI is a source type input. Please make reasonable wiring according to the characteristics of the load circuit.

Common Digital Output

The circuits for DO3 and DO6 the same. The following description takes DO3 circuit as an example.

- **The host controller provides relay input.**
  - **Correct wiring:**

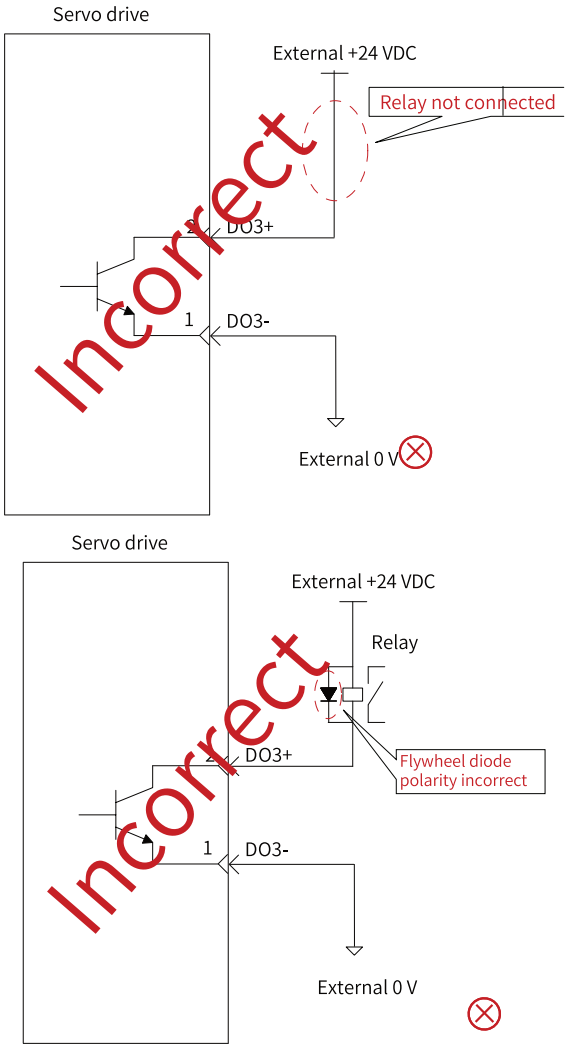


Note

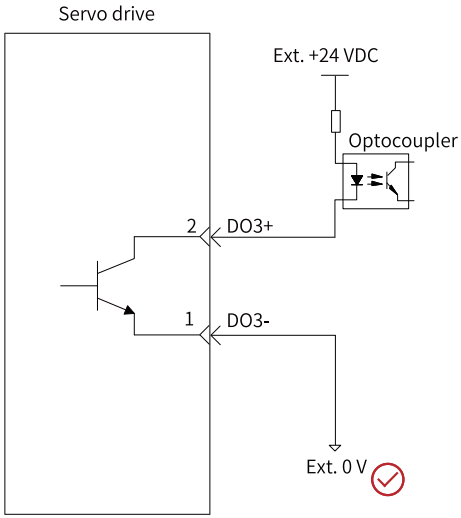
When the host controller provides relay input, a flywheel diode must be installed; otherwise, the DO terminals may be damaged.

For the external voltage and current range of the DO, see *" Basic DO information" on page 232*.

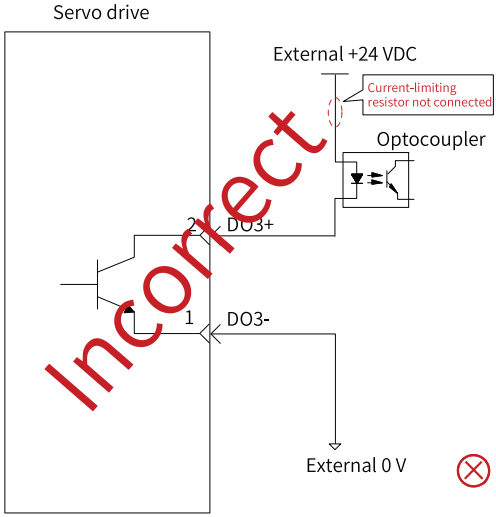
- **Wrong wiring:**



- **The host controller provides optocoupler input:**
  - **Correct wiring:**



  - **Wrong wiring:**

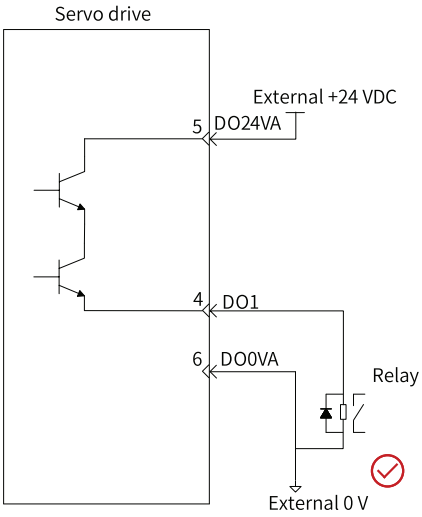


Safety Digital Output

The circuits for DO1, DO2, DO4, and DO5 are the same. The following description takes DO1 circuit as an example.

The safety DO is a drain output. Please make reasonable wiring according to the characteristics of the load circuit.

- The host controller provides relay input.
  - **Correct wiring:**

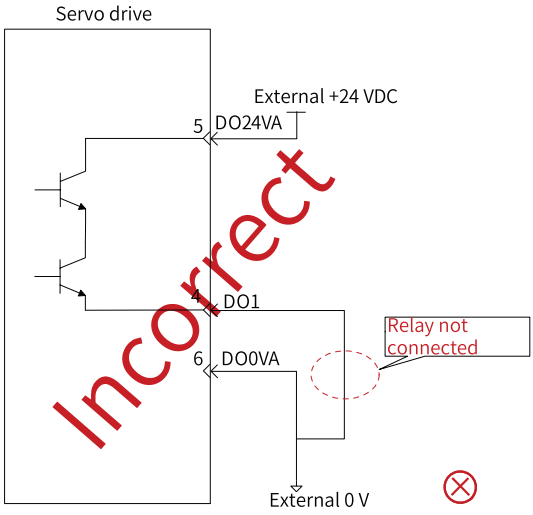


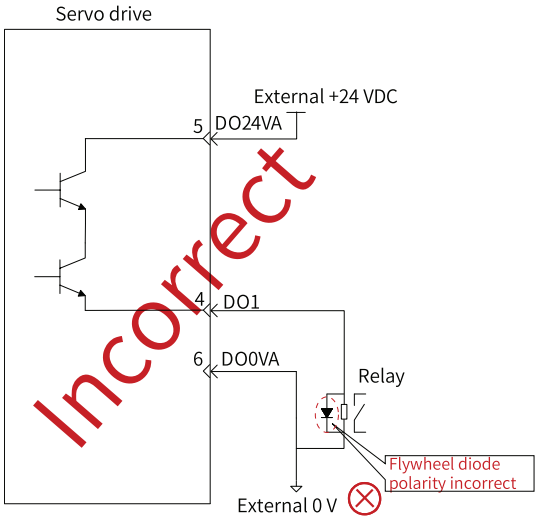
Note

When the host controller provides relay input, a flywheel diode must be installed; otherwise, the DO terminals may be damaged.

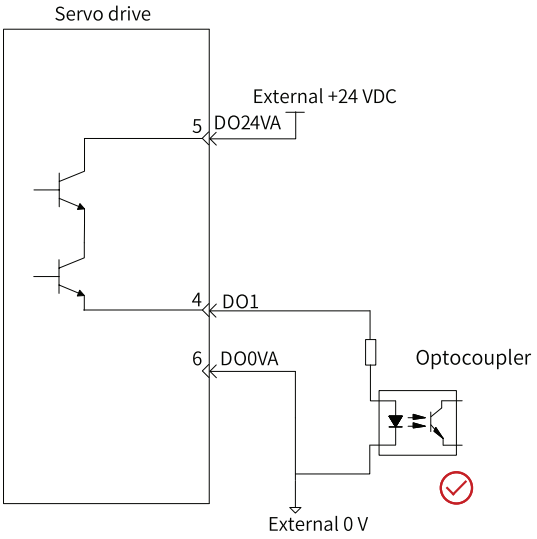
For the external voltage and current range of the DO, see *" Basic DO information" on page 232*.

  - **Wrong wiring:**



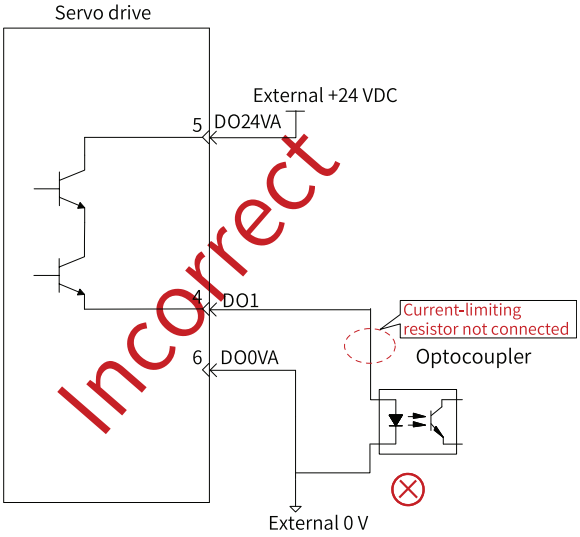


- **The host controller provides optocoupler input:**
  - **Correct wiring:**



Minimum current limiting resistor resistance R = (External power supply specification 24-0.75-0.75-Vf of optocoupler)/If of optocoupler.

- **Wrong wiring:**

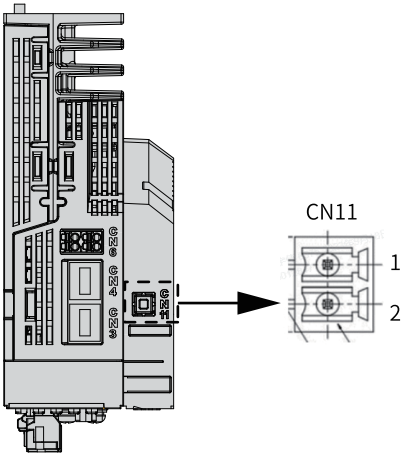


7.2 CN11 24V Terminal

Note

The CN11 24 V standby power input terminal is only available in functional safety and standby power-enabled products.

Terminal Arrangement



Pin No.	Descrip tion	Description	Pin No.	Descrip tion	Description
1	GND_BP	0 V input of the backup power supply	2	24V_BP	24 V input of the backup power supply

Description

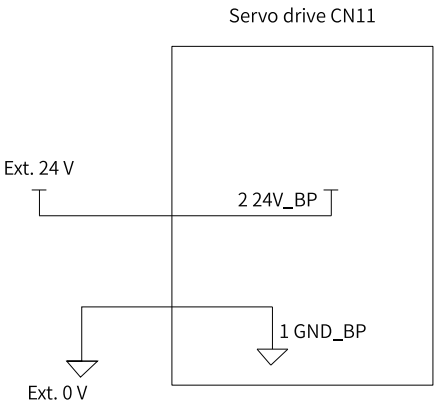
Models with backup power can have separate power supply to the control circuit. When the main circuit is not energized, 24V BP supplies power to the control circuit to maintain functions like programming, parameter configuration in the software tool, and communication. The operating panel of the drive shows "nrd.1" under this circumstance.

Table 7–3 Power input specifications

Item	Specification
Power input range	Voltage: 24 V DC±15% (must be SELV/PELV power supply)
Power of the external power supply	⩾ 50 W

Wiring

As shown in the following figure.



8 Commissioning Tool

8.1 Keypad

8.1.1 Components

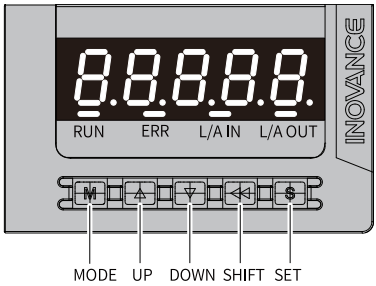


Figure 8-1 Magnified view of the keypad

The operation panel of the SV680-INT Series servo drive consists of a 5-digit, 8-segment LED screen, 5 keys and 4 status indicators. The keypad is used for value display, parameter setting, user password setting and general function execution.

Keys

The following table takes parameter setting as an example to describe the general functions of the keys.

Table 8–1 Descriptions of keys

Name	Illustration	Description
MODE		Switches among different modes. Returns to the previous menu.
UP		Increases the value of the blinking digit for the LED.
DOWN		Decreases the value of the blinking digit for the LED.

Name	Illustration	Description
SHIFT		Shifts the blinking digit for the LED. You can view the high digits of the number consisting of more than 5 digits.
SET		Switches to the lower-level menu. Executes commands such as storing parameter setting value.

Indicators

Note

The description of Indicators is only available for model N.

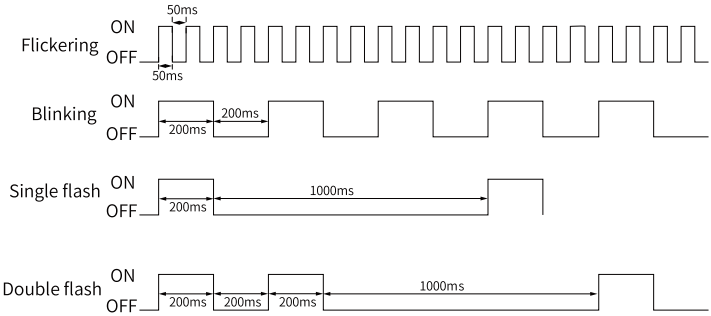


Figure 8-2 Description of indicators

Table 8–2 Description of indicators

Indicator	Status	Status Indication
RUN	OFF	Initialization.
	Blinking (on for 200 ms/off for 200 ms)	Pre-Operational.
	Single flash (on for 200 ms/off for 1000 ms)	Safe-Operational.
	ON	Operational.
ERR	OFF	No Network error.
	Blinking (on for 200 ms/off for 200 ms)	Communication setting error.
	Single flash	Sync event error.

Indicator	Status	Status Indication
	(on for 200 ms/off for 1000 ms)	
	Double flash (on for 200 ms and off for 200 ms, and then on for 200 ms and off for 1000 ms)	Watchdog timeout.
L/A IN indicator[1] L/A OUT indicator	OFF	Link is not established.
	Flickering (on for 50 ms/off for 50 ms)	Link is established. A data transceiving signal is present.
	ON	Link is established. No data transceiving signal is present.

Note

- [1]：L/A IN、L/A OUT represents the Link state and action state of the physical layer of each terminal.
- ERR indicator lights up in red. The other three indicators lights up in green.

8.1.2 Panel Display

Table 8–3 Physical numbers of the displayed content

Display	Equivalent	Display	Equivalent	Display	Equivalent	Display	Equivalent
	0		9		h		r
	1		A		c		t
	2		B		J		U
	3		C		L		y
	4		D		n		T

Display	Equivalent	Display	Equivalent	Display	Equivalent	Display	Equivalent
	5		E		N		u
	6		F		o		-
	7		H		P	-	-
	8		G		q	-	-

The operating panel can display the running status, parameter, faults, and monitoring information during running of the servo drive.

- Status display: Displays current servo drive status, such as servo ready or servo running.
- Parameter display: Displays parameters and their setpoints
- Fault display: Displays faults and alarms that occurred on the servo drive.
- Monitored value display: Displays values of monitoring parameters.

Transition relation between the panel display and the operation object of the host controller

The mapping relation between the parameter displayed on the keypad (in decimal) and the object dictionary operated by the host controller (in hexadecimal, "Index" and "Sub-index") is as follows.

Object dictionary index = 0x2000 + Parameter group number

Object dictionary sub-index = Hexadecimal offset within the parameter group + 1 For example:

Panel Display	Object dictionary operated by the host controller
H02.15	2002.10h

Note

The following section only describes the display and parameter settings on the keypad side (in decimal), which are different from those displayed in the software tool (in hexadecimal). Make necessary value conversions during use.

Display mode switchover

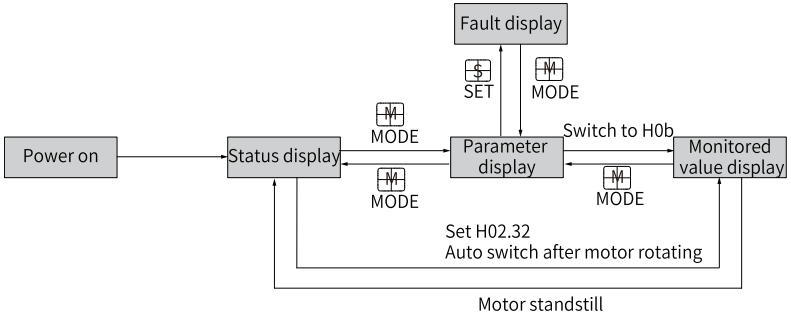


Figure 8-3 Switchover among different display modes

- The keypad enters status display immediately upon power-on.
- Press MODE to switch among different display modes based on the conditions shown in *"Figure 8–3 " on page 247* .
- In the status display mode, set H02.32 to select the monitored parameter. When the motor rotates, the operation panel automatically switches to the monitoring display mode. After the motor stops, the panel automatically restores to the status display mode.
- In the parameter display mode, after you select the parameter to be monitored in group H0b, the keypad switches to monitored value display.
- Once a fault occurs, the keypad switches to fault display immediately, with all the five LEDs blinking. Press SET to stop the LEDs from blinking, and then press MODE to switch to parameter display.

State display of SV680P-INT

Display	Name	Applicable Occasion	Meaning
	reset Servo drive initializing	Upon power-on	The servo drive is in the initialization or reset status. After initialization or reset is done, the servo drive automatically switches to other status.
	nrd.x Servo not ready	Initialization done, but servo drive not ready.	Meaning of nrd.x: For specific reasons and troubleshooting methods, see *"Table 8–4 Cause and troubleshooting" on page 248*.
	rdy Ready	Servo drive ready	The servo drive is ready to run and waits for the enabling signal from the host controller.

Display	Name	Applicable Occasion	Meaning
	run Running	S-ON signal is ON.	The servo drive is running.
	JOG Jog	Servo drive in jog status	
	STO STO function display selection	-	Check if the 24V input for the STO terminal is disconnected.

STO function display selection:

Defines whether to display the STO status or report E150.0 after the STO function is triggered.

0: Displays the STO status. The keypad displays "sto_" after the STO function is triggered. In this case, no fault is reported and there is no output from the fault DO.

1: Displays the STO failure. The keypad displays "E150.0" after the STO function is triggered. In this case, the servo drive reports E150.0 and the fault DO generates output.

Table 8–4 Cause and troubleshooting

nrd.x/81nr.x	Cause	Troubleshooting
nrd.1/81nr.1	The control voltage H0b.57 is less than the undervoltage threshold H01.78 (the input 220VAC threshold is 190VDC, and the input 400VAC threshold is 380VDC).	1. Measure if the L1C and L2C inputs meet the input specifications. 2. If yes, read H0b.57. If H0b.57 is close to 0, the hardware circuit may be damaged.
nrd.2/81nr.2	L1–L3 input is abnormal.	1. Use a multimeter to check whether there is voltage input in L1–L3. 2. Use an oscilloscope to test L1–L3 inputs for phase loss.

nrd.x/81nr.x	Cause	Troubleshooting
nrd.3/81nr.3	The bus voltage H0b.26 is less than the undervoltage threshold H01.42 (the input 220VAC threshold is about 200VDC, and the input 400VAC threshold is about 380VDC).	1. Check if inputs L1–L3 meet the input specifications. 2. If yes, and H0b.26 is close to 0, the hardware circuit may be damaged.
nrd.4/81nr.4	Servo soft start resistor not bypassed.	Check if bus voltage H0b.26 is in the normal range (input 220VAC: 235VDC–378VDC, input 400VAC: 478VDC–751VDC).
nrd.5/81nr.5	Encoder initialization not done.	Contact the manufacturer technical personnel.
nrd.6/81nr.6	Short-circuit to ground detection not done.	Check the value of H0b-57.
nrd.7/81nr.7	Other.	-
nrd.9/81nr.9	Fully closed-loop encoder initialization not done.	Contact the manufacturer technical personnel.

State display of SV680N-INT

Display	Name	Applicable Occasion	Meaning
	81nr.x Servo not ready	Initialization done, Single servo drive not ready.	Meaning of "81nr.x": For specific reasons and troubleshooting methods, see *"Table 8–4 Cause and troubleshooting" on page 248*.
	-88rn Servo drive is running	Servo drive is enabled.	The servo drive is running.
	-88ry Servo ready	The servo drive is ready to run.	The servo drive is ready to run and waits for the enabling signal from the host controller.
	1–A: Control modes	-	Displays present operation mode of the servo drive in hexadecimal digits. 1: Profile position control 3: Profile velocity mode 4: Profile torque mode 6: Homing mode 8: Cyclic synchronous position mode

Display	Name	Applicable Occasion	Meaning
			9: Cyclic synchronous velocity mode A: Cyclic synchronous torque mode
	1–8: Communication status	-	Displays the status of the slave EtherCAT status machine in the form of characters. 1: Initialization 2: Pre-operational 4: Safe-operational 8: Running
	- CN3 connection indication	EtherCAT output connected successfully.	Solid OFF: No communication connection is detected in the physical layer. Solid ON: Communication connection is detected in the physical layer.
	- CN4 connection indication	EtherCAT input connected successfully.	
	STO STO function display selection	-	Check if the 24V input for the STO terminal is disconnected.

Parameter Display

Parameters are divided into groups H00...H34 based on functions. Parameters can be located quickly based on the parameter group they belong to. For details, see *SV680-INT Series Servo Drive Parameter Guide*.

- Display of parameter groups

Display	Name	Description
HXX.YY	Parameter group	XX: Parameter group No. (Hexadecimal) YY: Offset within the parameter group (decimal)

For example, "H02.00" is displayed as follows.

Display	Name	Description
	H02.00	02: Parameter group No. 00: Offset within the parameter group

- Display of negative numbers and numbers with different lengths
  - Signed number with 4 digits and below or unsigned number with 5 digits and below
    Such numbers are displayed in a single page (five digits). For signed numbers, the highest bit "-" represents the negative symbol.

    For example, "-9999" is displayed as follows:

    For example, "65535" is displayed as follows:

  - Signed number with more than 4 digits or unsigned number with more than 5 digits
    Such numbers are displayed from low to high bits in several pages (5 digits per page): current page + values on current page, as shown in the following figure. Hold down SHIFT for more than 2s to switch to the next page.

    For example, "-1073741824" is displayed as follows:

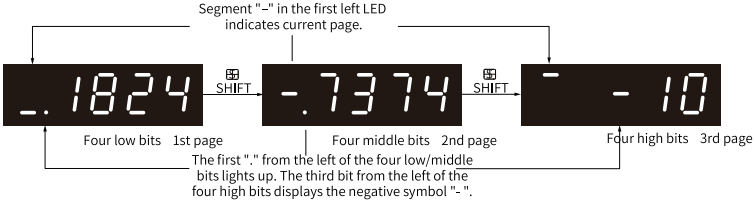
    

    Figure 8-4 Display of "-1073741824"

    Example: "1073741824" is displayed as follows:

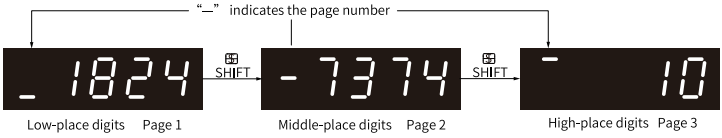
    

    Figure 8-5 Display of "1073741824"

- Display of the decimal point

The segment "." of the ones indicates the decimal point, which does not blink.

Display	Name	Description
	Decimal point	100.0

- Display of parameter setting status

Display	Name	Applicable Occasion	Meaning
	Done Parameter setting complet ed	The parameter is set successfully.	The parameter is set and saved to the servo drive (Done). The servo drive can execute other operations.
	F.InIt (Restored to default settings)	Parameter initialization is in progress (H02.31 = 1).	The servo drive is in the process of parameter initialization. After parameter initialization is done, switch on the control power supply again.
	Error (wrong password)	The user password (H02.30) is activated and the password entered is wrong.	A wrong password is entered. You need to enter the password again.
	TunE	Auto-tuning with one-key enabled	The function of auto-tuning with one-key is in progress.
	FAIL	Auto-tuning with one-key enabled	The function of auto-tuning with one-key fails.
	AdJ_	Enable tuning: phase sequence tuning and resistance and inductance tunning.	The drive is being tuned.

Fault Display

- The panel displays the active or history faults and warning codes. For troubleshooting, see section “Troubleshooting" in *SV680-INT Series Servo Drive Function Guide*.

- When a fault or alarm occurs, the operating panel displays the corresponding fault or alarm code immediately. When multiple faults or errors occur, the keypad displays the fault or error code of the highest fault level.
- You can select the previous fault/alarm to be viewed through H0b.33 and view the code of the selected fault/alarm in H0b.34.
- You can clear the latest 20 faults or warnings saved in the servo drive by setting H02.31 to 2.

For example, "E941.0" is displayed as following:

Display	Name	Description
	E941.0 Alarm code	E: A fault or alarm occurs on the servo drive. 941.0: Alarm code

Monitored value display

- H0b parameters monitor the operating state of the servo drive. You can enable keypad monitoring display by H02.32. The parameter group number displayed is H0b and the group offset is the setpoint of H02.32.
- When the valid offset is set in H02.32, the keypad enters the "state display" mode if the motor was in the static state, or the "parameter display" mode if the motor was in the rotating state. Mode switchover is not related to whether the servo drive is enabled.
- For example, if you set H02.32 to 00 and the motor changes from the static state to the running state, the keypad switches from the "state display" mode to "parameter display" mode and displays the value of H0b.00.

The following table describes the monitoring parameters in H0b.00.

Parameter	Name	Unit	Meaning	Example
H0b.00	Motor speed actual value	[mm/s]/[rpm]	Indicates the actual motor speed after round-off, which is accurate to 1 [mm/s]/[rpm].	3000 [mm/s]/[rpm] is displayed as:  -3000 [mm/s]/[rpm] is displayed as: 

Note

For details of parameter group H0b, see the related section.

8.1.3 Parameter Settings

Example of parameter settings

You can set parameters through the keypad. For details, see *SV680-INT Series Servo Drive Parameter Guide*. The following figure shows how to switch from position control mode to speed control mode using the keypad after power-on.

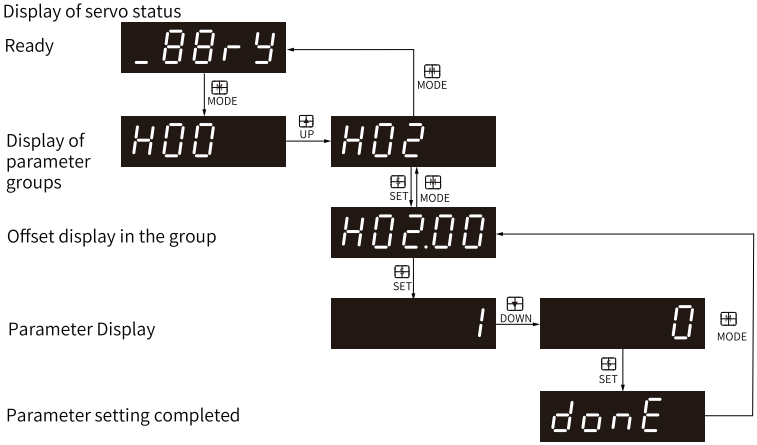


Figure 8-6 Example of parameter setting

For description of keys, see the related section.

After parameter setting is done, that is, "donE" is displayed on the keypad, press MODE to return to the parameter group interface (interface of "H02.00").

Forced DI/DO signals

You can assign different functions to DI/DOs by setting parameters in groups H03 and H04 through the keypad (or host controller), so that the host controller can control the servo functions through DI signals or use the DO signals outputted by the servo drive.

The servo drive also provides forced DI/DO functions. The forced DIs can be used to test the DI functions of the servo drive, and the forced DOs can be used to check the DO signal connection between the host controller and the servo drive.

Forced DI signal input

After this function is enabled, all DI signal levels are controlled by the forced DI setting (H0d.18), independent of external DI signal status.

- Steps:

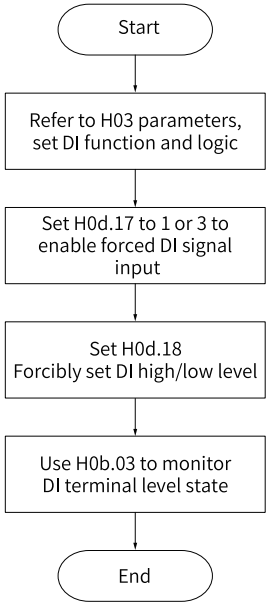


Figure 8-7 Procedure for setting forced DI function

Set the DI logic through parameters in group H03. H0b.03 is used to monitor the DI level status. H0d.18 is used to forcibly set the DI level and displayed in hexadecimal on the keypad. H0b.03 is used to monitor the DI terminal level state and is displayed as a level on the keypad. But the software reads it in hexadecimal.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0d.17	200d-12h	Forced DI/DO enable switch	bit0: Forced DI enable switch 0: Disabled 1: Enabled bit1: Forced DO enable switch 0: Disabled 1: Enabled	0	-	Real-time

- **Take SV680P-INT as an Example**:
  As shown in the figure below, when the terminal logic is set to active low, the functions of terminals DI1, DI6, and DI7 are effective, while the functions of terminals DI2 to DI5 and DI8 are ineffective. Since the binary number "10011110" is "9E" in hexadecimal, the value of H0d.18 can be set to "9E". At this point, the keypad displays terminals DI1, DI6, and DI7 as low level, while terminals DI2 to DI5

and DI8 as high level. If the DI function is normal, and the read value of H0b.03 is the same as the value of H0d.18, the value of H0b.03 read by the software is 9E.

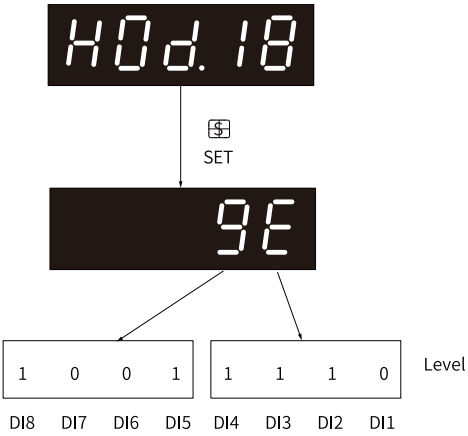


Figure 8-8 Meaning of the H0d.18 setpoint

Monitoring the DI level status through H0b.03. Display on the operating panel:

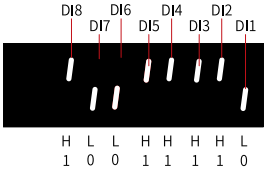


Figure 8-9 DI level status corresponding to H0b.03

Note

Upper LED segments ON: high level (indicated by "1") Lower LED segments ON: low level (indicated by "0")

- Exit
  The forced DI signal function is not retentive upon power-off. Normal DIs apply after restart, or you can set H0d.17 to 0 (No operation) to return to the normal DI mode.

Forced DO function

After this function is enabled, all DO signal levels are controlled by H0d.19 (Forced DO value), regardless of the internal DO status of the servo drive.

- Operating process

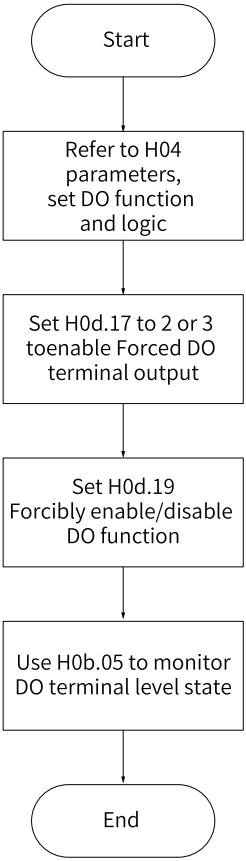


Figure 8-10 Procedure for setting forced DO function

Set the DO logic through parameters in group H04. H0b.05 is used to monitor the DO level status. H0d.19 is used to forcibly disable/enable the DO function and displayed in hexadecimal on the keypad. H0b.05 is used to monitor the DI terminal level state and is displayed as a level on the keypad. But the software reads it in hexadecimal.

- Take SV680P-INT as an Example:
  As shown in the figure below, when the terminal logic is set to active high, the functions of terminals DO2–DO5 are effective, while the functions of terminal DO1 are ineffective. Since the binary number "00011110" is "1E" in hexadecimal, the value of H0d.19 can be set to "1E". At this point, the keypad displays terminals DO2–DO5 as high level, while terminal DO1 as low level. If the DO function is normal, and the read value of H0b.05 is the same as the value of H0d.19, the value of H0b.05 read by the software is 1E.

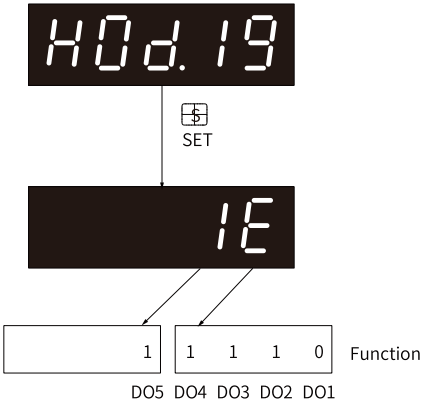


Figure 8-11 Meaning of the H0d.19 setpoint

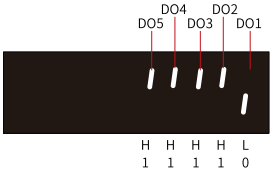


Figure 8-12 Display H0b.05 when all DO are "active high"

- Exit
  The forced DO signal function is not retentive upon power-off. Normal DOs apply after restart, or you can set H0d.17 to 0 (No operation) to return to the normal DO mode.

Bus control forced DO[1]

Note

[1] Bus-controlled forced DO signal output is only available for SV680N-INT series.

The function of the corresponding DO is set to 31. After this function is enabled, all DO signal levels are controlled by 60FE.01h (Physical output) and are unrelated to the internal DO signal status.

- Operating process

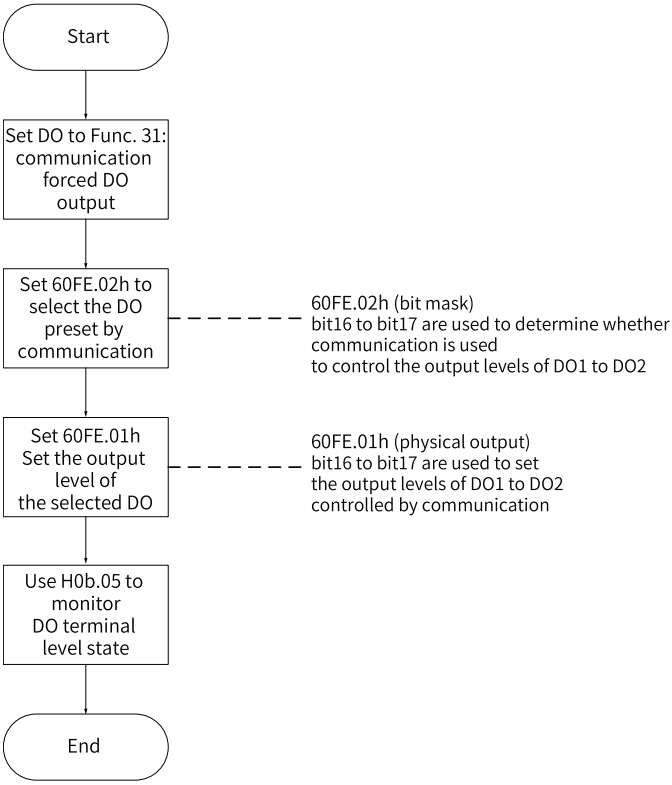


Figure 8-13 Procedure for setting bus control forced DO function

60FEh (Digital output) can be used to forcibly set the DO terminal level through the bus, regardless of the internal DO status of the drive.

bit	Related DO	Output mask: 60FE.02h	Physical output: 60FE.01h
16	DO1	1: DO1 forced output enabled	DO1 forced output (0: OFF, 1: ON)
17	DO2	1: DO2 forced output enabled	DO2 forced output (0: OFF, 1: ON)

When bit16–bit17 of 60FE.02h and 60FE.01h are all set to 1, the corresponding forced DO is ON.

H0b.05 is used to monitor the DO level status. The keypad displays the level, and the value of H0b.05 (monitored DO signal) read in the software tool is decimal.

Example: To make the output levels of DO1 and DO2 be forcibly set by the bus, in which DO1 outputs low level and DO2 outputs high level, set as follows:

Set 60FE.02h to 0x00030000, and 60FE.01h to 0x00020000. Monitor the DO level status through H0b.05. The keypad displays as follows.

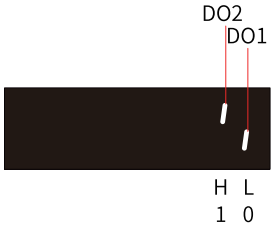


Figure 8-14 Display of H0b.05 when DO signals are controller by the bus

- Disconnection logic

Table 8–5 EtherCAT forced DO in non-operational status

bit0	bit1	Description
0	0	Status of DO1 and DO2 is unchanged in the non-operational status
1	0	No output in DO1 and status of DO2 unchanged in the non-operational status
0	1	No output in DO2 and status of DO1 unchanged in the non-operational status
1	1	No output in DO1 and DO2 in the non-operational status

User password

After the user password (H02.30) is activated, only authorized operators can set parameters.

- Setting the user password
  The following figure shows how to set the user password to "00001".

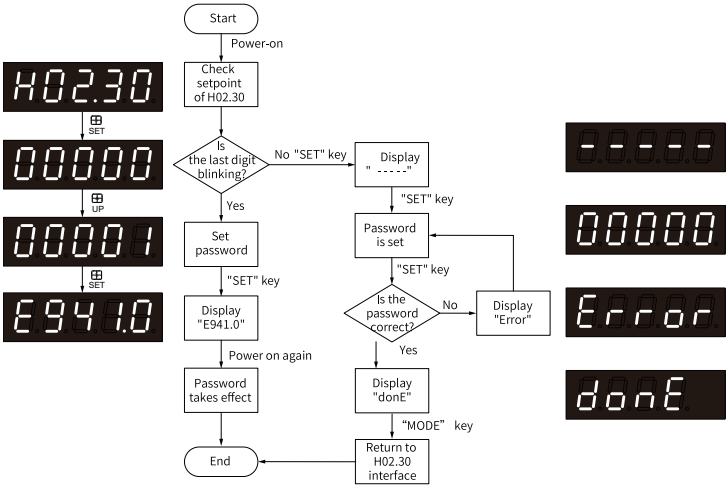


Figure 8-15 Procedure for setting the user password

- Modifying the user password
  To change the user password, input current password first to authorize the access to parameter setting. Next, enter H02.30 again to set a new password based on the procedure shown in the preceding figure.

Note

If the last bit does not blink, the access to parameters is password protected. If the last bit blinks, password is not needed or the password entered is correct.

- Canceling the user password
  Enter the set user password, and set H02.30 to "00000" to cancel the user password.

8.2 Commissioning Software

8.2.1 Overview

InoDriverShop is a new commissioning software tool for Inovance servo drives. Except the old SV620 series products, it is the commissioning tool for all new and future products.

8.2.2 Installation

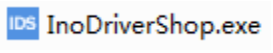
1. Software

a. Visit the official website of Inovance as shown below.
http://www.inovance.com

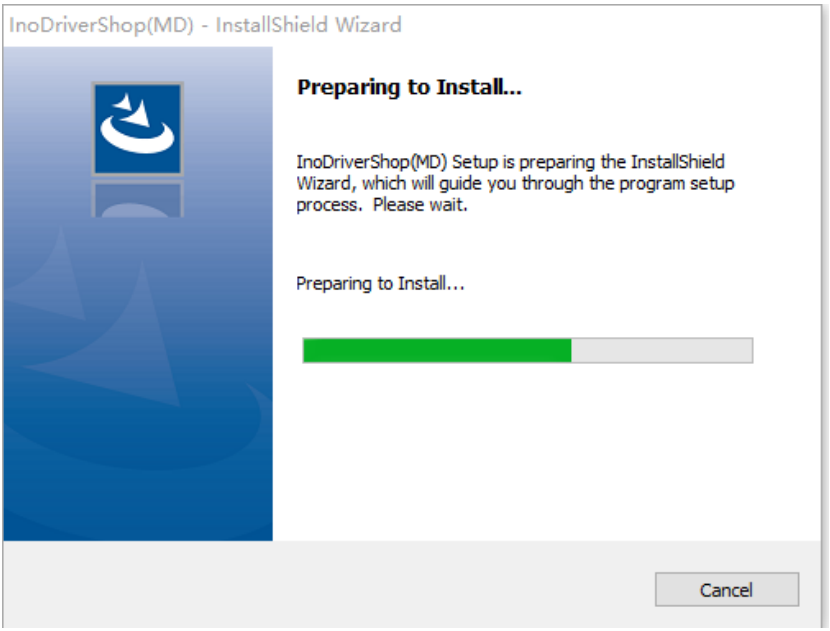
b. Choose Support → Download, and then type in the keyword InoDriverShop and click Search.

c. Click Download.

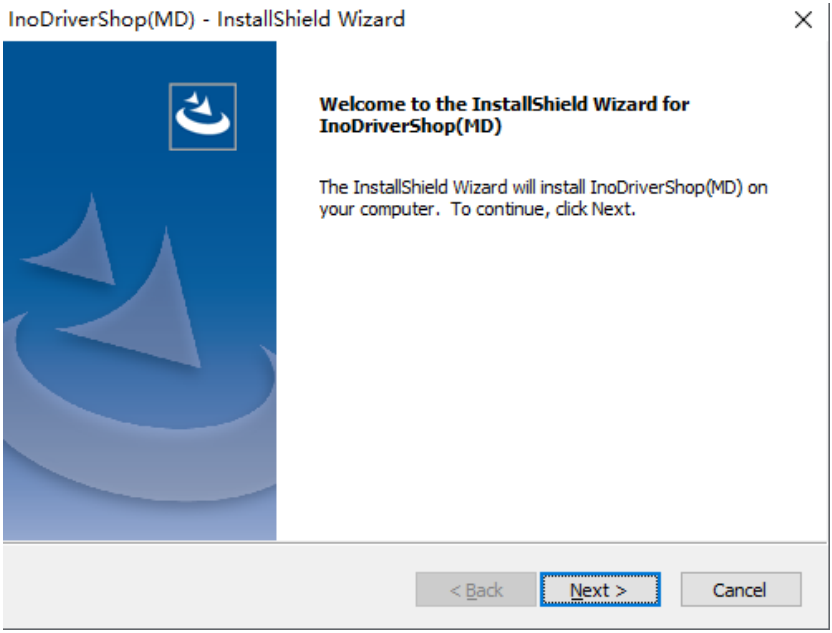
2. Unzip the package downloaded.

3. Click 

to start installing InoDriverShop.

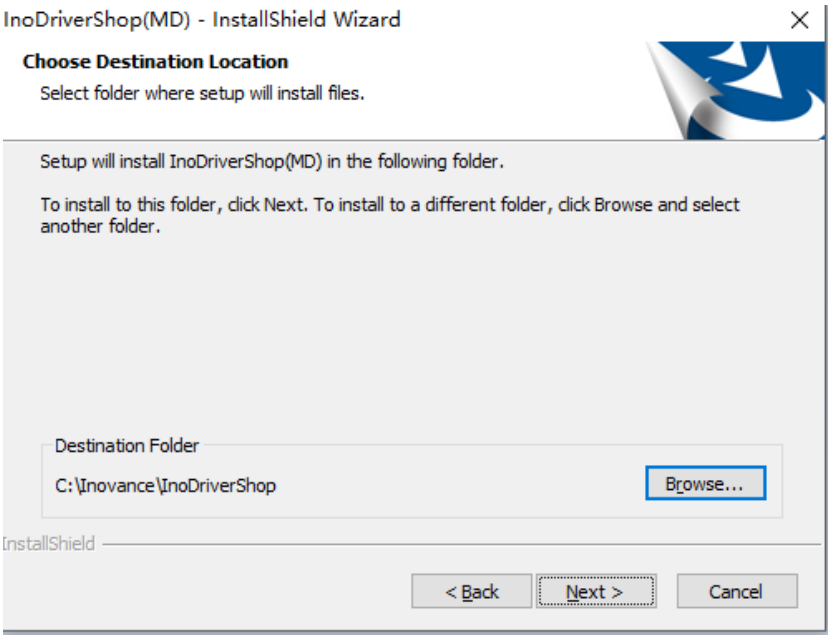


4. Click Next.

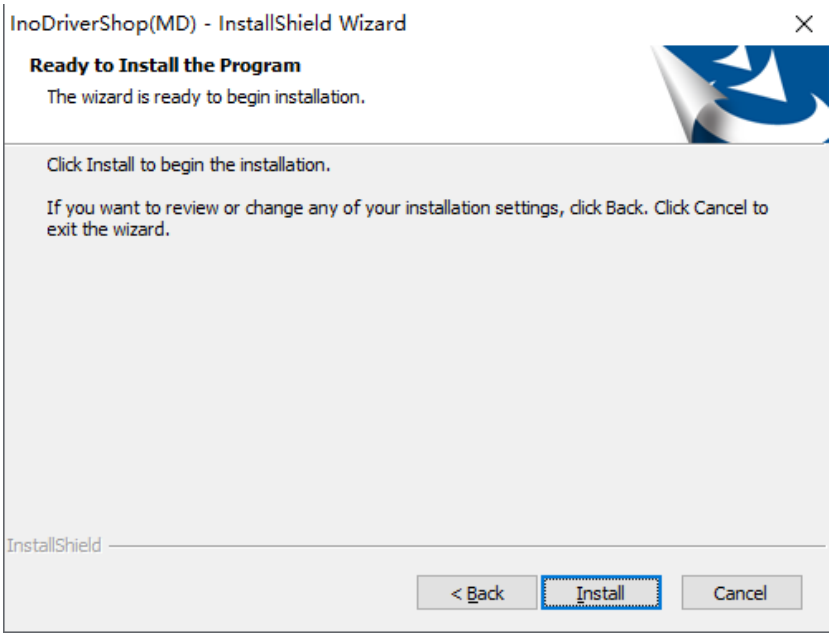


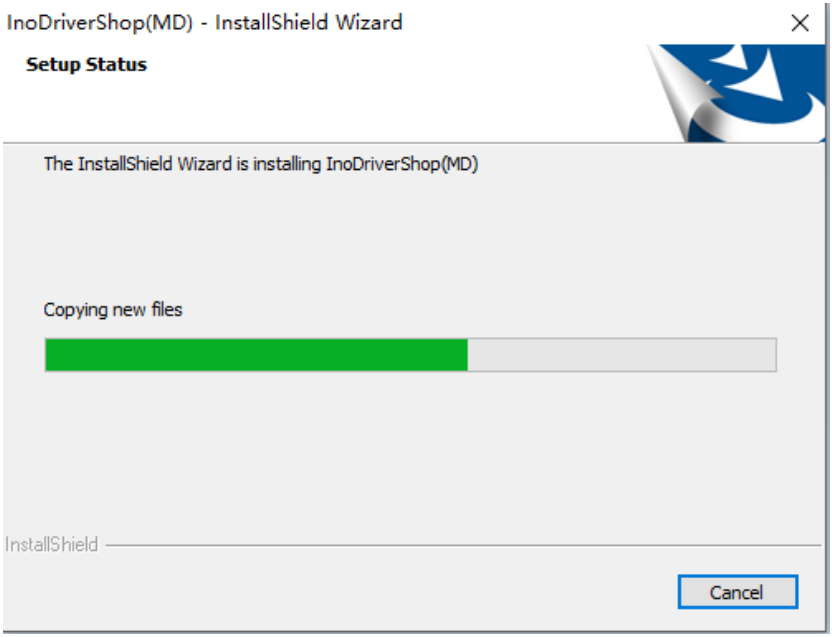
5. You can select the directory for installation as needed through the Browse button. The default directory for installation is "C:\Program Files\Inovance\InoDriverShop". In online upgrade, InoDriverShop will be upgraded directly in the original directory.

   After selecting the directory for installation, click Next.

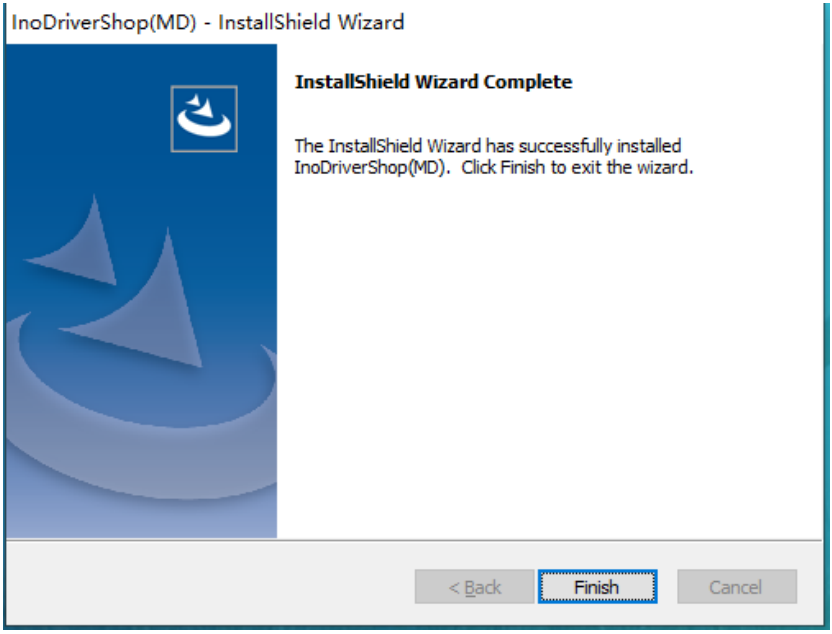


6. Click Install to start installation.





7. After installation is done, click Finish.



8. A shortcut icon for InoDriverShop will be generated automatically on the desktop.



8.2.3 Connection

Take the SV680P-INT as an example:

1. Start InoDriverShop.



- Double-click to start the InoDriverShop.
- If there is no shortcut for InoDriverShop on your desktop, click Start and search for InoDriverShop.

2. Create a project.

a. Click ① shown in the following figure to create a project.

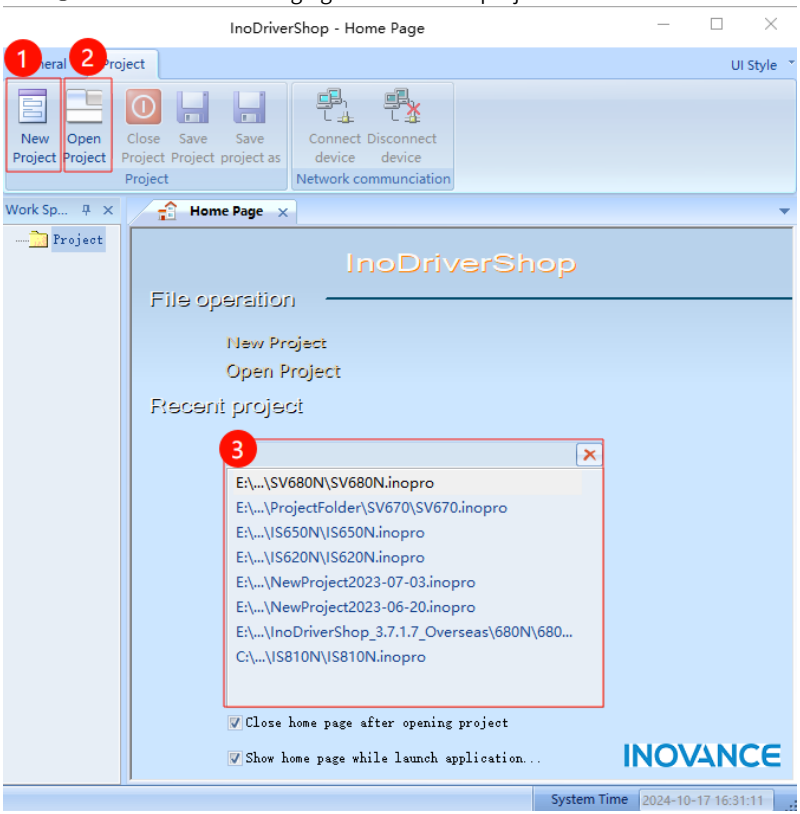


Figure 8-16 Software startup interface

Note

You can select ② or ③ in the preceding figure to open the project saved before.

b. Open the Project Guide interface.
Click Online or Offline in area ①. Next, click the product series in area ②. Finally, load default communication parameters in area ③ based on the product series selected.



Figure 8-17 Project Guide interface

c. Click Next page to create a project.

- Creating a project for online device brings you to the following interface. The device is scanned automatically. Select the device to be commissioned and click Finish.

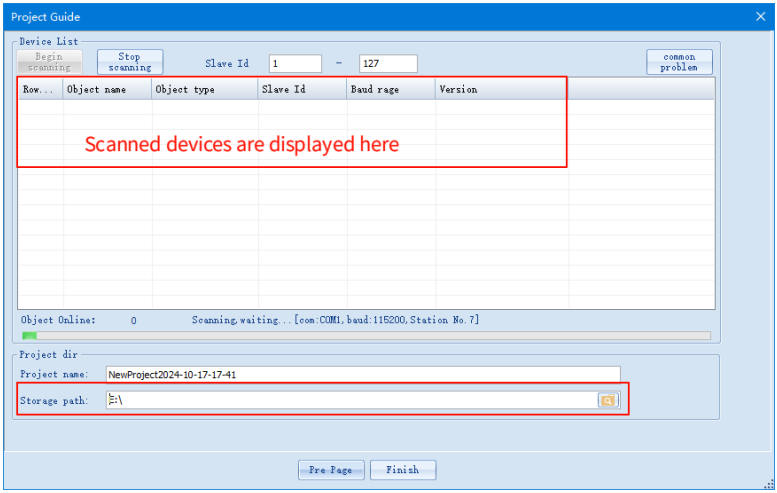


Figure 8-18 Scan interface

- Creating a project for offline device brings you to the following interface. You can select the Slave ID, Object Type, and Software Version as needed (1) and add different standards or customized devices (2). You can also designate the directory for storage or create multiple offline devices (4). Click (5) to complete.

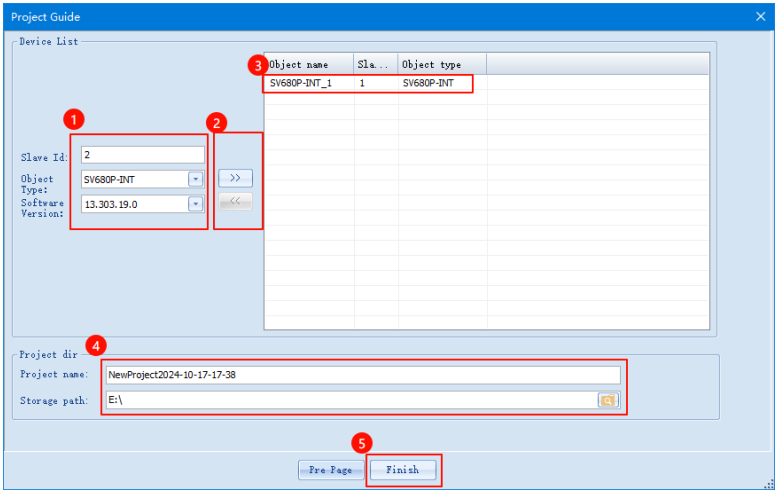


Figure 8-19 Project Guide interface for offline device

Note

① Station No., ④ Project name, and the storage directory can be changed as needed.

d. The project has been created.

3. The main interface is shown as follows.

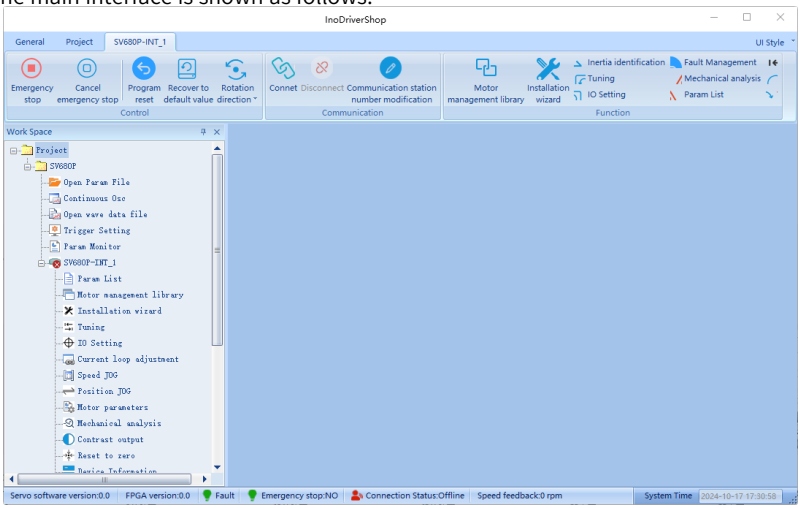


Figure 8-20 Main interface

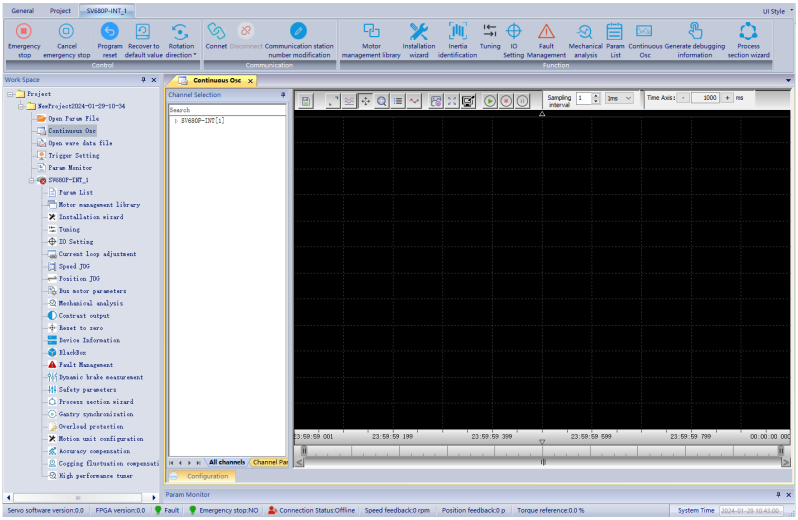
Note

When you create a new online or offline project, the parameter attribute will be automatically updated to match the motor when you make a connection for the first time. If the type of the motor changes later, the parameter attribute will automatically update.

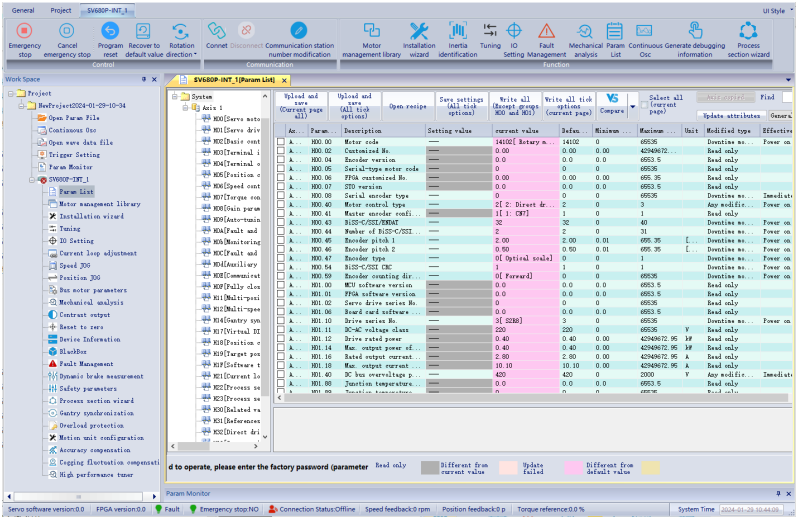
8.2.4 Common Functions

InoDriverShop features the following functions:

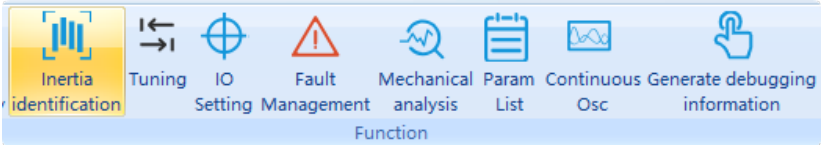
- Oscilloscope: Detects and saves the instantaneous data during operation. Double-click **Continuous Osc** in the workspace to open the continuous oscillator view.

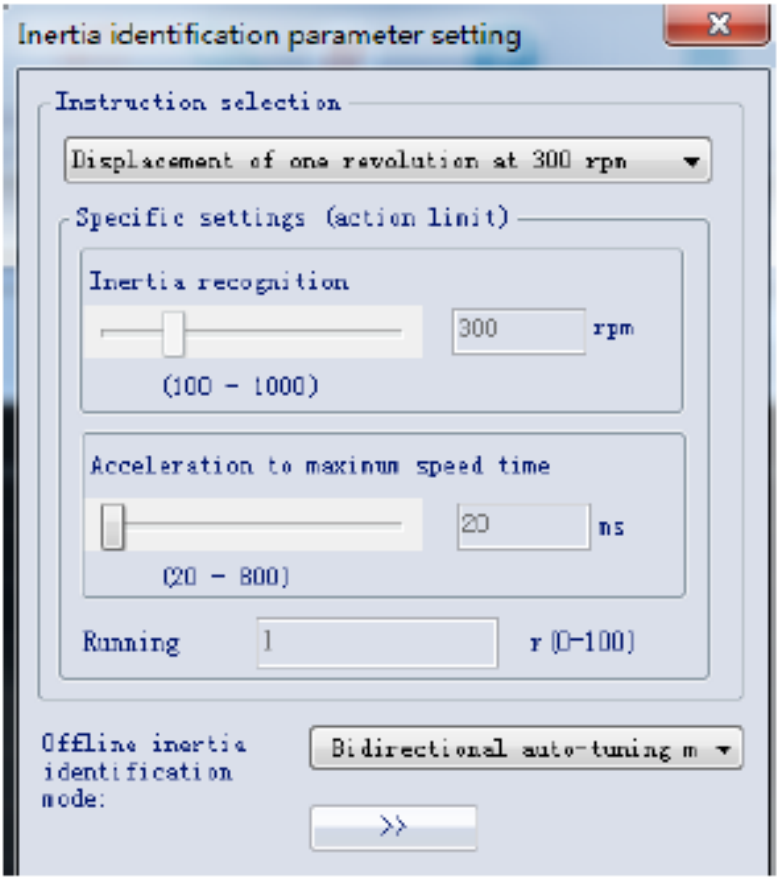


- Parameter management: Reads and downloads parameters in batches. Double-click **Parameter List** in the workspace to open the parameter list view. The current values of drive parameters are displayed in the parameter list. You can edit the parameter values and write them to the drive as needed.

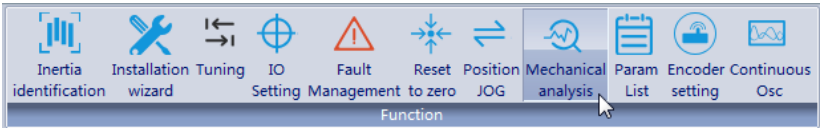


- Inertia auto-tuning: Generates the load inertia ratio automatically. Select the target axis to be operated through the drop-down list and configure the inertia auto-tuning parameters. After setting the inertia auto-tuning parameters, click the bottom button to enter the inertia auto-tuning interface.

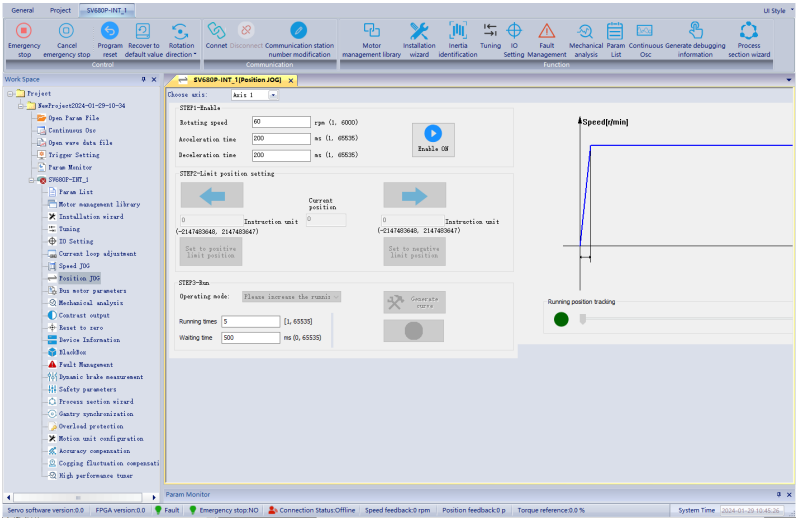




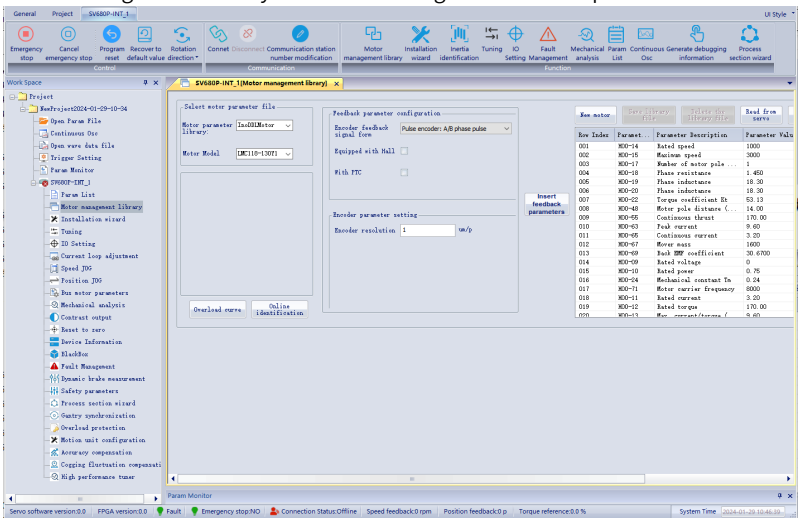
- Mechanical characteristic analysis: Analyzes the resonance frequency of the mechanical system.



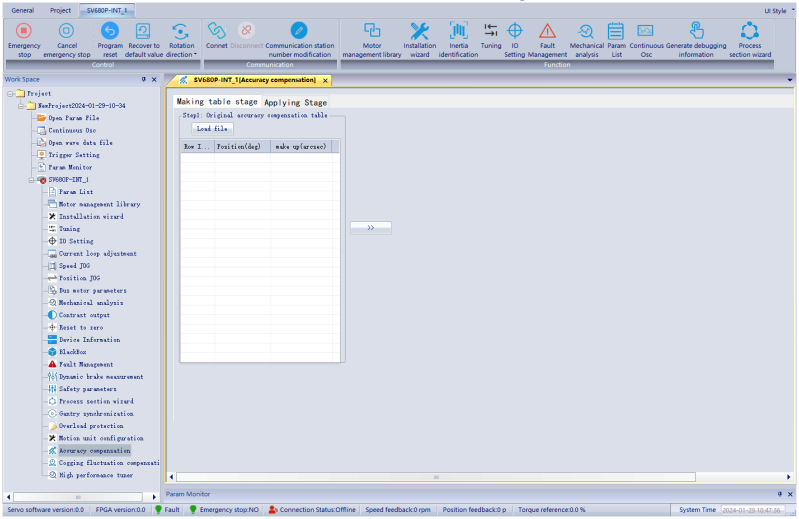
- Motion JOG: Generates position references to make the motor run. Select the target axis in the drop-down list, and configure and enable parameters.



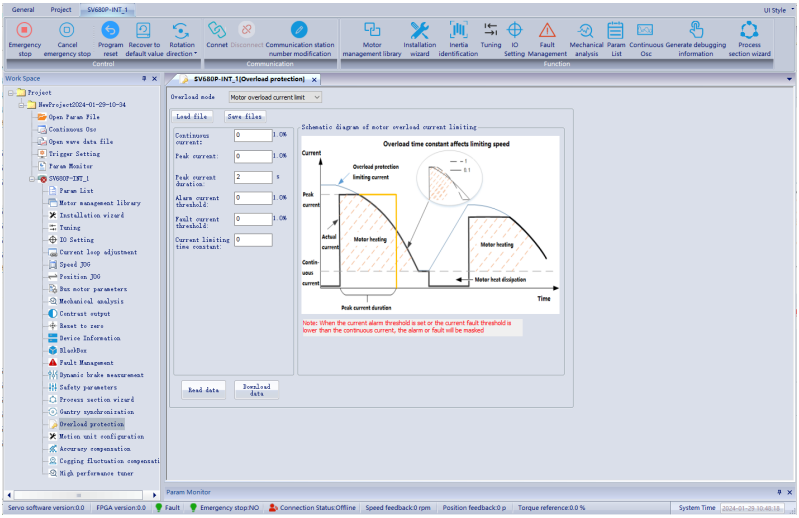
- Gain tuning: Adjusts the stiffness level and monitors the motion data.
- Motor Management Library: Save and manage users' motor parameters.



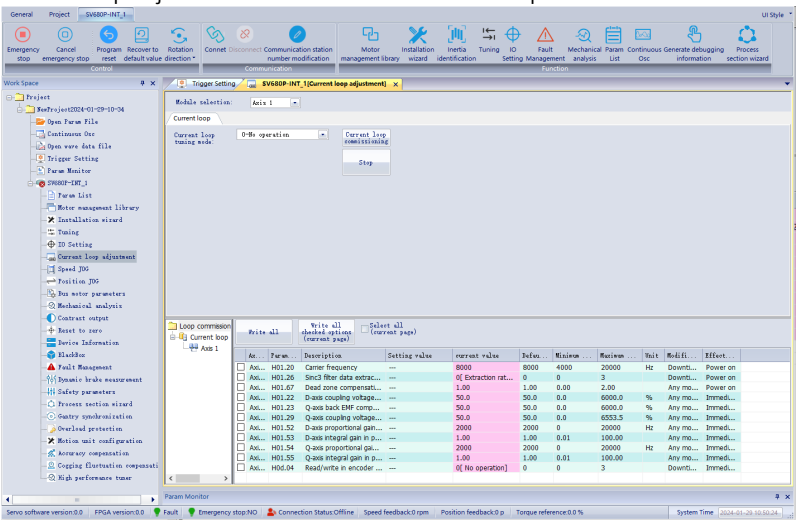
- Accuracy compensation: Compensate the positioning accuracy of the motor.



- Overload curve: Select the motor overload protection method.



- Current loop adjustment: Commission the current loop.



- Host controller homing: For details, see information on 6098h in *SV680-INT Series Servo Drive Function Guide*.

9 Commissioning and Operation

9.1 Commissioning Objects

The types of motors supported by the SV680-INT drive include the following:

Motor type	Component type	Compatibility	Remarks
DDL motor	Motor temperature detection	Switching PTC	-
	Position feedback	Inovance communication encoder	-
		Sine/Cosine analog encoder	Must be used with an Inovance T5 interpolator
		ABZ incremental encoder (TTL signal)	The maximum supported frequency of AB orthogonalization is 4MHz
		BiSS-C encoder	Max. data length 32 bits
		SSI encoder	Max. data length 32 bits
		EnDat 2.2 encoder	-
		Switching UVW Hall sensor	-
	Limit signal device	Switching	For details of DI input data, see *SV680-INT Series Servo Drive Hardware Guide*.
DDR motor	Motor temperature detection	Switching PTC	-
	Position feedback	Inovance communication encoder	23-bit, 26-bit
		Sine/Cosine analog encoder	Must be used with an Inovance T5 interpolator
		ABZ incremental encoder (TTL signal)	The maximum supported frequency of AB orthogonalization is 4MHz
		BiSS-C encoder	Max. data length 32 bits
		SSI encoder	Max. data length 32 bits
		EnDat 2.2 encoder	-
		Switching UVW Hall sensor	-

Motor type	Component type	Compatibility	Remarks
	Limit signal device	Switching	For details of DI input data, see *SV680-INT Series Servo Drive Hardware Guide*.
Servo motor	Motor temperature detection	Switching PTC	-
	Position feedback	Inovance communication encoder	23-bit, 26-bit
		Sine/Cosine analog encoder	Must be used with an Inovance T5 interpolator
		ABZ incremental encoder (TTL signal)	The maximum supported frequency of AB orthogonalization is 4MHz
		BiSS-C encoder	Max. data length 32 bits
		EnDat 2.2 encoder	-
		SSI encoder	Max. data length 32 bits
		Nikon encoder	17-bit, 20-bit
		TAMAGAWA encoder	17-bit, 23-bit
		Switching UVW Hall sensor	-
	Limit signal device	Switching	For details of DI input data, see *SV680-INT Series Servo Drive Hardware Guide*.

9.2 Commissioning Flowchart

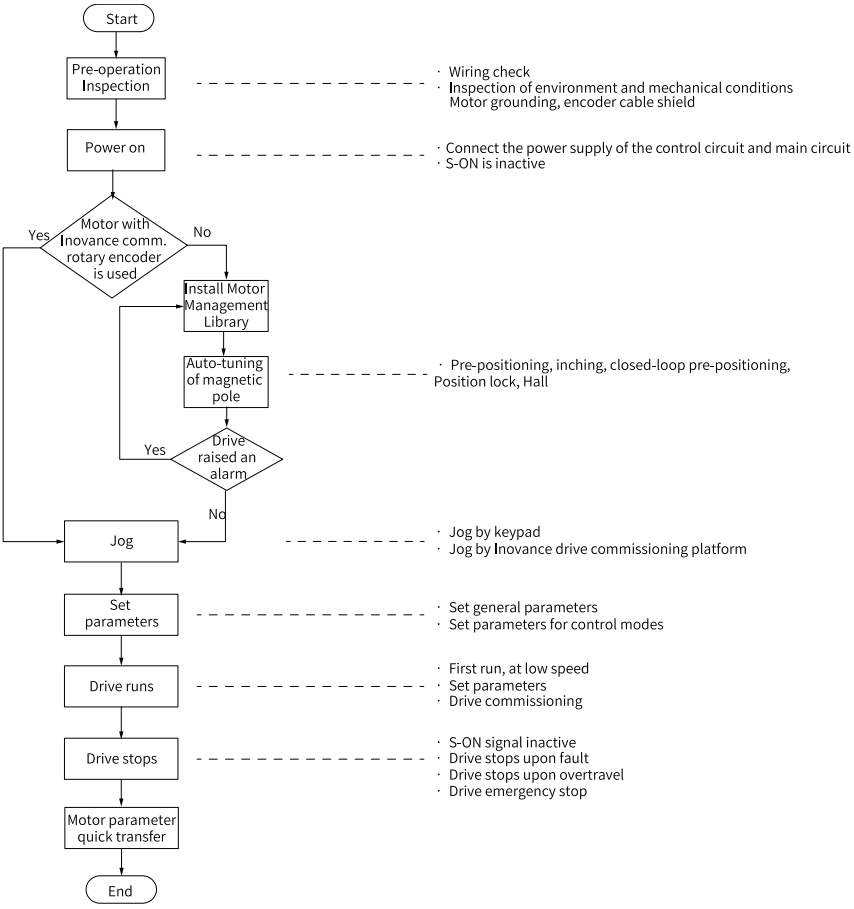


Figure 9-1 Commissioning flowchart of the drive

9.3 Pre-operation Inspection

Check the following items before operating the servo drive and the motor.

Table 9–1 Checklist before operation

No.	Item	Yes
Wiring		
1	The power input terminals (L1C, L2C, L1, L2, L3, R, S, T) of the servo drive are connected properly.	□

No.	Item	Yes
2	The main circuit cables (U, V, W) of the motor are connected to the U/V/W terminals of the drive correctly.	☐
3	No short circuit exists in the power input terminals (L1C, L2C, L1, L2, L3, R, S, T) or main circuit output terminals (U, V, W) of the servo drive.	☐
4	The control signal cables, such as the brake signal cable and overtravel protection signal cable, are connected properly.	☐
5	The servo drive and motor are grounded properly.	☐
6	The stress suffered by the cable is within the specified range.	☐
7	All the wiring terminals are insulated properly.	☐
8	The shield layer of the encoder cable is reliably connected with the PE terminal on the drive.	☐
Environment and Mechanical Conditions		
1	There are no unwanted objects (such as cable terminals and metal chippings) that may cause short circuit of the signal cable and power cable inside or outside the servo drive.	☐
2	The servo drive and the external braking resistor are placed on incombustible objects.	☐
3	The motor is installed properly. The motor shaft is connected to the machine securely.	☐
4	The motor and the machine it is connected to are in good condition and ready to run.	☐

9.4 Power-on

Switching on the input power supply

The power input terminals are L1C/L2C (control circuit power input terminals) and L1/L2/L3 or R/S/T (main circuit power input terminals).

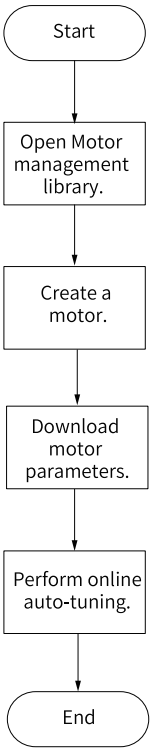
After the power supply is switched on, if the bus voltage indicator is in the normal state and the keypad displays "reset"→"nrd.x"→"rdy" in sequence, the drive is ready to run and waits for the S-ON signal.

Note

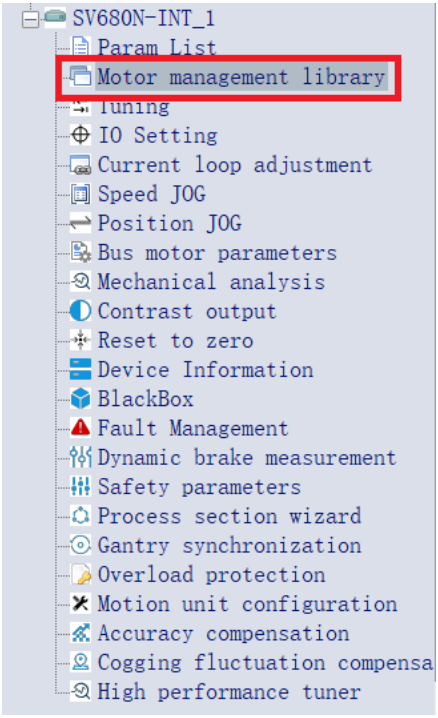
- To connect the main circuit to a single-phase 200–240 VAC power supply, use any two of terminals L1, L2, L3.
- If the keypad keeps displaying "nrd.x" or a fault code, eliminate the fault according to the related section.

9.5 Installation of Motor management library

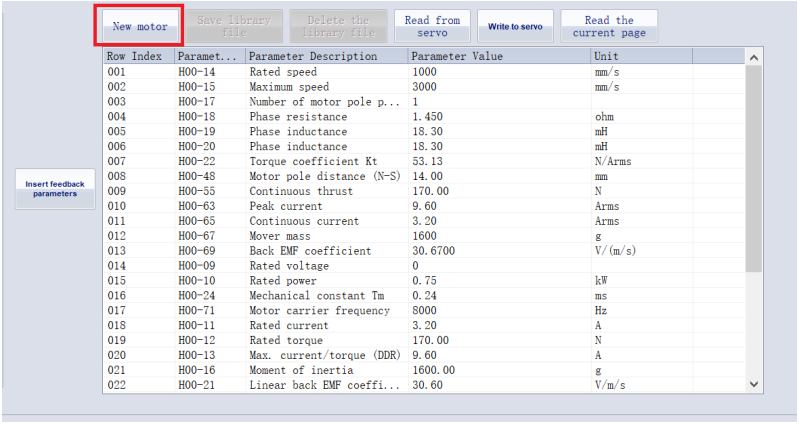
New motor matching



1. Open InoDriverShop, create an SV680-INT project, and click Motor Management Library in the left panel. The motor management library allows you to create and manage your own motor library.



2. Select **New Motor**.



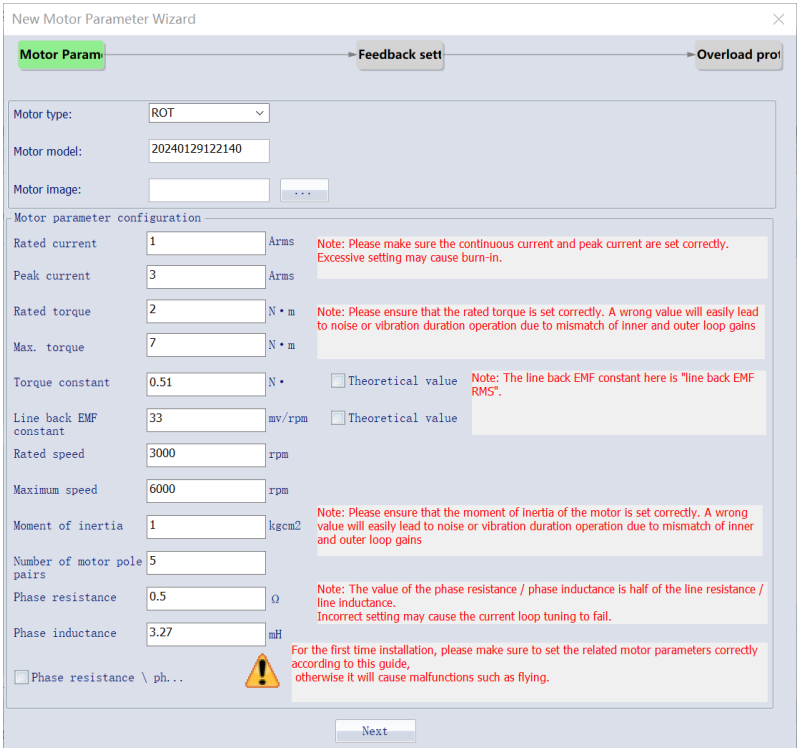
3. Create motor parameters.

   a. First, select the motor type, input the motor model name, and input the corresponding motor parameters.

Note

Motor parameters are slightly different for different motor types, so it is important to select the correct motor type. Failure to comply may result in the following consequences:

- Motor runaway: Such as motor runaway, stall, and overspeed
- The motor does not show the above symptoms, but the servo reports motor overtemperature protection (E630.0), motor runaway (E234.0), and motor overspeed (E500.x) faults.

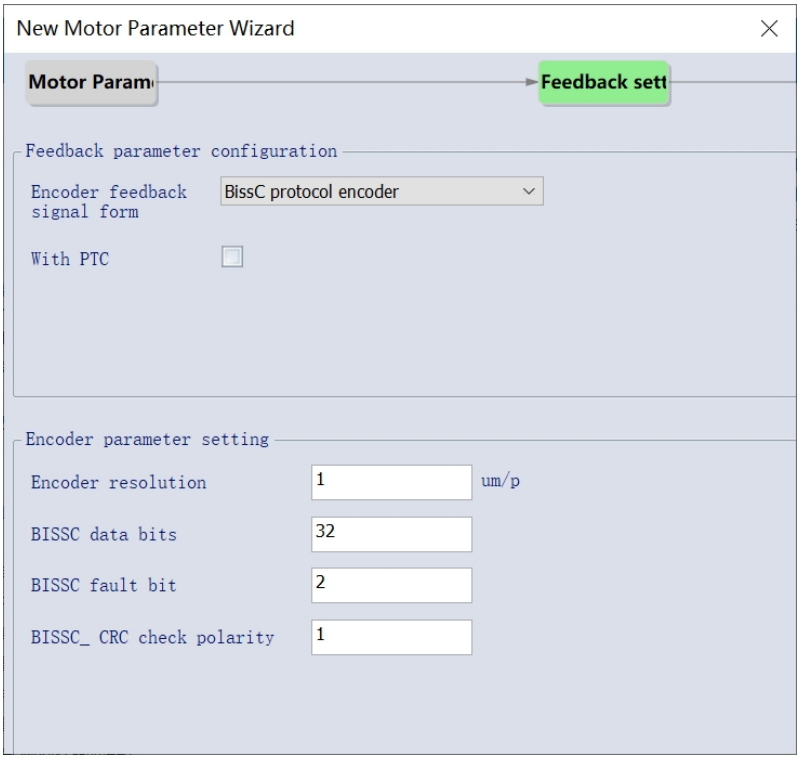


b. Select the correct encoder and configure the correct parameters according to the corresponding encoder manual.

Note

Select the correct encoder type and ensure that the encoder parameters are set correctly. Failure to comply may result in the following consequences:

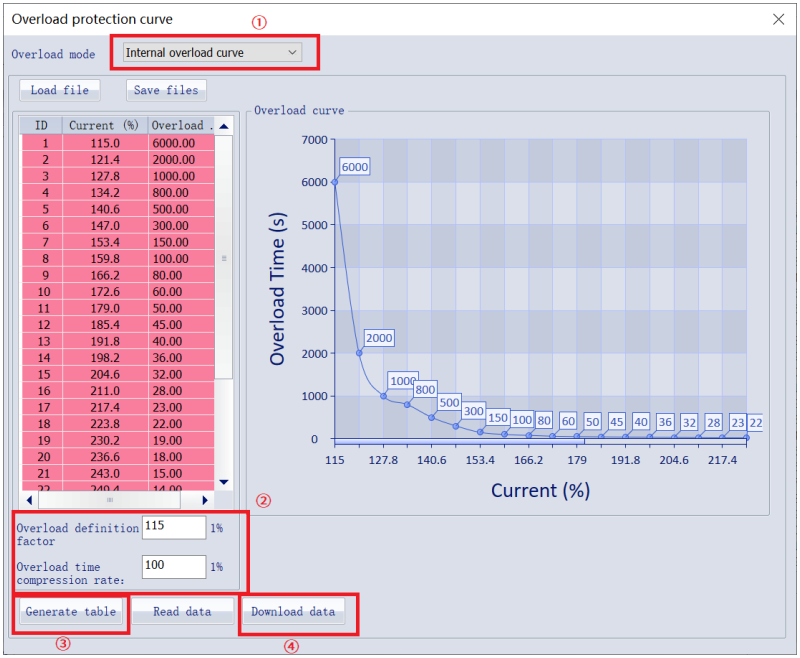
- The servo position information is incorrect, resulting in mal-function of the motor.
- Motor runaway: Such as motor runaway, stall, and overspeed
- The motor does not show the above symptoms, but the servo reports motor overtemperature protection (E630.0), motor runaway (E234.0), and motor overspeed (E500.x) faults.



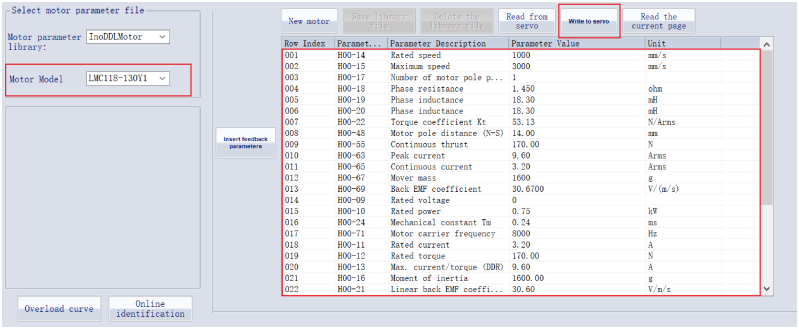
Note

- ABZ incremental encoder: Note that it may have a Z signal.
- Inovance T5 interpolator: The Inovance T5 interpolator converts an analog signal or pulse signal to a communication signal, and the number of communication signals per revolution is fixed to 8388608. Parameters related to the input interpolator need to be configured.
- BiSS-C encoder:
  - The BiSS-C encoder generally has a data bit and an error bit. You can obtain their data lengths in the corresponding encoder user guide. For the linear motor, you only need to set the total length. For the rotary motor, you need to set the total length and single-turn data length. The data length of the error bit is usually 2 bits.
  - You can obtain the communication frequency and recovery time from the encoder user guide.
  - CRC is used.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).
- SSI encoder:
  - The SSI encoder generally has a data bit and an error bit. You can obtain their data lengths in the corresponding encoder user guide. For the linear motor, you only need to set the total length. For the rotary motor, you need to set the total length and single-turn data length.
  - Parity check is used.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).
- EnDat2.2 encoder:
  - You need to set the data length for the EnDat2.2 encoder. For the linear motor, you only need to set the total length. For the rotary motor, you need to set the total length and single-turn data length.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).

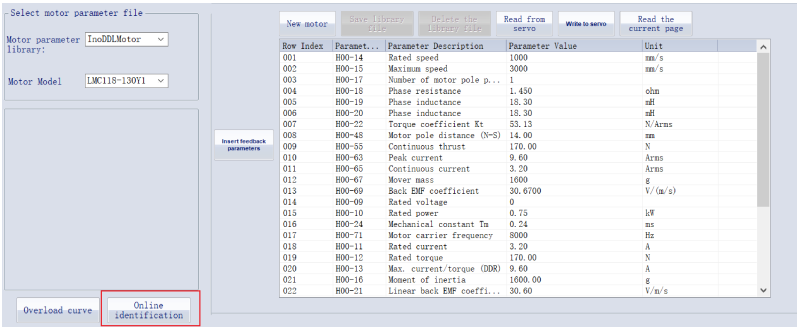
c. Select the overload protection mode and click **Done**. For details of overload protection settings, see *" Motor overload protection" on page 285*.



4. Return to the Motor Management Library page, where all motor parameters are displayed in the table on the right side. Ensure the parameters are set correctly, and click Write to Drive to download the parameters.



5. Click **Online Auto-tuning** to start auto-tuning.



Motor overload protection

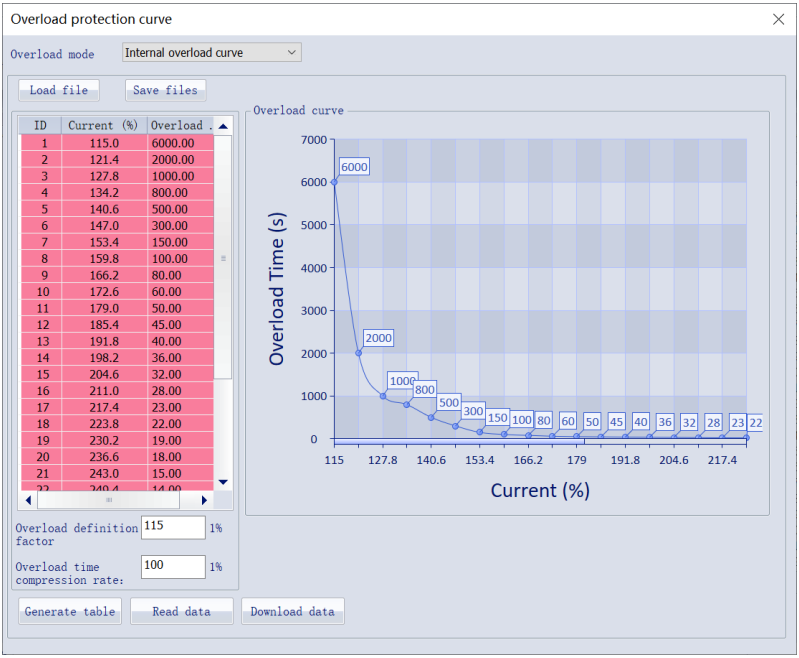
The SV680-INT provides three kinds of motor overload protection methods: internal overload curve download, overload curve download and motor overload current limit.

Method 1: Internal overload curve

To fit more applications, the internal overload curve provides two parameter adjustment overload curves, namely overload thermal limit coefficient and overload time compression ratio.

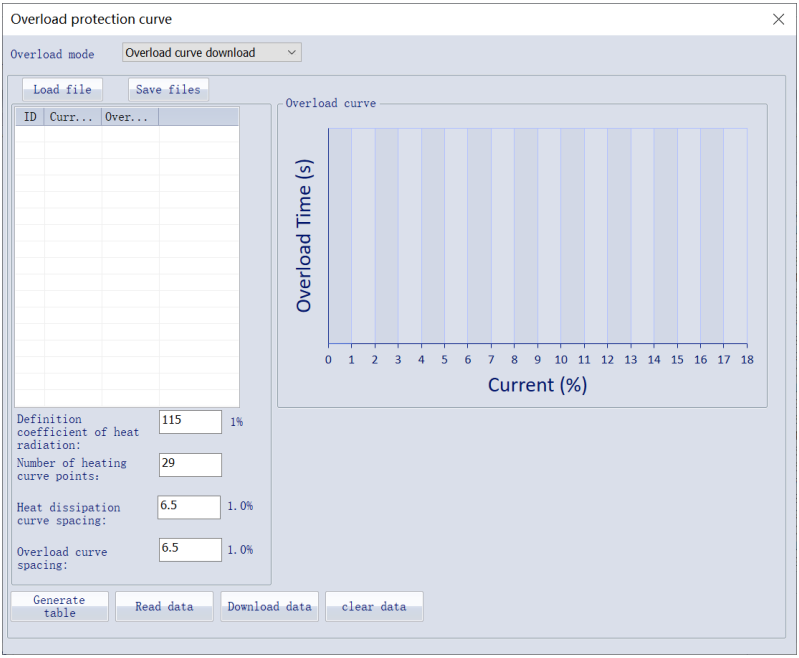
The overload thermal limit coefficient is a current value (the empirical value is about 115%) around which the motor keeps running continuously. The motor can finally stay at a constant temperature due to balance between heating and heat dissipation , that is, if the motor current is higher than this value, the motor will continue to heat up, and if it is lower than this value, the motor will be in a heat dissipation state.

The overload time compression ratio is the overall compression overload time. For example, if the current keeps at 200% for 30 seconds, an alarm is raised. If you modify the overload time compression ratio to 150% and generate a table, the current keeps at 200% for about 50 seconds.



Method 2

Overload curve download is applied to applications which require high motor overload performance. You need to know the overload curve of the matched motor and then write it into the drive.



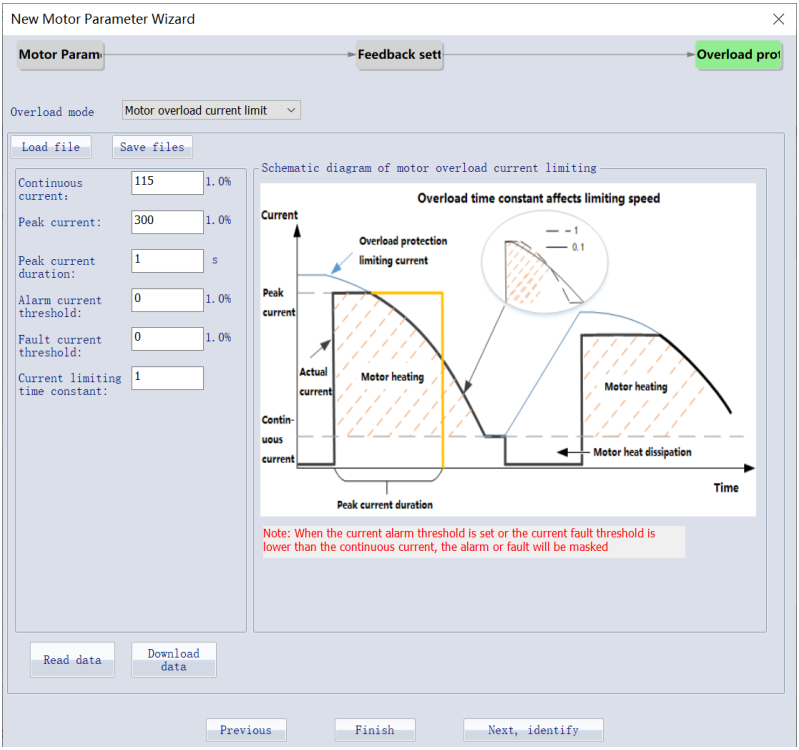
Method 3

Motor overload current limit estimates the motor heat threshold according to the duration of peak current, and then limits the motor current according to the heat generated by the motor real-time current, so as to protect the motor.

- Thermal limit current is a percentage of motor rated current defaulted to 100%, above which the motor starts to heat continuously. The motor current will be finally maintained at this value.
- Peak current: Defines the ratio of the peak current that can be reached by the motor to the rated current of the motor.
- Peak current duration: Calculate the maximum heat that can be reached by the motor based on the maximum current continuous time, and take this value as the motor overload alarm threshold.
- Alarm current threshold: If current limit protection is effective, and the limited current is lower than this value, the drive will raise an alarm.
- Fault current threshold: If current limit protection is effective, and the limited current is lower than this value, the drive will report an error.

Note

As the minimum value of the current limit protection is the thermal threshold current, when the current threshold for alarms and faults is lower than the thermal threshold current, the fault and alarm cannot be reported.



9.6 Auto-tuning of Magnetic Pole

Overview

Before controlling a direct drive or third-party motor, the drive needs to perform magnetic pole auto-tuning (that is, H0d.03 initial electrical angle auto-tuning) to determine the control electrical reference of the drive.

The drive provides 5 magnetic pole auto-tuning methods, which are detailed as follows:

Method	Operation range	Applicable motor	Applicable encoder	Load capacity
Pre-positioning	Large	Barrel/U-shaped	All	Weak
Inching	Small	All	Grating	Medium
Hall Auto-tuning	N/A	High power	All	Strong
Position locking	Tiny	All	All	Strong
Closed-loop pre-positioning	Large	All	All	Strong

Installation Method	Characteristics	Applicable Occasion	Advantages and disadvantages
Pre-positioning	Dynamic auto-tuning	Applications where the mover is allowed to move between two polar distances.	Advantages: Extensive applications.
			Disadvantages: • The mover may move violently (overshoot may occur within the travel range). • Disturbance is not allowed.
Closed-loop pre-positioning		When the mover is allowed to move within two polar distances, auto-tuning can be performed at the hard limit.	Advantages: Extensive applications.
			Disadvantages: Long operation distance.
Inching		Applications with light load (within half rated load) or no load.	Advantages: The moving range of the mover cannot be observed by naked eyes (within hundreds of pulses, which is related to the setpoint).
			Disadvantages: Disturbance is not allowed.
Position locking	Quasi-static auto-tuning	With load, Z axis, external disturbance. During auto-tuning, 100P movement (encoder unit) is allowed.	Advantages: Barely observable movement and strong disturbance resistance. An alarm can be triggered in case of mechanical interference.
			Disadvantages: For specific DDL motors or applications, you may need to fine tune the default auto-tuning parameters.
Hall Auto-tuning	Static auto-tuning	Applications where the mover is not allowed to move when the motor is powered on.	Advantages: There is no need to identify the initial angle after power-on.

Installation Method	Characteristics	Applicable Occasion	Advantages and disadvantages
			Disadvantages: Increased cost since an additional Hall sensor is required. (If static auto-tuning is selected, it is recommended to use this method.)

Note

Dynamic auto-tuning is preferred when the mover has small inertia and is able to move, while static auto-tuning is preferred when the mover has large inertia and is hard to move.

Auto-tuning state

The states are different when you match different encoders.

- For the incremental encoder, the magnetic pole auto-tuning is automatically carried out during first enabling after power-on by default. If starting conditions of angle auto-tuning are set, the auto-tuning will be started according to the conditions.
- For the absolute encoder feedback motor or a matched incremental encoder, the auto-tuning can only be carried out by setting H0d.03.

The auto-tuning state is as follows:

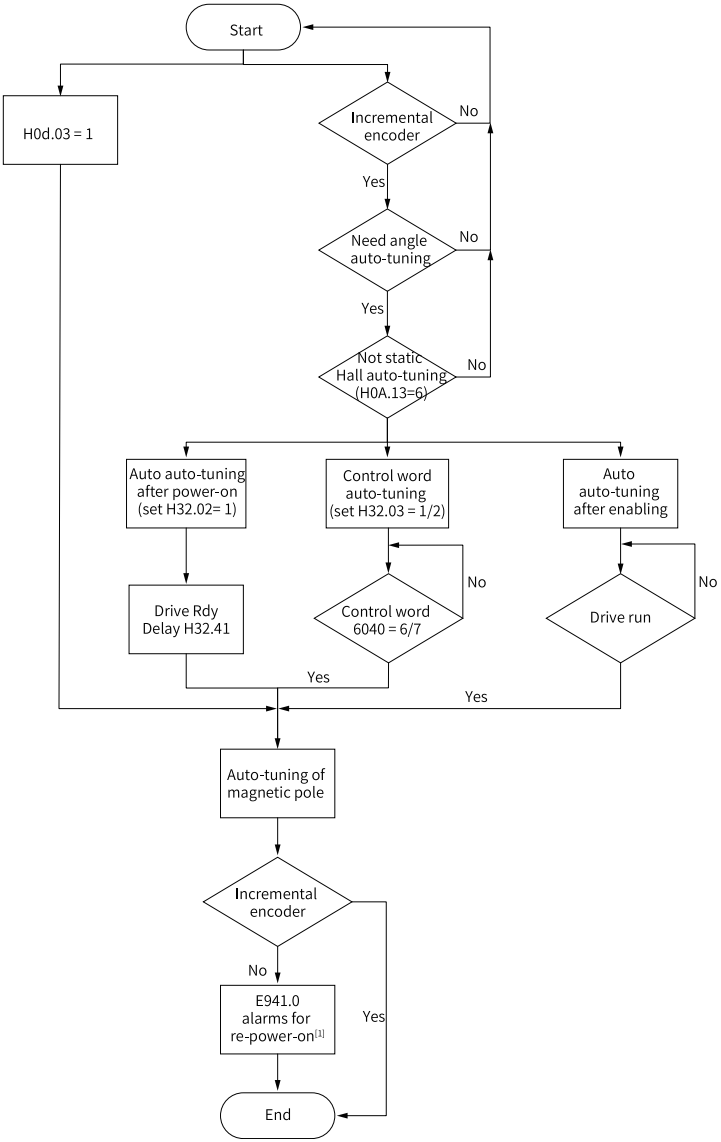


Figure 9-2 Flow chart of magnetic pole auto-tuning state

Note

- [1]: Motors with an Inovance absolute encoder must be completely powered off and then on. Complete power-off: The USB cable and control power are disconnected.After the angle auto-tuning of the Inovance encoder is done, wait for the parameter to be written, and then perform power-off (H0d.04 restored to 0 or 3).
- You are not notified by default if the incremental encoder is powered on without angle auto-tuning. You can change that through parameter H32.04. H32.04 bit0: alarm bit of 6041h, bit1: E602.9 alarm. If neither is set, neither takes effect. If bit0 is set, bit0 takes effect. If bit1 is set, bit1 takes effect. If both are set, only bit0 takes effect. After angle auto-tuning, the alarm bit or alarm is automatically reset.
- For the N model, during the first angle auto-tuning of a non-Hall incremental encoder, the motor will operate, leading to inconsistence between 607Ah (target position) and 6064h (position feedback). After auto-tuning is done and enable state is on, the motor will move towards the target position with slight jitter, which is normal. Set H32.06 to 1. After the first angle auto-tuning, 607Ah (target position) and 6064h (position feedback) will be aligned automatically, and the motor will no longer operate.

9.6.1 Auto-tuning Steps

For motors without a Hall component, use other auto-tuning methods. For motors with a Hall component, use Hall auto-tuning. Therefore, the auto-tuning steps are different.

Steps without a Hall sensor

Applicable to: pre-positioning auto-tuning, inching auto-tuning, closed-loop pre-positioning auto-tuning, and position locking auto-tuning.

The flow chart is as follows:

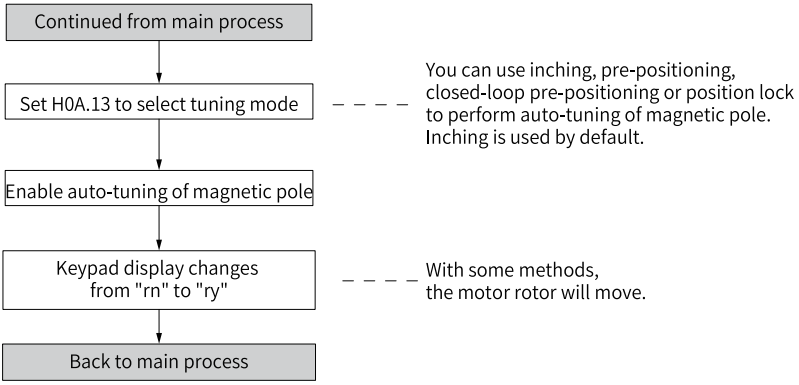


Figure 9-3 Magnetic pole auto-tuning without a Hall sensor

Magnetic pole auto-tuning process with a Hall sensor

Applicable to Hall auto-tuning

The flow chart is as follows:

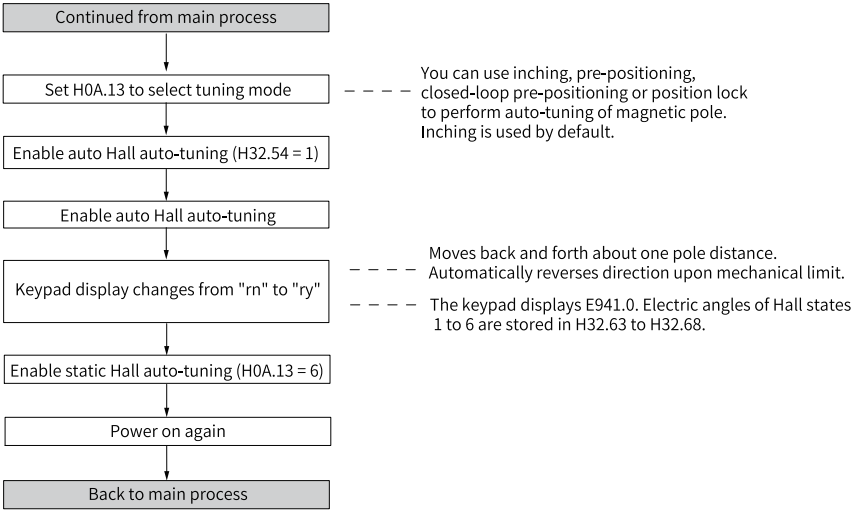


Figure 9-4 Magnetic pole auto-tuning process with a Hall sensor

9.6.2 Pre-positioning Auto-tuning

For the use of pre-positioning auto-tuning, see the related section.

During pre-positioning auto-tuning, the drive controls the motor to reciprocate several times, and the mover is finally positioned near the electrical angle.

Table 9–2 Pre-positioning Auto-tuning

Mover operation	Max. movement range	Completion
Move quickly from the power-on position to the pre-positioning 0° electrical angle, and then try to move in a smaller range. (Avoid mechanical interference)	The mover may move violently in a large range, up to the distance between N and S.	If the status displayed on the drive screen changes from "rn" to "ry", it means that the auto-tuning is successful. The auto-tuning takes about 10s.

Related Parameters:

Parameter Group			Name	Option Description	Value Range	Default	Change Mode	Effective Time
Hexadecimal		Decimal						
Group	Index	Parameter						
200 A	0Eh	H0A.13	Initial angle auto-tuning mode	0: Pre-positioning 1: Inching 6: Static Hall 8: Closed loop pre-positioning 9: Position lock	0 to 9	0	Stop setting	At once
200d	04h	H0d.03	Initial angle auto-tuning	0: No auto-tuning 1: Angle auto-tuning enabled 2: Phase sequence auto-tuning enabled	0 to 2	0	Stop setting	At once

9.6.3 Inching Auto-tuning

For the use of inching auto-tuning, see the related section.

During inching auto-tuning, the motor mover will move left and right in a small range, and you will hear the sound of current. If the state display on the the drive changes from "rn" to "ry", it means that the auto-tuning is successful and you can perform further commissioning. If E602 is displayed in the auto-tuning process, it indicates that the auto-tuning failed.

Related Parameters:

Parameter Group			Name	Option Description	Value Range	Default	Change Mode	Effective Time
Hexadecimal		Decimal						
Group	Index	Parameter						
200 A	0Eh	H0A.13	Initial angle auto-tuning mode	0: Pre-positioning 1: Inching 6: Static Hall 8: Closed-loop pre-positioning 9: Position locking	0 to 9	0	Stop setting	At once
200d	04h	H0d.03	Initial angle auto-tuning	0: No auto-tuning 1: Angle auto-tuning enabled 2: Phase sequence auto-tuning enabled	0 to 2	0	Stop setting	At once
2032	0Ah	H32.10	Max. reference current in angle auto-tuning through inching	-	10% to 300%	100%	Stop setting	At once
2032	0Dh	H32.13	Ramp-up rate of injection current in angle auto-tuning through inching	-	0.001deg to 20.000deg	0.2deg	Stop setting	At once
2032	0Eh	H32.14	Motor operation threshold (ROT/DDR) in angle auto-tuning through inching	-	0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]	1.0 [mm/s]/[rpm]	Stop setting	At once
2032	0Fh	H32.15	Motor operation threshold (DDL) in angle auto-tuning through inching	-	0.001 mm–20.000 mm	0.2 mm	Stop setting	At once
2032	10h	H32.16	Motor standstill threshold (DDL) in angle auto-tuning through inching	-	0.1 mm/s–100.0 mm/s	1.0 mm/s	Stop setting	At once

Note

- When angle auto-tuning is performed through inching, ensure that the phase sequence of the motor is correct.
- If the auto-tuning fails, see the specific fault subcode *"Table 9–3 " on page 296* to troubleshoot.

Table 9–3 Related fault codes:

Fault Code	Name	Description
E602.0	Locked-rotor	• Check for locked-rotor. • Check the connection of the power cable. • If locked rotor is reported when the motor operates, check the motor operation evaluation threshold and reduce it if necessary.
E602.3	Large encoder jitter during angle auto-tuning	When the encoder resolution is low and there is ripple, the motor standstill conditions are not met. Check the static speed feedback ripple of the encoder, and increase the standstill evaluation threshold appropriately.
E602.6	Angle auto-tuning does not converge	• Check if the bench is affected by other vibrating components. Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. • Check whether the angle gain is set too large.

9.6.4 Closed-loop Pre-positioning Auto-tuning

For the use of closed loop pre-positioning auto-tuning, see the related section.

Closed-loop pre-positioning is similar to pre-positioning. The drive controls the motor to move left and right in a range to determine the initial electrical angle of the motor, and closed-loop control is introduced to ensure smooth operation. This auto-tuning method features high load capacity. It is immune to the characteristics of the motor and encoder, and can provide accurate results.

If the mechanical limit is encountered during auto-tuning, the mover will automatically return and complete the auto-tuning.

Related Parameters:

Parameter Group			Name	Option Description	Value Range	Default	Change Mode	Effective Time
Hexadecimal		Decimal						
Group	Index	Parameter						
200 A	0Eh	H0A.13	Initial angle auto-tuning mode	0: Pre-positioning 1: Inching 6: Static Hall 8: Closed-loop pre-positioning 9: Position locking	0 to 9	0	Stop setting	At once
200d	04h	H0d.03	Initial angle auto-tuning	0: No auto-tuning 1: Angle auto-tuning enabled	0 to 2	0	Stop setting	At once

Parameter Group			Name	Option Description	Value Range	Default	Change Mode	Effective Time
Hexadecimal		Decimal						
Group	Index	Parameter						
				2: Phase sequence auto-tuning enabled				
2032	14h	H32.20	Max. reference current in angle auto-tuning through pre-positioning (closed-loop)	-	10% to 300%	100%	Stop setting	At once
2032	16h	H32.22	Electric angle for closed-loop pre-positioning	-	0.0deg to 360.0deg	0.0deg	Stop setting	At once
2032	17h	H32.23	Motor stop evaluation threshold for close-loop pre-positioning auto-tuning (ROT/DDR)	-	10.0deg to 170.0deg	90.0deg	Stop setting	At once
2032	18h	H32.24	Motor stop evaluation threshold for close-loop pre-positioning auto-tuning (DDL)	-	0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]	1.0 [mm/s]/[rpm]	Stop setting	At once
2032	1Ah	H32.26	Damping in angle auto-tuning through pre-positioning (closed-loop)	-	0.00[N/(m/s)]/[N·m/rpm]–655.35[N/(m/s)]/[N·m/rpm]	0.00[N/(m/s)]/[N·m/rpm]	Stop setting	At once

Note

If the auto-tuning fails, see the specific fault subcode *"Table 9–4 " on page 298* to troubleshoot.

Table 9–4 Related fault codes:

Fault Code	Name	Description
E602.0	Locked-rotor	• Check for locked-rotor. • Check the connection of the power cable.
E602.1	Angle auto-tuning overtravel	The movement exceeds 1 polar distance during auto-tuning. • Check for external disturbance. • If the auto-tuning current is too large or the rising slope is too large or the damping of the auto-tuning speed loop is too small, the overshoot of the motor will lead to overtravel.
E602.2	Wrong U/V/W phase sequence detected in angle auto-tuning	• First adjust phase sequence through phase sequence auto-tuning, and then carry out closed-loop pre-positioning auto-tuning again. • Adjust the phase sequence manually.
E602.3	Large encoder jitter during angle auto-tuning	When the encoder resolution is low and there is ripple, the motor stop evaluation conditions cannot not be met. Check the static speed feedback ripple of the encoder, and increase the motor stop evaluation threshold appropriately.
E602.4	Auto-tuning failed. Auto-tuning timeout.	The single-step overtravel of left and right movement exceeds 30s. • Check for locked-rotor. • Check the connection of the power cable. • If the motor moves slowly and gives an alarm, increase the auto-tuning current or reduce the damping of the auto-tuning speed loop. • If the motor stops after moving for a certain distance and then a timeout alarm is raised, increase the motor stop evaluation threshold appropriately.

9.6.5 Position Locking Auto-tuning

For the use of position locking auto-tuning, see the related section.

This auto-tuning feature barely observable movement and strong disturbance resistance. Moreover, the magnetic pole position can be correctly identified regardless of any mechanical interference and no alarm is raised.

Related Parameters:

Parameter Group			Name	Option Description	Value Range	Default	Change Mode	Effective Time
Hexadecimal		Decimal						
Group	Index	Parameter						
200 A	0Eh	H0A.13	Initial angle auto-tuning mode	0: Pre-positioning 1: Inching 6: Static Hall 8: Closed-loop pre-positioning 9: Position locking	0 to 9	0	Stop setting	At once
200d	04h	H0d.03	Initial angle auto-tuning	0: No auto-tuning 1: Angle auto-tuning enabled 2: Phase sequence auto-tuning enabled	0 to 2	0	Stop setting	At once
2032	1Eh	H32.30	Max. reference current in angle auto-tuning through position lock	-	10% to 300%	100%	Stop setting	At once
2032	21h	H32.33	Motor action threshold (ROT/DDR) in angle auto-tuning through position lock	-	0.001deg to 20.000deg	0.2deg	Stop setting	At once
2032	22h	H32.34	Motor standstill threshold (ROT/DDR) in angle auto-tuning through position lock	-	0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]	1.0 [mm/s]/[rpm]	Stop setting	At once
2032	23h	H32.35	Motor action threshold (DDL) in angle auto-tuning through position lock	-	0.001 mm–20.000 mm	0.2 mm	Stop setting	At once
2032	24h	H32.36	Motor standstill threshold (DDL) in angle auto-tuning through position lock	-	0.1 mm/s–100.0 mm/s	1.0 mm/s	Stop setting	At once

Parameter Group			Name	Option Description	Value Range	Default	Change Mode	Effective Time
Hexadecimal		Decimal						
Group	Index	Parameter						
2032	26h	H32.38	Inertia ratio in angle auto-tuning through position lock	-	0.00 to 120.0	0.00	Stop setting	At once
2032	27h	H32.39	Gain class in angle auto-tuning through position lock	-	4level to 31level	16level	Stop setting	At once

Note

- Position lock is an angle auto-tuning method with position closed loop. The position closed loop mode ensures that the movement of auto-tuning is much smaller than other angle auto-tuning methods.
- However, you need to set the auto-tuning gain parameters due to the position closed loop regulator.
- Set the auto-tuning inertia ratio and auto-tuning gain level according to the actual applications.
- If you do not know the load inertia or loop gain level during the first installation of the motor, it is recommended to use other auto-tuning methods to complete inertia auto-tuning and basic gain auto-tuning before switching to the position locking method.

Table 9–5 Related fault codes:

Fault Code	Name	Description
E602.0	Locked-rotor	• Check for locked-rotor. • Check the connection of the power cable. • If locked rotor is reported when the motor operates, check the motor operation evaluation threshold and reduce it if necessary.
E602.1	Angle auto-tuning overtravel	Large movement during auto-tuning. • Set a reasonable auto-tuning inertia ratio and appropriately increase the auto-tuning gain level. • Contact the manufacturer technical personnel.

Fault Code	Name	Description
E602.3	Large encoder jitter during angle auto-tuning	When the encoder resolution is low and there is ripple, the motor standstill conditions are not met. Check the static speed feedback ripple of the encoder, and increase the standstill evaluation threshold appropriately.
E602.6	Angle auto-tuning does not converge	• Check if the bench is affected by other vibrating components. Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. • Check whether the angle gain is set too large.

9.6.6 Hall Auto-tuning

For the use of Hall auto-tuning, see the related section.

To use Hall auto-tuning, you must install a Hall assembly and trigger dynamic auto-tuning of the Hall sensor. The state of the currently installed Hall sensor and the electrical angle value will be stored in H32.63–H32.68, and static Hall sensor auto-tuning will be enabled automatically (H0A.13=6) and a power cycle.

Related Parameters:

Parameter Group			Name	Option Description	Value Range	De fault	Unit	Change Mode	Effec tive Time
Hexadecimal		Decimal							
Group	Index	Parameter							
200 A	0Eh	H0A.13	Initial angle auto-tuning mode	0: Pre-positioning 1: Inching 6: Static Hall 8: Closed-loop pre-positioning 9: Position locking	0 to 9	0	1	Stop setting	At once
200d	04h	H0d.03	Initial angle auto-tuning	0: No auto-tuning 1: Angle auto-tuning enabled 2: Phase sequence auto-tuning enabled	0 to 2	0	1	Stop setting	At once
2032	37h	H32.54	Hall auto-tuning selection	-	0 to 65535	0	1	Stop setting	At once
2032	38h	H32.55	Hall signal UVW manual adjustment	Hall signal active level Bit0: 0: U active high 1: U active low	0 to 7	0	1	Any condi tion	At once

Parameter Group			Name	Option Description	Value Range	De fault	Unit	Change Mode	Effec tive Time
Hexadecimal		Decimal							
Group	Index	Parameter							
				bit1: 0: V active high 1: V active low bit2: 0: W active high 1: W active low					
2032	39h	H32.56	UVW filter time of Hall signal	-	0 ms–10 ms	5ms	1ms	Any condi tion	At once
2032	3Ah	H32.57	Hall closed-loop locked-rotor speed	The speed to determine if locked-rotor occurs during Hall dynamic auto-tuning	0[mm/s]/ [rpm]–65535[mm/s]/[rpm]	2 [mm/ s]/ [rpm]	1 [mm/ s]/ [rpm]	Any condi tion	At once
2032	3Bh	H32.58	Hall closed-loop locked-rotor current	-	0.0% to 300.0%	120.0 %	0.1%	Any condi tion	At once
2032	3Ch	H32.59	Hall closed-loop locked-rotor time window	-	0 ms–2000 ms	10ms	1ms	Any condi tion	At once
2032	3Dh	H32.60	Hall closed-loop inertia ratio	-	0.00 to 120.00	0	0.01	Any condi tion	At once
2032	3Eh	H32.61	Hall closed-loop rigidity	-	4 to 31	16	1	Any condi tion	At once
2032	3Fh	H32.62	Hall electrical angle saved flag	0: Not saved 1: Saved	0 to 65535	0	1	Any condi tion	Take effect after power-off.
2032	40h	H32.63	Electric angle corresponding to Hall state 1	-	0 to 65535	0	1	Any condi tion	At once
2032	41h	H32.64	Electric angle corresponding to Hall state 2	-	0 to 65535	0	1	Any condi tion	At once
2032	42h	H32.65	Electric angle corresponding to Hall state 3	-	0 to 65535	0	1	Any condi tion	At once
2032	43h	H32.66	Electric angle corresponding to Hall state 4	-	0 to 65535	0	1	Any condi tion	At once

Parameter Group			Name	Option Description	Value Range	De fault	Unit	Change Mode	Effec tive Time
Hexadecimal		Decimal							
Group	Index	Parameter							
2032	44h	H32.67	Electric angle corresponding to Hall state 5	-	0 to 65535	0	1	Any condi tion	At once
2032	45h	H32.68	Electric angle corresponding to Hall state 6	-	0 to 65535	0	1	Any condi tion	At once

9.7 Jog



When using the jog function, set the S-ON signal of the servo drive to OFF. Otherwise, this function cannot be used.

The jog function can be used in trial run to check whether the motor rotates properly, without abnormal vibration or noise generated during rotation.

This operation can be performed through keypad speed mode jogging, keypad position mode jogging, software speed mode jogging and DI jogging.

Note

The acceleration and deceleration time constants of speed and position references can be set through H06.12 during jogging.

Using the keypad (speed control mode)

- Commissioning Steps

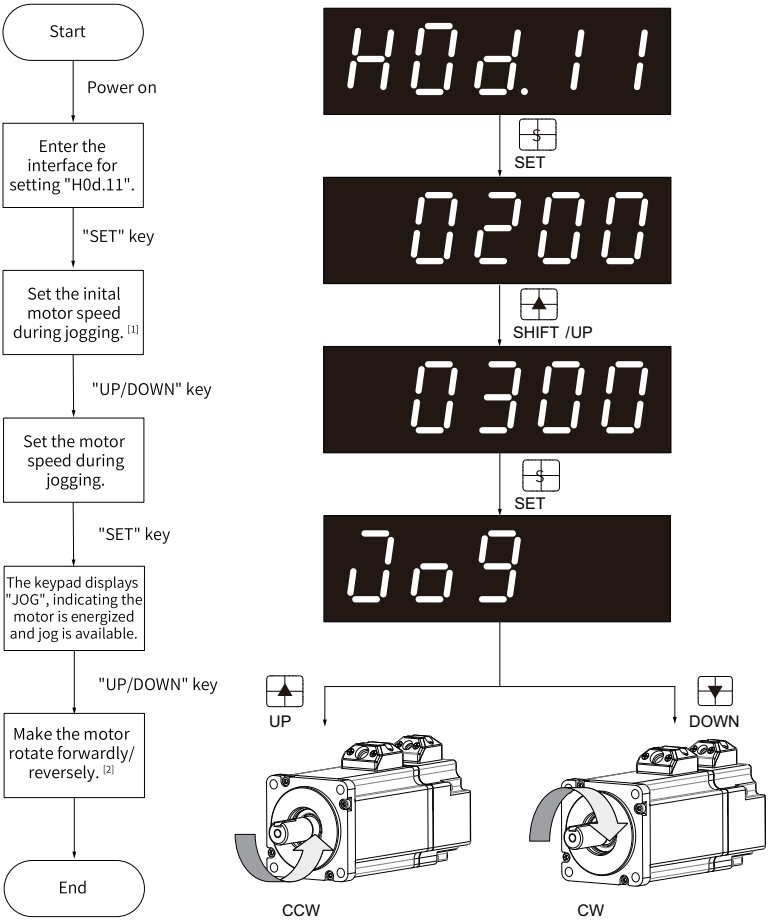


Figure 9-5 Procedure for setting the jog function

Note

- [1]: Press the UP or DOWN key to increase or decrease the jog speed. After exiting from the jog mode, the motor reverts to the initial speed.
- [2]: If magnetic pole auto-tuning is not performed after the incremental encoder motor is powered on, the auto-tuning will be automatically carried out at this time. After auto-tuning, press key UP or DOWN to enable the motor to rotate in forward or reverse direction. After you release the key, the motor stops running immediately.

- Procedure:

1. Enter the jog mode by setting H0d.11 through the keypad.

   The keypad displays the default jog speed at this moment.
2. Press the SET key and adjust the jog speed through the UP/DOWN key and press the SET key to enter the jog state.

   The keypad displays "JOG" at this moment, and the motor is energized.
3. Hold the UP/DOWN key down to make the motor jog forwardly or reversely.
4. Press the MODE key to exit the jog mode and return to the upper-level menu.

   The setpoint of H06.04 returns to the default value.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.04	2006-05h	DI jog speed reference	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	150	[mm/s]/[rpm]	Real-time

Jogging through the software tool

Steps:

1. Open the Speed JOG interface in the software tool.
2. Set the jog speed.
3. After switching the servo status to ON, press the forward/reverse arrow displayed on the interface to switch between forward and reverse jog.

Jogging through the DI

Note

Note: The jog function can be activated through the DI in any control mode.

Steps:

1. Assign FunIN.18 and FunIN.19 to two external Dis through H03 parameters..
2. Set H06.04.
3. Make the motor jog forwardly or reversely through changing the DI level status.

☆ Related parameters:

Code	Name	Function Name	Description
FunIN.18	JOGCMD+	Forward jog	Active: Input based on command Inactive: Command input stopped
FunIN.19	JOGCMD–	Reverse jog	Active: Input in reverse to the command Inactive: Command input stopped

Using the keypad (position control mode)

Procedure:

1. Enter the jog mode by setting H0d.08 through the keypad.
   The keypad displays the default jog speed at this moment.
2. Press the SET key and adjust the jog speed through the UP/DOWN key and press the SET key to enter the jog state.
3. The keypad displays "JOG-P" at this moment, and the motor is energized.
4. Hold the UP/DOWN key down to make the motor jog forwardly or reversely.
   Press the MODE key to exit the jog mode and return to the upper-level menu.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.12	2006-0Dh	Acc./dec. ramp time of speed jog	0 ms–65535 ms	10	ms	Real-time

9.8 Setting Parameters [P]

For general parameter settings, see **Setup wizard** in InoDriverShop.

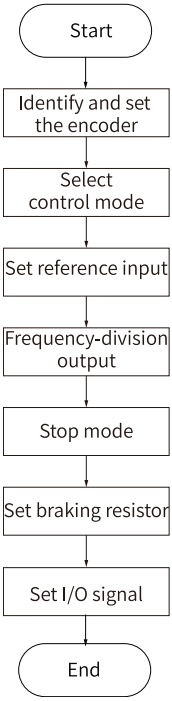


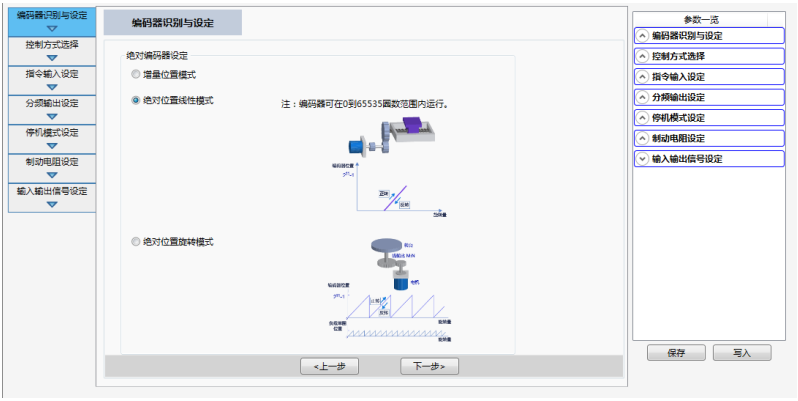
Figure 9-6 Setup wizard process

Note

Parameters set in the setup wizard process will not be written to the drive. After all settings in setup installation wizard are done, you can check the configured parameters in Parameter List and click Write to write parameters to the drive in batches.

Identify and set the encoder.

After setting the encoder type in **Encoder auto-tuning** > **Encoder setting**, click **Next** to select the **Rotation direction**, and then click **Application**. The set parameters will be generated in **Parameter list** on the right.



Set H02.02 to change the direction of rotation directly.

☆ Related parameters:

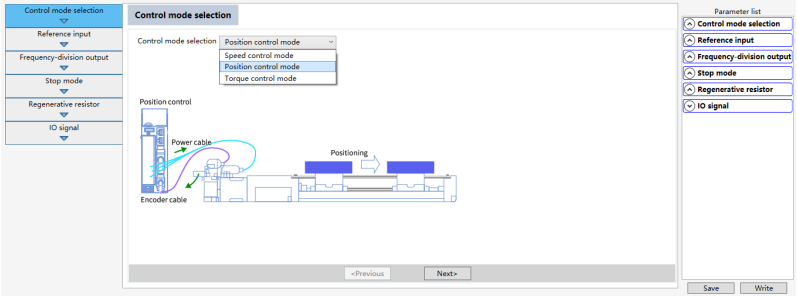
Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.02	2002-03h	Rotation direction selection	0: Counterclockwise (CCW) as forward direction 1: Clockwise (CW) as forward direction	0	-	At stop

The change of H02.02 does not affect the pulse output form or the sign (+/-) of monitoring parameter values.

Control mode selection

You can select **Speed mode**, **Position mode**, or **Torque mode** in the control mode selection interface. After selecting the control mode, click **Next** to set corresponding parameters. The sub-process that needs to be set vary with the control mode. The following takes position control as an example.

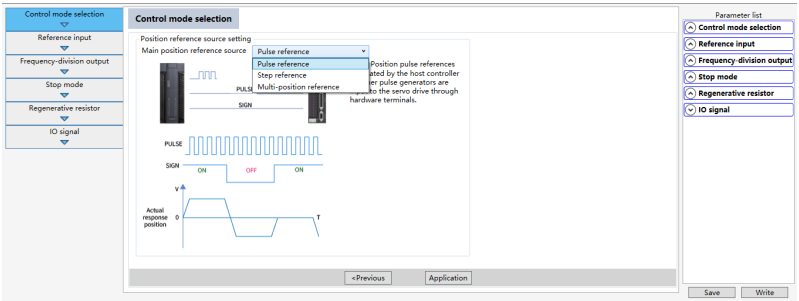
1. Select **Position mod**e in Control mode selection.



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.00	2002-01h	Control mode	0: Speed control mode 1: Position control mode 2: Torque control mode 3: Torque/Speed control mode 4: Speed/Position control mode 5: Torque/Position control mode 6: Torque/Speed/Position compound mode 7: Process segment 8: CANopen mode	1	-	At stop

2. Select **Pulse reference** in **Main position reference source**.



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.00	2005-01h	Primary position reference source	0: Pulse reference 1: Step reference 2: Multi-position reference	0	-	Real-time

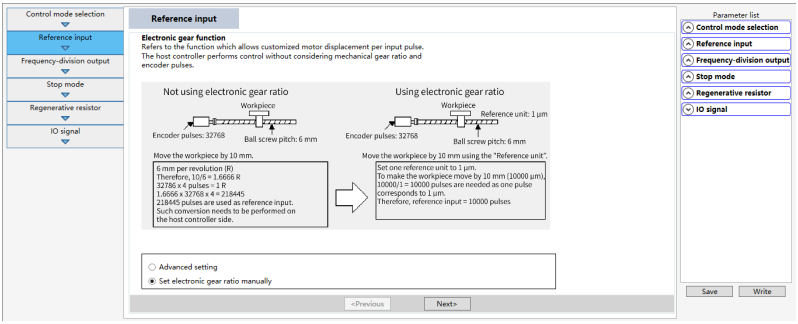
3. After setting the sub-process of the control mode, click **Application** to enter the sub-process of **Reference input**.

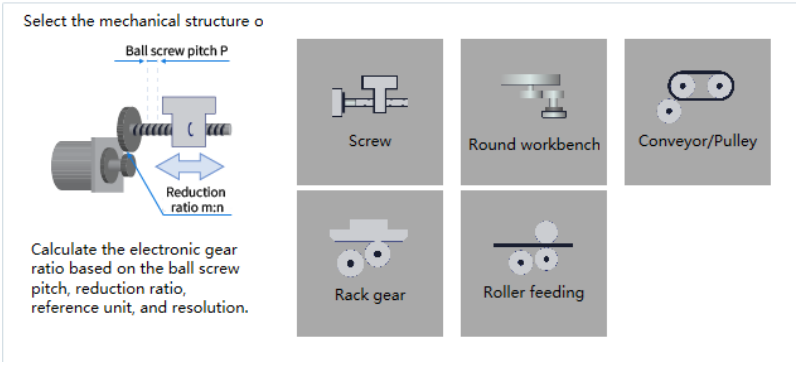
Reference input setting

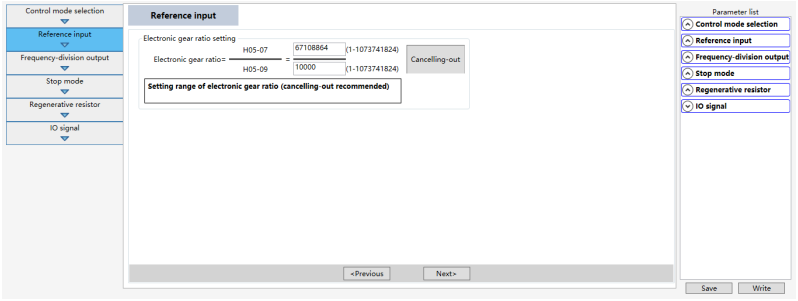
This process is used to set the gear ratio, pulse access selection, reference form, and positioning completed threshold.

- The gear ratio can be set in two ways: **Advanced setting** and **Set electronic gear ratio manually**.
  Set electronic gear ratio manually: You can input the electronic gear ratio manually.

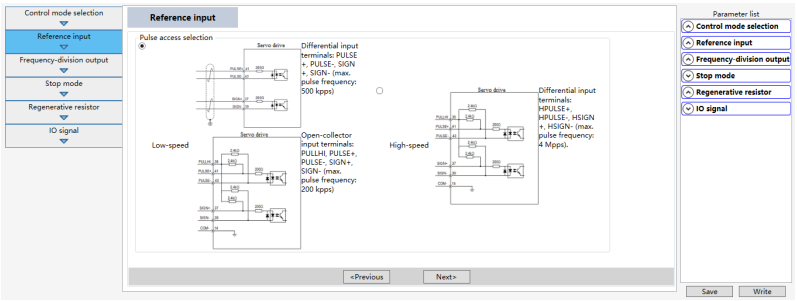
Advanced setting: You can infer the gear ratio based on different mechanical transmission mode. The mechanical transmission models shown in the following figures are supported.



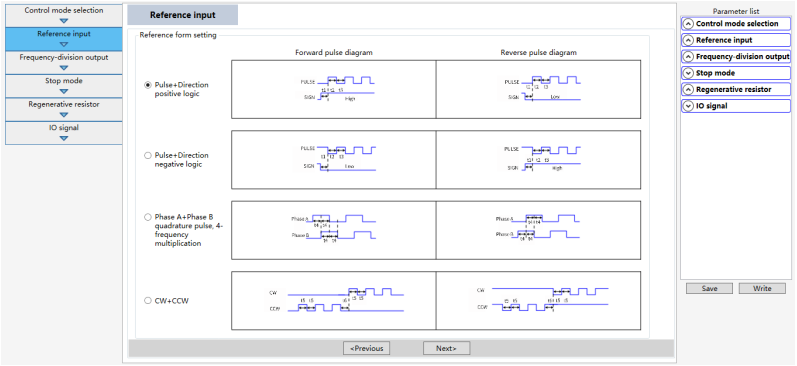




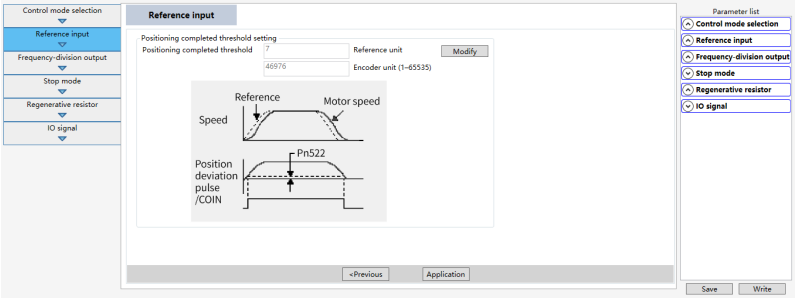
- Pulse access selection



- Reference form setting



- Positioning completed threshold setting



☆ Related parameters:

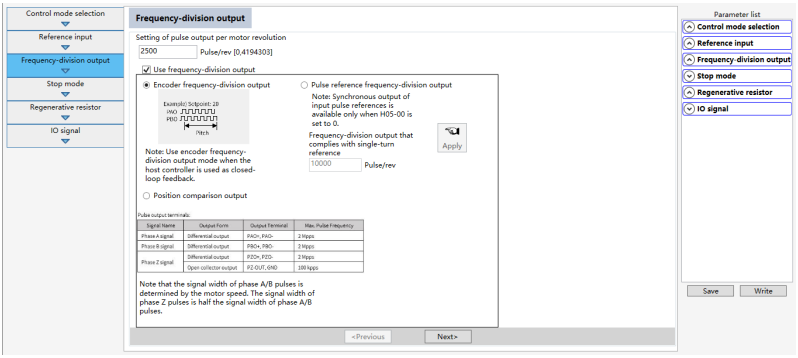
Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.02	2005-03h	Pulses per revolution	0 to 4294967295	0	[P/N-N]/[P/Rev]	At stop
H05.07	2005-08h	Electronic gear ratio 1 (numerator)	1 to 1073741824	67108864	-	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.09	2005-0Ah	Electronic gear ratio 1 (denominator)	1 to 1073741824	10000	-	Real-time
H05.11	2005-0Ch	Electronic gear ratio 2 (numerator)	1 to 1073741824	67108864	-	Real-time
H05.13	2005-0Eh	Electronic gear ratio 2 (denominator)	1 to 1073741824	10000	-	Real-time

Frequency-division output

This process is mainly used to set the encoder frequency-division output, pulse output source, and pulse output feedback direction.

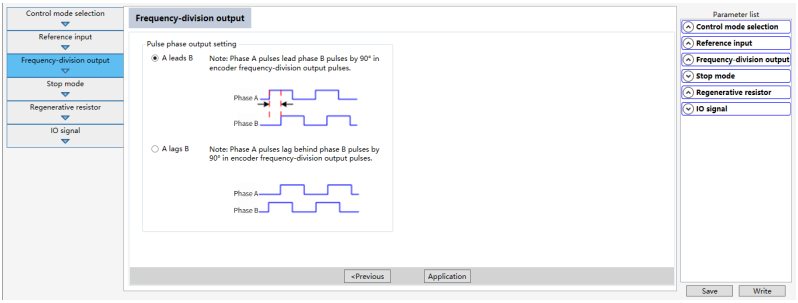
- Encoder frequency-division output



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.17	2005-12h	Number of encoder frequency-division pulses	0 to 4194303	2500	[P/N-N]/[P/Rev]	At stop

- Pulse output source



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.03	2002-04h	Output pulse phase	0: Phase A leads phase B 1: Phase A lags behind phase B	0	-	At stop

The change of H02.02 does not affect the pulse output form or the sign (+/-) of monitoring parameter values.

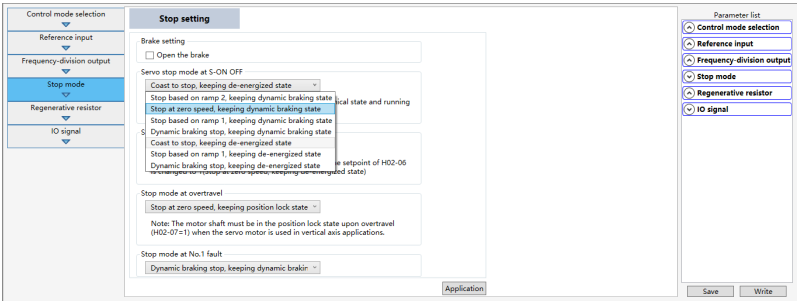
The direction of "forward drive" in overtravel prevention is the same as that defined by H02.02.

The output pulse of the servo drive is phase A + phase B quadrature pulse. The relationship between phase A and phase B pulses can be changed directly through H02.03.

Stop mode

The stop modes include Brake setting, Servo stop mode at S-ON OFF, Stop mode at No.2 fault, Stop mode at overtravel, and Stop mode at No.1 fault.

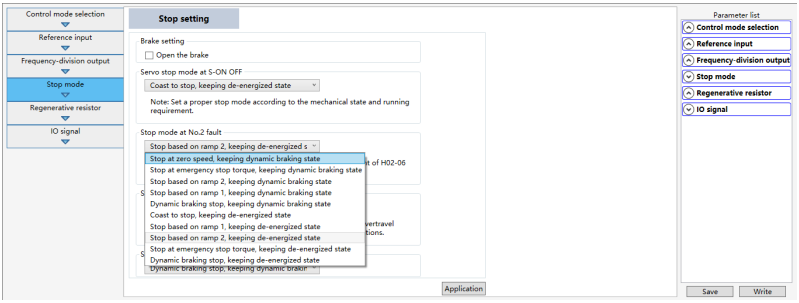
1. Select whether to use the brake in **Brake setting**.
2. Select the stop mode for stop at S-ON OFF.



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.05	2002-06h	Stop mode at S-ON OFF	-4: Stop based on ramp 2, keeping dynamic braking state -3: Stop at zero speed, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Dynamic braking stop, keeping de-energized state	0	-	Real-time

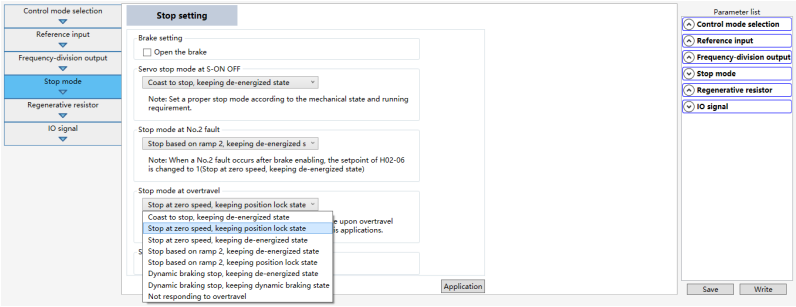
3. Select the stop mode at No.2 fault.



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.06	2002-07h	Stop mode at No. 2 fault	-5: Stop at zero speed, keeping dynamic braking state -4: Stop at emergency stop torque, keeping dynamic braking state -3: Stop based on ramp 2, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Stop based on ramp 2, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state	2	-	Real-time

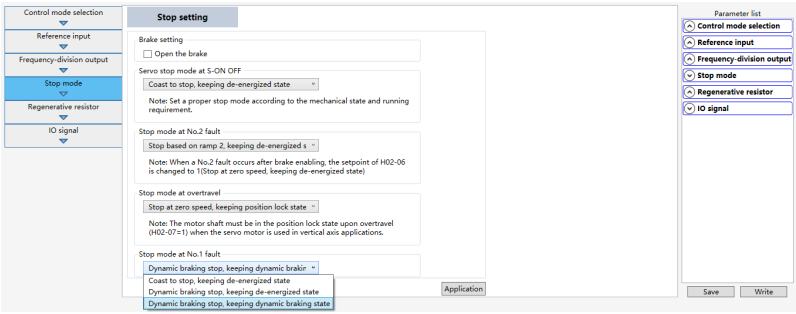
4. Select the stop mode at overtravel.



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.07	2002-08h	Stop mode at overtravel	0: Coast to stop, keeping de-energized state 1: Stop at zero speed, keeping position lock state 2: Stop at zero speed, keeping de-energized state 3: Stop based on ramp 2, keeping de-energized state 4: Stop based on ramp 2, keeping position lock state 5: Dynamic braking stop, keeping de-energized state 6: Dynamic braking stop, keeping dynamic braking state 7: Not responding to overtravel	1	-	At stop

5. Select the stop mode at No.1 fault.



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.08	2002-09h	Stop mode at No.1 fault	0: Coast to stop, keeping de-energized state 1: Dynamic braking stop, keeping de-energized state 2: Dynamic braking stop, keeping dynamic braking state	2	-	At stop

Brake setting

The brake is used to prevent the motor shaft from moving and lock the position of the motor and the motion part when the drive is in the non-operational status.

Caution

- Use the built-in brake for position-lock purpose only. Do not use this brake for any other purposes (such as braking) other than position lock in the stop state.
- The brake coil has no polarity.
- After the motor stops, switch off the S-ON signal.
- When the motor with brake runs, the brake may generate a click sound, which does not affect its function.
- If instruments such as a magnetic sensor is operating near the motor, flux leakage may occur on the motor shaft end when brake coils are energized (brake released).

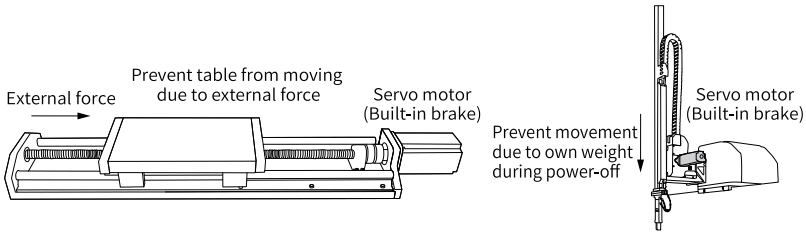


Figure 9-7 Application of the brake

Table 9–6 Brake specifications

Motor Model	Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated power (W)	Coil Resistance (Ω)±7%	Exciting Current (A)	Release Time (ms)	Apply Time (ms)	Backlash (°)
MS1H1-05B/10B MS1H4-10B	0.32	24	6.1	94.4	0.25	⩽ 20	⩽ 40	⩽ 1.5
MS1H1-20B/40B MS1H4-20B/40B	1.5		7.6	75.79	0.32	⩽ 20	⩽ 60	⩽ 1.5
MS1H1-75B/10C MS1H4-75B/10C	3.2		10	57.6	0.42	⩽ 40	⩽ 60	⩽ 1
MS1H2-10C/ 15C/20C/25C	8		17.6	32.73	0.73	⩽ 40	⩽ 100	⩽ 1
MS1H2-30C/ 40C/50C	16		24	24	1	⩽ 60	⩽ 120	⩽ 1
MS1H3-85B/ 13C/18C	16		24	24	1	⩽ 60	⩽ 120	⩽ 1
MS1H3-29C/ 44C/55C/75C	50		31	18.58	1.29	⩽ 100	⩽ 200	⩽ 1

Note

- Do not use a holding brake for braking.
- The release time and operation time of the brake depend on the discharge circuit. Be sure to confirm the operation delay of your equipment before use.
- You need to prepare the 24 VDC power supply yourself.

- Brake software setting
  For the motor with a brake, use BK+/BK– of CN8 on the servo drive and set H02.16 to 1.

  The operating sequences of the brake are different in the normal state and fault state.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.16	2002-11h	Brake enable switch	0: OFF 1: ON	0	-	Real-time

- Brake sequence in normal state
  The brake sequence in the normal state is further divided into the following two types:
  - Standstill: The actual motor speed is lower than 20 RPM.
  - Rotating: The motor speed is equal to or higher than 20 RPM.
- Brake sequence for servo motor at standstill
  If the servo enabling (S-ON) signal changes from ON to OFF, and the present motor speed is lower than 20 RPM, the servo drive acts according to the brake time sequence in the static state of the motor.



- After the brake output signal changes from "OFF" to "ON", do not input a position/speed/torque reference within the time defined by H02.09. Otherwise, reference loss or an operation error may occur.
- When the motor is used to drive a vertical axis, the motion part may move slightly under the influence of gravity or external force. If the S-ON signal is switched off, the brake output is set to "OFF" immediately when the motor is at standstill. However, within the time defined by H02.10, the motor is still energized, preventing the load from moving under the influence of gravity or external force.

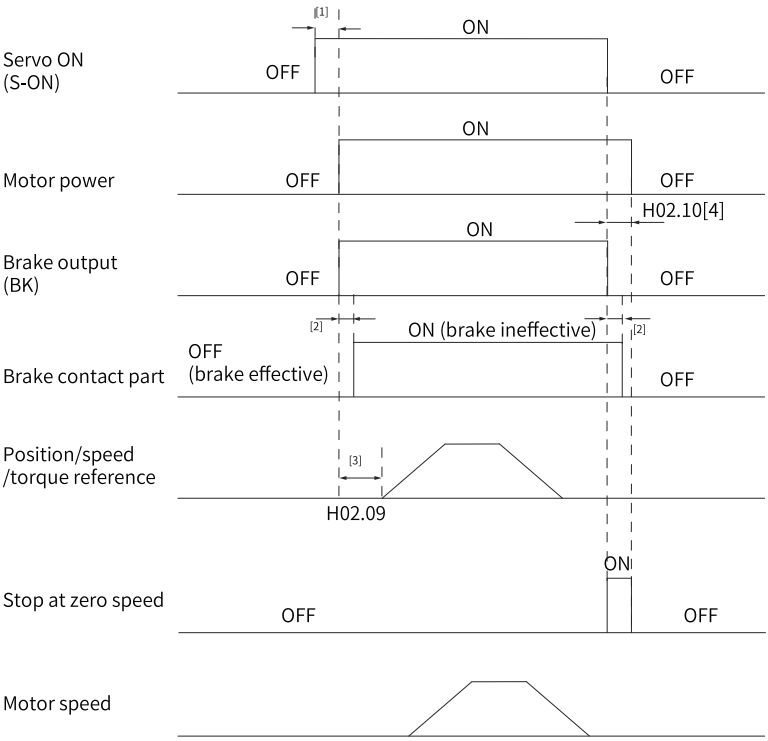


Figure 9-8 Brake sequence for motor at standstill

Note

- [1]: When the S-ON signal is switched on, the brake output is set to "ON" at a delay of about 80 ms, with motor being energized at the same time.
- [2]: For delay of brake contactor actions, see *"Table 9–6 " on page 317*.
- [3]: The interval time, starting from the moment when brake output is set to "ON" to the moment when a command is input, must be higher than the setpoint of H02.09.
- [4]: When the S-ON signal is switched off with motor at standstill (motor speed lower than 20 rpm), the brake output is set to "OFF". You can set in H02.10 the delay of the motor in entering the de-energized state after the brake output is set to "OFF".

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.09	2002-0Ah	Delay from brake output ON to command received	0 ms–500 ms	250	ms	Real-time
H02.10	2002-0Bh	Delay from brake output OFF to motor de-energized	50 ms–1000 ms	150	ms	Real-time

- Brake sequence for motor in the rotation state
  If the S-ON signal changes from ON to OFF, and the present motor speed is equal to or higher than 20 RPM, the servo drive acts according to the brake time sequence in motor rotating state.



- When the S-ON signal is switched on, do not input a position/speed/torque reference within the time defined by H02.09. Otherwise, reference loss or an operation error may occur.
- If the S-ON signal is switched off when the motor is still rotating, the motor enters the "Stop at zero speed" state, but the brake output can be set to "OFF" only when one of the following conditions is met:
  - The motor has decelerated to the value defined by H02.11, but the time defined by H02.12 is not reached.
  - The time defined by H02.12 has been reached, but the motor speed is still higher than the value defined by H02.11.
- The motor is still energized within 50 ms after the brake output changes from "ON" to "OFF". This is to prevent the motion parts from moving under the influence of gravity or external force.

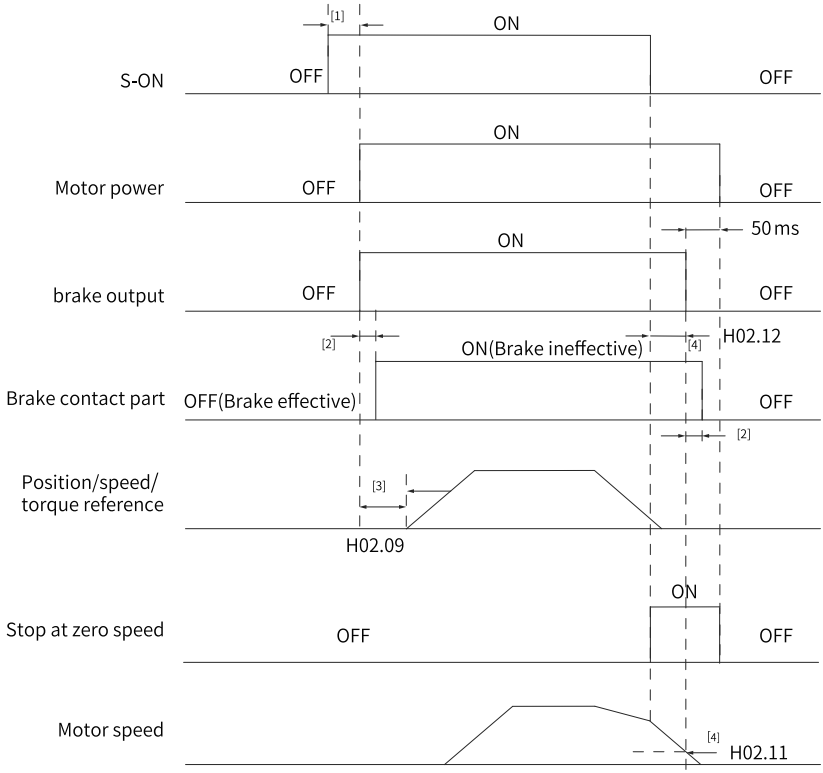


Figure 9-9 Brake sequence for a rotating motor

Note

- [1]: When the S-ON signal is switched on, the brake output is set to "ON" at a delay of about 80 ms, with motor being energized at the same time.
- [2]: For delay of brake contactor actions, see *"Table 9–6 " on page 317*.
- [3]: The interval time, starting from the moment when brake output is set to "ON" to the moment when a command is input, must be higher than the setpoint of H02.09.
- [4]: When the motor is rotating and S-ON is OFF, the motor enters a non-energized state when the brake outputs OFF after the delay set in H02.12 or the speed feedback is less than H02.11.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.11	2002-0Ch	Motor speed threshold at brake output OFF in rotation state	20[mm/s]/[rpm]–3000[mm/s]/[rpm]	30	[mm/s]/[rpm]	Real-time
H02.12	2002-0Dh	Delay from S-ON OFF to brake output OFF in rotation state	1 ms–65535 ms	500	ms	Real-time

- Brake sequence in the fault state
  Servo drive faults can be classified into No. 1 faults and No. 2 faults based on the stop mode, see Chapter "Troubleshooting" of SV680-INT Series Servo Drive Function Guide for details. The brake sequences in the fault state are further divided into the following two types:
  - In case of No. 1 faults:
    The condition for brake output is the same as the brake sequence for the motor in the rotation state. Which is to say: The brake output can be set to "OFF" only when any one of the following conditions is met:
    - The motor has decelerated to the value defined by H02.11, but the time defined by H02.12 is not reached.
    - The time defined by H02.12 has been reached, but the motor speed is still higher than the value defined by H02.11.
  - In case of No. 2 faults:
    When a No. 2 fault occurs and the brake is enabled, the stop mode is forced to "Stop at zero speed, keeping dynamic braking status".

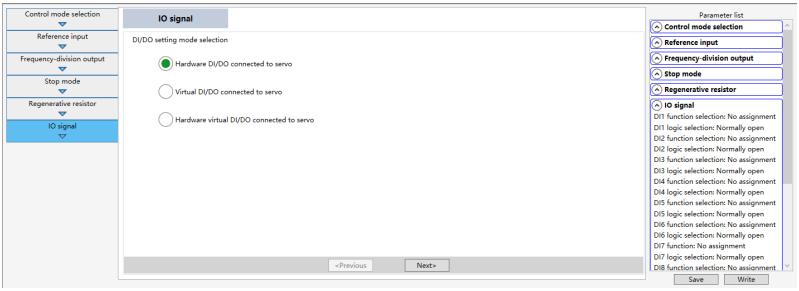
    In this case, the servo motor stops at zero speed first. When the actual motor speed is lower than 20 RPM, the brake output signal immediately becomes OFF, but the motor is still in the energized state within the time defined by H02.10.

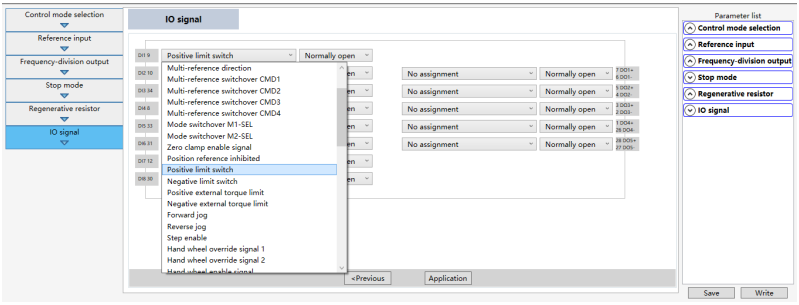
Input/Output signal setting

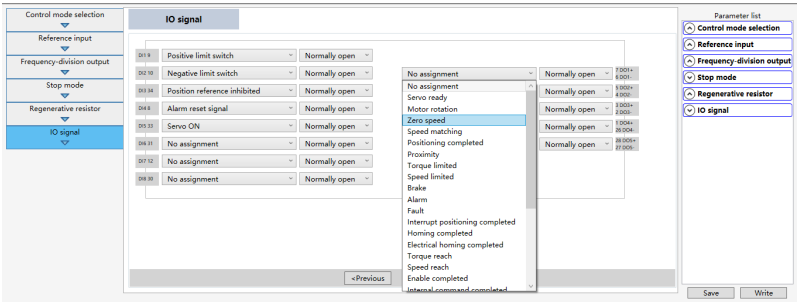
The input/output signal setting is the same as "DI/DO setting mode selection".

The DI/DO setting modes include "Hardware DI/DO connected to servo", "Virtual DI/DO connected to servo", and "Hardware virtual DI/DO connected to servo".

The corresponding default function will be generated based on different control modes selected in "Control Mode", or you can define the function as needed.







General parameters of the servo drive are set.

After preceding steps are done, you can view all the configured parameters in **Parameter list**. If parameters in the sub-process need to be adjusted, click the corresponding table to enter the sub-process directly and reset parameters.

After confirming parameters are set correctly, click **Write** to write parameters to the drive or click **Save** to save parameters.

9.9 Setting Parameters [N]

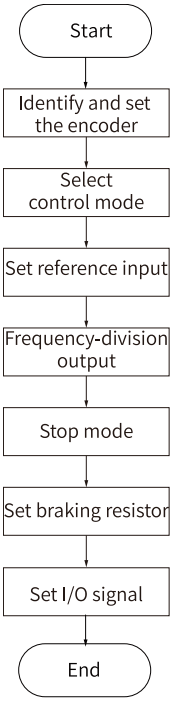


Figure 9-10 General Parameter Setting Flowchart

Identify and set the encoder.

Check whether parameter H00.00 (motor code) agrees with the motor.

Set H02.02 to change the direction of rotation directly.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H00.00	2000-01h	Motor SN	20000: Linear motor - pulse encoder 14203: Linear motor - BiSS-C encoder 14206: Linear motor - SSI encoder 14207: Linear motor - EnDat2.2 encoder 14202: Linear motor - Inovance communication 23-bit encoder 14205: Linear motor - Inovance T5 interpolator 20001: DDR motor - pulse encoder 14210: DDR motor - Inovance T5 interpolator 14201: DDR motor - Inovance communication 23-bit encoder 14211: DDR motor - BiSS-C encoder 14212: DDR motor - EnDat2.2 encoder 14213: DDR motor - SSI encoder 20002: Rotary motor - pulse encoder 14000: Rotary motor - Inovance communication 20-bit encoder 14101: Rotary motor - Inovance communication 23-bit encoder 14102: Rotary motor - Inovance communication 26-bit encoder 14020: Rotary motor - Harmonic 20-bit encoder - 2.5M baud rate 14021: Rotary motor - Harmonic 17-bit encoder - 2.5M baud rate 14022: Rotary motor - Harmonic 17-bit encoder - 4M baud rate 14120: Rotary motor - Nikon 20-bit encoder - 2.5M baud rate 14121: Rotary motor - Nikon 17-bit encoder - 2.5M baud rate 14122: Rotary motor - Nikon 17-bit encoder - 4M baud rate 14130: Rotary motor - TAMAGAWA 17-bit encoder 14131: Rotary motor - TAMAGAWA 23-bit encoder 14140: Rotary motor - EnDat2.2 encoder 14150: Rotary motor - SSI encoder 14160: Rotary motor - BiSS-C encoder	14102	-	At stop

The change of H02.02 does not affect the pulse output form or the sign (+/-) of monitoring parameter values.

The direction of "forward drive" in overtravel prevention is the same as that defined by H02.02.

Setting electronic gear ratio

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6091.01h	6091-01h	Motor resolution	1 to 4294967295	1	-	At stop
6091.02h	6091-02h	Shaft resolution	1 to 4294967295	1	-	At stop

Stop mode

The stop modes include Brake setting, Servo stop mode at S-ON OFF, Stop mode at No.2 fault, Stop mode at overtravel, and Stop mode at No.1 fault.

1. Select whether to use the brake in **Brake setting**.

   ☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
H02.16	2002-11h	Brake enable switch	0: OFF 1: ON	0	-	Real-time

2. Select the stop mode for stop at S-ON OFF.

   ☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
H02.05	2002-06h	Stop mode at S-ON OFF	–4: Ramp to stop as defined by 6085h, keeping dynamic braking state –3: at zero speed, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Dynamic braking stop, keeping de-energized state	0	-	Real-time

3. Select the stop mode at No.2 fault.

   ☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
H02.06	2002-07h	Stop mode at No. 2 fault	–5: Stop at zero speed, keeping dynamic braking state –4: Stop at emergency stop torque, keeping dynamic braking state –3: Ramp to stop as defined by 6085h, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state	2	-	Real-time

4. Select the stop mode at overtravel.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
H02.07	2002-08h	Stop mode at overtravel	0: Coast to stop, keeping de-energized state 1: Stop at zero speed, keeping position lock state 2: Stop at zero speed, keeping de-energized state 3: Stop based on ramp, keeping de-energized state 4: Stop based on ramp, keeping position lock state 5: Dynamic braking stop, keeping de-energized state 6: Dynamic braking stop, keeping dynamic braking state 7: Not responding to overtravel	1	-	At stop

5. Select the stop mode at No.1 fault.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
H02.08	2002-09h	Stop mode at No.1 fault	0: Coast to stop, keeping de-energized state 1: Dynamic braking stop, keeping de-energized state 2: Dynamic braking stop, keeping dynamic braking state	2	-	At stop

Brake setting

The brake is used to prevent the motor shaft from moving and lock the position of the motor and the motion part when the drive is in the non-operational status.

Caution

- Use the built-in brake for position-lock purpose only. Do not use this brake for any other purposes (such as braking) other than position lock in the stop state.
- The brake coil has no polarity.
- After the motor stops, switch off the S-ON signal.
- When the motor with brake runs, the brake may generate a click sound, which does not affect its function.
- If instruments such as a magnetic sensor is operating near the motor, flux leakage may occur on the motor shaft end when brake coils are energized (brake released).

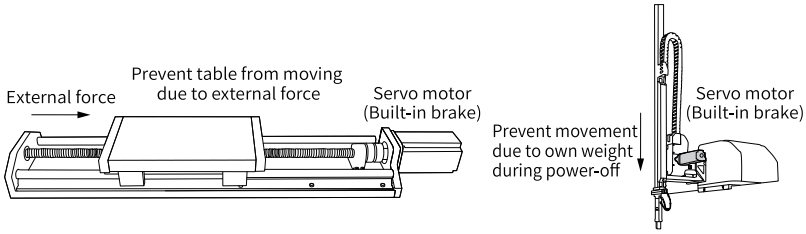


Figure 9-11 Application of the brake

Table 9–7 Brake specifications

Motor Model	Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated power (W)	Coil Resistance (Ω)±7%	Exciting Current (A)	Release Time (ms)	Apply Time (ms)	Backlash (°)
MS1H1-05B/10B MS1H4-10B	0.32	24	6.1	94.4	0.25	⩽ 20	⩽ 40	⩽ 1.5
MS1H1-20B/40B	1.5		7.6	75.79	0.32	⩽ 20	⩽ 60	⩽ 1.5

Motor Model	Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated power (W)	Coil Resistance (Ω)±7%	Exciting Current (A)	Release Time (ms)	Apply Time (ms)	Backlash (°)
MS1H4-20B/40B								
MS1H1-75B/10C MS1H4-75B/10C	3.2		10	57.6	0.42	⩽ 40	⩽ 60	⩽ 1
MS1H2-10C/ 15C/20C/25C	8		17.6	32.73	0.73	⩽ 40	⩽ 100	⩽ 1
MS1H2-30C/ 40C/50C	16		24	24	1	⩽ 60	⩽ 120	⩽ 1
MS1H3-85B/ 13C/18C	16		24	24	1	⩽ 60	⩽ 120	⩽ 1
MS1H3-29C/ 44C/55C/75C	50		31	18.58	1.29	⩽ 100	⩽ 200	⩽ 1

Note

- Do not use a holding brake for braking.
- The release time and operation time of the brake depend on the discharge circuit. Be sure to confirm the operation delay of your equipment before use.
- You need to prepare the 24 VDC power supply yourself.

- Brake software setting
  For the servo motor with a brake, use BK+/BK– of CN8 on the servo drive and set H02.16 to 1.

  The operating sequences of the brake are different in the normal state and fault state.

  ☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
H02.16	2002-11h	Brake enable switch	0: OFF 1: ON	0	-	Real-time

- Brake sequence in normal state
  The brake sequence in the normal state is further divided into the following two types:
  - Standstill: The actual motor speed is lower than 20 RPM.
  - Rotating: The motor speed is equal to or higher than 20 RPM.
- Brake sequence for servo motor at standstill

If the servo enabling (S-ON) signal changes from ON to OFF, and the present motor speed is lower than 20 RPM, the servo drive acts according to the brake time sequence in the static state of the motor.

Caution

- After the brake output signal changes from "OFF" to "ON", do not input a position/speed/torque reference within the time defined by H02.09. Otherwise, reference loss or an operation error may occur.
- When the motor is used to drive a vertical axis, the motion part may move slightly under the influence of gravity or external force. If the S-ON signal is switched off, the brake output is set to "OFF" immediately when the motor is at standstill. However, within the time defined by H02.10, the motor is still energized, preventing the load from moving under the influence of gravity or external force.

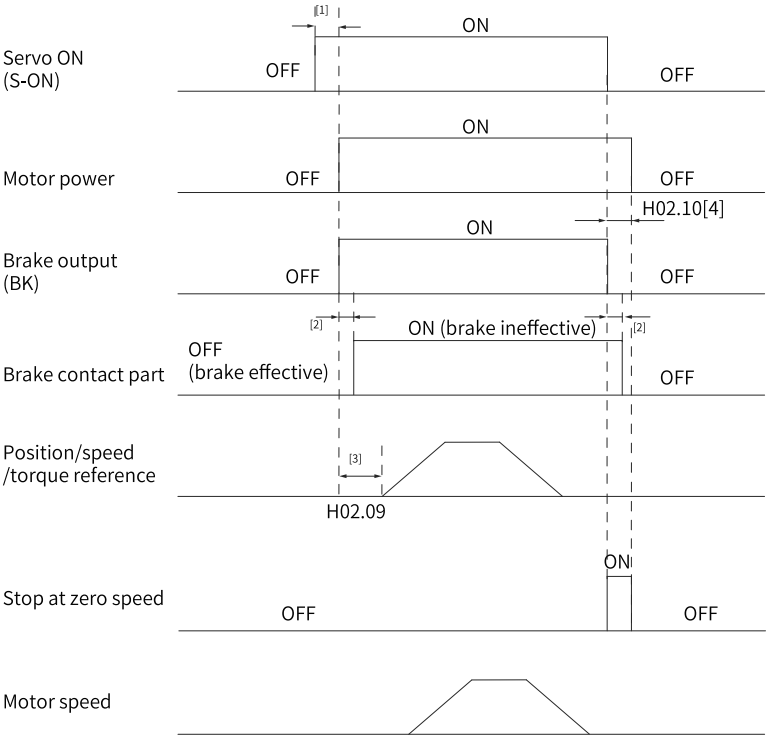


Figure 9-12 Brake sequence for motor at standstill

Note

- [1]: When the S-ON signal is switched on, the brake output is set to "ON" at a delay of about 80 ms, with motor being energized at the same time.
- [2]: For delay of brake contactor actions, see *"Table 9–7 " on page 328*.
- [3]: The interval time, starting from the moment when brake output is set to "ON" to the moment when a command is input, must be higher than the setpoint of H02.09.
- [4]: When the S-ON signal is switched off with motor at standstill (motor speed lower than 30 rpm), the brake output is set to "OFF". You can set in H02.10 the delay of the motor in entering the de-energized state after the brake output is set to "OFF".

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
H02.09	2002-0Ah	Delay from brake output ON to command received	0 ms–500 ms	250	ms	Real-time
H02.10	2002-0Bh	Delay from brake output OFF to motor de-energized	50 ms–1000 ms	150	ms	Real-time

- Brake sequence for motor in the rotation state
  If the S-ON signal changes from ON to OFF, and the present motor speed is equal to or higher than 20 RPM, the servo drive acts according to the brake time sequence in motor rotating state.



- When the S-ON signal is switched on, do not input a position/speed/torque reference within the time defined by H02.09. Otherwise, reference loss or an operation error may occur.
- If the S-ON signal is switched off when the motor is still rotating, the motor enters the "Stop at zero speed" state, but the brake output can be set to "OFF" only when one of the following conditions is met:
  - The motor has decelerated to the value defined by H02.11, but the time defined by H02.12 is not reached.
  - The time defined by H02.12 has been reached, but the motor speed is still higher than the value defined by H02.11.
- The motor is still energized within 50 ms after the brake output changes from "ON" to "OFF". This is to prevent the motion parts from moving under the influence of gravity or external force.

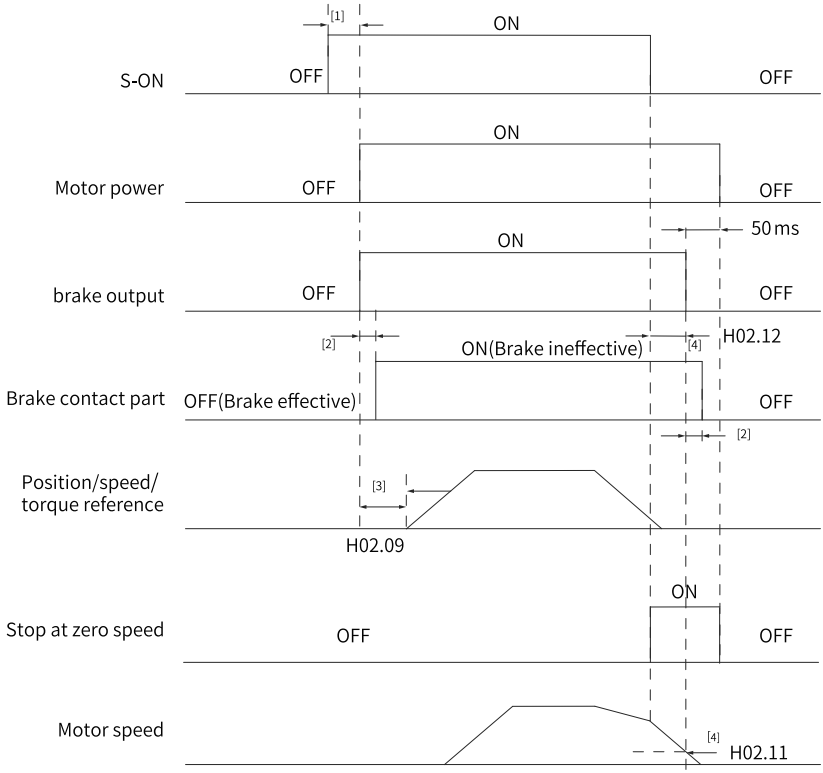


Figure 9-13 Brake sequence for a rotating motor

Note

- [1]: When the S-ON signal is switched on, the brake output is set to "ON" at a delay of about 80 ms, with motor being energized at the same time.
- [2]: For delay of brake contactor actions, see *"Table 9–7 " on page 328*.
- [3]: The interval time, starting from the moment when brake output is set to "ON" to the moment when a command is input, must be higher than the setpoint of H02.09.
- [4]: When the motor is rotating and S-ON is OFF, the motor enters a non-energized state when the brake outputs OFF after the delay set in H02.12 or the speed feedback is less than H02.11.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
H02.11	2002-0Ch	Motor speed threshold at brake output OFF in rotation state	20[mm/s]/[rpm]–3000[mm/s]/[rpm]	30	[mm/s]/[rpm]	Real-time
H02.12	2002-0Dh	Delay from S-ON OFF to brake output OFF in rotation state	1 ms–65535 ms	500	ms	Real-time

- Brake sequence in the fault state
  Servo drive faults can be classified into No. 1 faults and No. 2 faults based on the stop mode, see Chapter "Troubleshooting" of SV680-INT Series Servo Drive Function Guide for details. The brake sequences in the fault state are further divided into the following two types:
  - In case of No. 1 faults:
    The condition for brake output is the same as the brake sequence for the motor in the rotation state. Which is to say: The brake output can be set to "OFF" only when any one of the following conditions is met:
    - The motor has decelerated to the value defined by H02.11, but the time defined by H02.12 is not reached.
    - The time defined by H02.12 has been reached, but the motor speed is still higher than the value defined by H02.11.
  - In case of No. 2 faults:
    When a No. 2 fault occurs and the brake is enabled, the stop mode is forced to "Stop at zero speed, keeping dynamic braking status".

    In this case, the servo motor stops at zero speed first. When the actual motor speed is lower than 20 RPM, the brake output signal immediately becomes OFF, but the motor is still in the energized state within the time defined by H02.10.

Input/Output signal setting

The input/output signal setting is the same as "DI/DO setting mode selection".

9.10 Drive Operation

Switch on the S-ON signal.

When a P model is in running state, the display shows "run". When a N is in running state, the display shows "88rn".

Since there is no command input at this moment, the motor does not rotate and stays locked. After a command is input, the motor starts rotating.

Table 9–8 Operation of the servo drive

No.	Item	Yes
1	During initial operation, set a proper command to make the motor run at low speed and check whether the motor rotates properly.	☐
2	Observe whether the motor rotating direction is correct. If the direction of rotation is opposite to the expected direction, check the reference signal input and the reference direction setting signal.	☐
3	If the motor rotates in the correct direction, you can view the actual speed in H0b.00 and the average load rate in H0b.12 through the keypad or the software tool.	☐
4	After checking preceding conditions, adjust related parameters to make the motor operate as desired.	☐
5	Adjust the drive according to section "Adjustment" in the function guide.	☐

Power-on sequence diagram

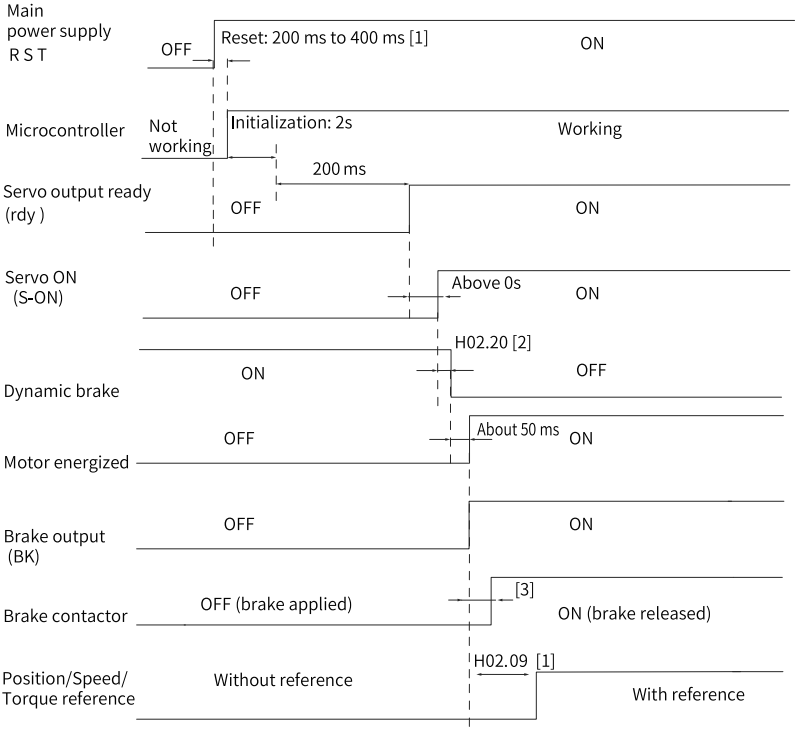


Figure 9-14 Power-on sequence diagram

Note

- [1] The DI signal used for fault reset (FunIN.2: ALM-RST) is edge triggered.
- [2] The dynamic brake is included in the standard configuration.
- [3] For the delay of brake contactor operation, see the technical data of the motor for details.
- [4] If the brake is not used, H02.09 is invalid.

Sequence diagram for stop at alarm or fault

- No. 1 fault: Coast to stop, keeping de-energized status

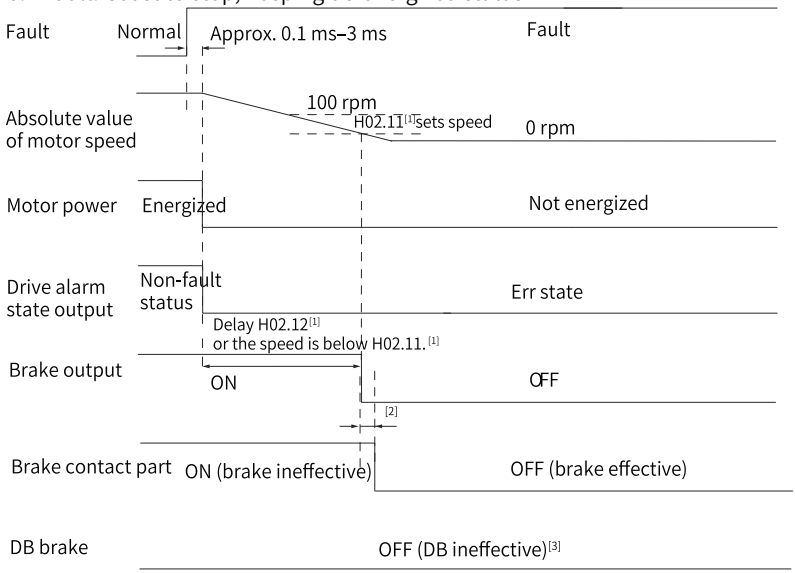


Figure 9-15 Sequence of "Coast to stop, keeping de-energized state" at No. 1 fault

Note

- [1] If the brake is not used, H02.11 and H02.12 are ineffective.
- [2] For the delay of brake contactor operation, see the technical data of the motor for details.
- [3] The dynamic brake is included in the standard configuration.

- No. 1 fault (without brake): Dynamic braking stop, keeping de-energized status

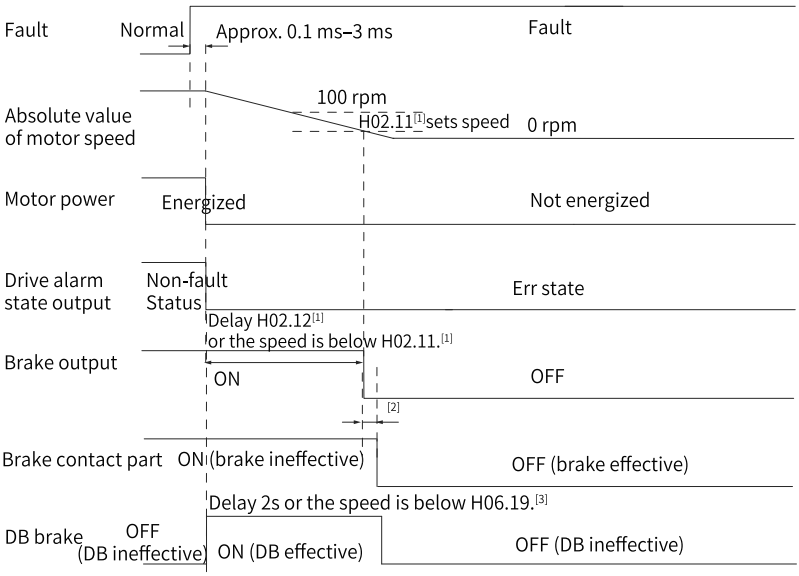


Figure 9-16 Sequence of "Dynamic braking stop, keeping de-energized state" at No. 1 fault

Note

- [1] If the brake is not used, H02.11 and H02.12 are ineffective.
- [2] For the delay of brake contactor operation, see the technical data of the motor for details.
- [3] The dynamic brake is included in the standard configuration.

- No. 1 fault: Dynamic braking stop, keeping dynamic braking state

Figure 9-17 Sequence of "Dynamic braking stop, keeping dynamic braking state" at No. 1 fault

Note

- [1] If the brake is not used, H02.11 and H02.12 are ineffective.
- [2] For the delay of brake contactor operation, see the technical data of the motor for details.
- [3] The dynamic brake is included in the standard configuration.

- No. 2 fault (without brake): Coast to stop, keeping de-energized state

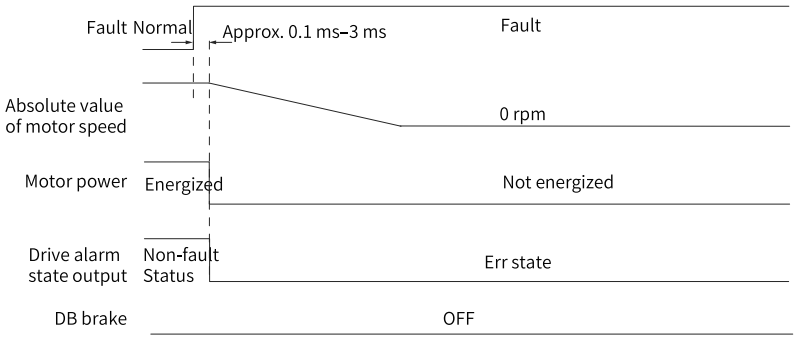


Figure 9-18 Sequence of "Coast to stop, keeping de-energized state" at No. 2 fault

- No. 2 fault (without brake): Stop at zero speed, keeping de-energized status

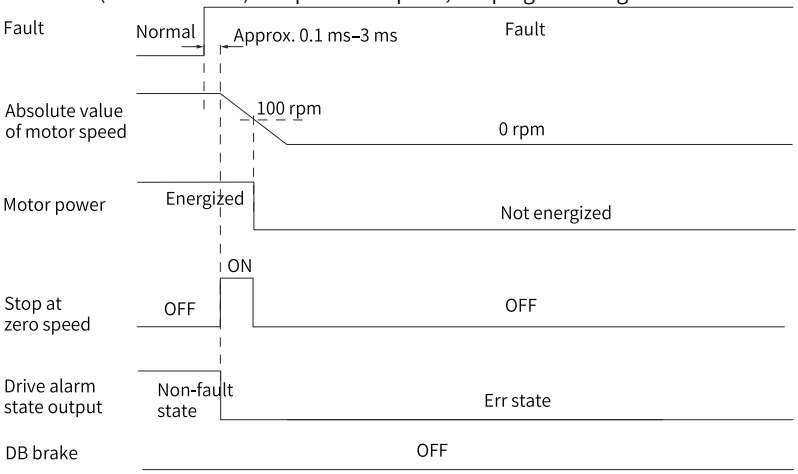


Figure 9-19 Sequence of "Stop at zero speed, keeping de-energized state" at No. 2 fault (without brake)

- No. 2 fault (without brake): Stop at zero speed, keeping dynamic braking state

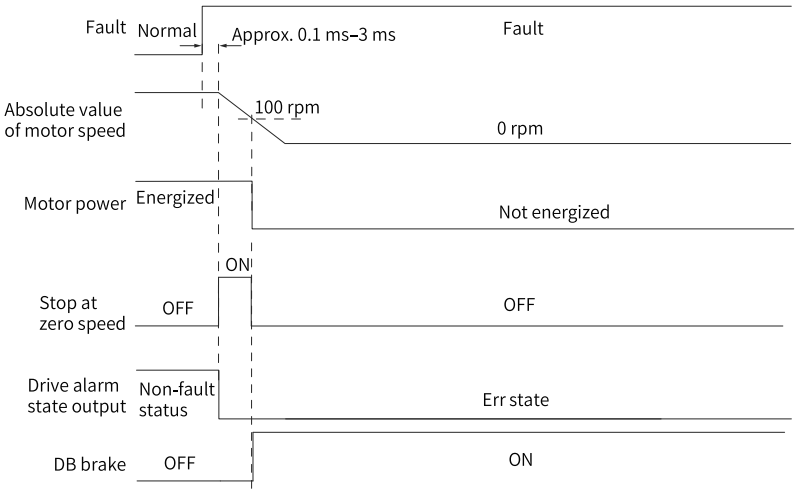


Figure 9-20 Sequence of "Stop at zero speed, keeping dynamic braking state" at No. 2 fault (without brake)

- No. 2 fault (without brake): Dynamic braking stop, keeping dynamic braking state

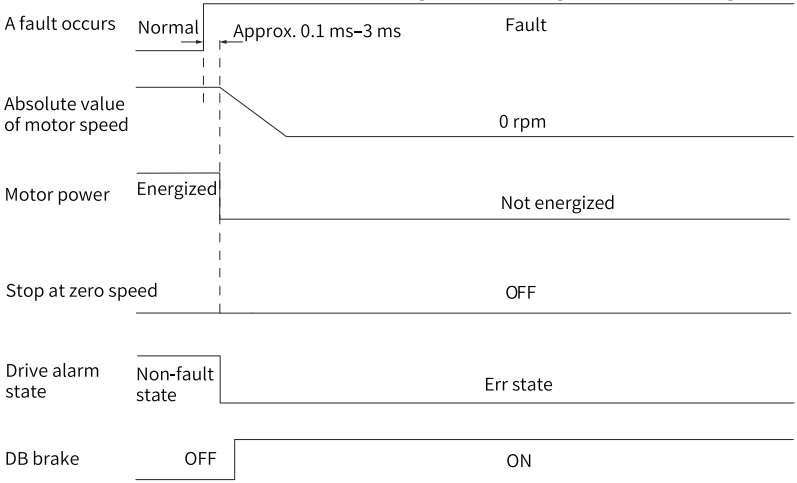


Figure 9-21 Sequence of "Dynamic braking stop, keeping dynamic braking state" at No. 2 fault (without brake)

- No. 2 fault (without brake): Dynamic braking stop, keeping de-energized state

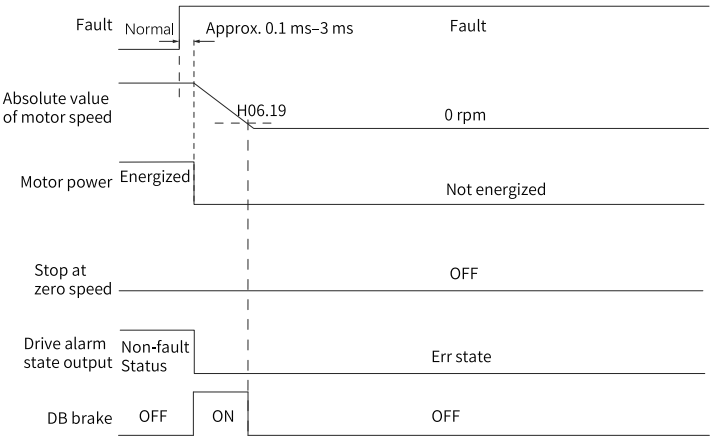


Figure 9-22 Sequence of "Dynamic braking stop, keeping de-energized state" at No. 2 fault (without brake)

- No. 2 fault (with brake): Stop at zero speed, keeping dynamic braking status

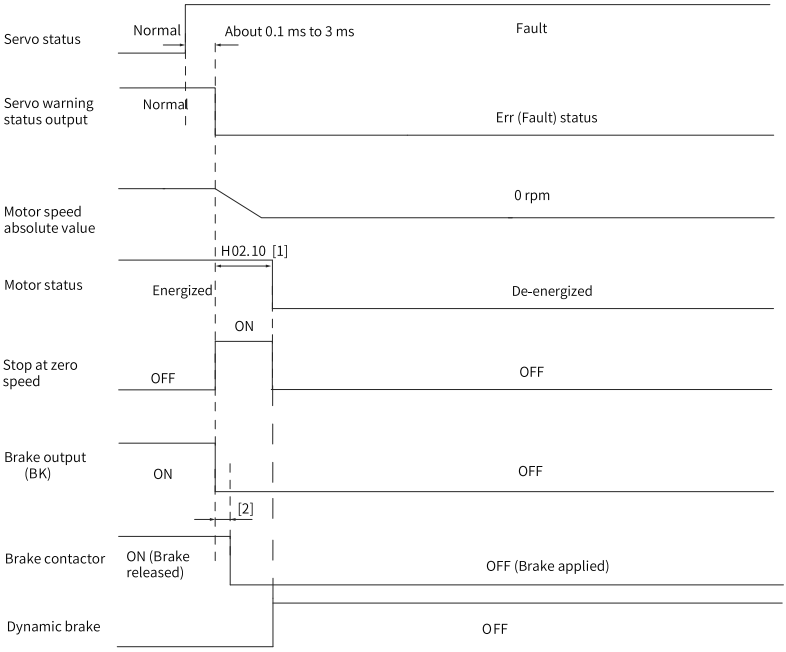


Figure 9-23 Sequence of "Stop at zero speed, keeping dynamic braking state" at No. 2 fault (with brake)

Note

- [1] If the brake is not used, H02.10 is invalid.
- [2] For the delay of brake contactor operation, see the technical data of the motor for details.

- When a No. 3 alarm occurs on the servo drive, such as E900.0 (DI emergency braking), E950.0 (Positive limit switch alarm), and E952.0 (Negative limit switch alarm), the servo drive stops according to *"Figure 9–24 Sequence for alarms that cause stop" on page 341*.
- Alarms that cause stop: Stop at zero speed, keeping position lock status

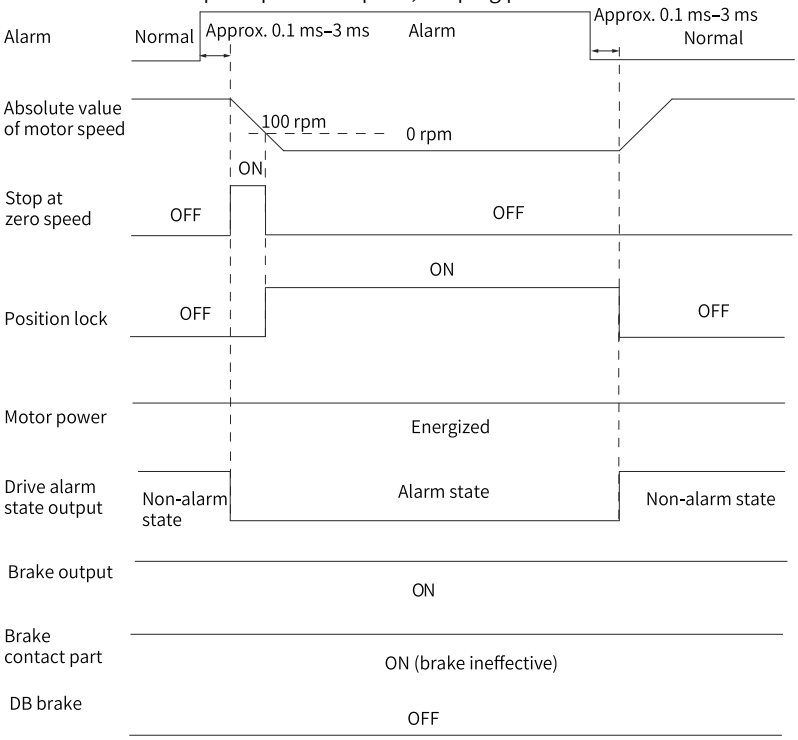


Figure 9-24 Sequence for alarms that cause stop

Other alarms do not affect the operation state of the drive. The sequence diagram for these alarms is shown in *"Figure 9–25 Sequence for alarms that do not cause stop" on page 342*.

- Alarms that do not cause stop

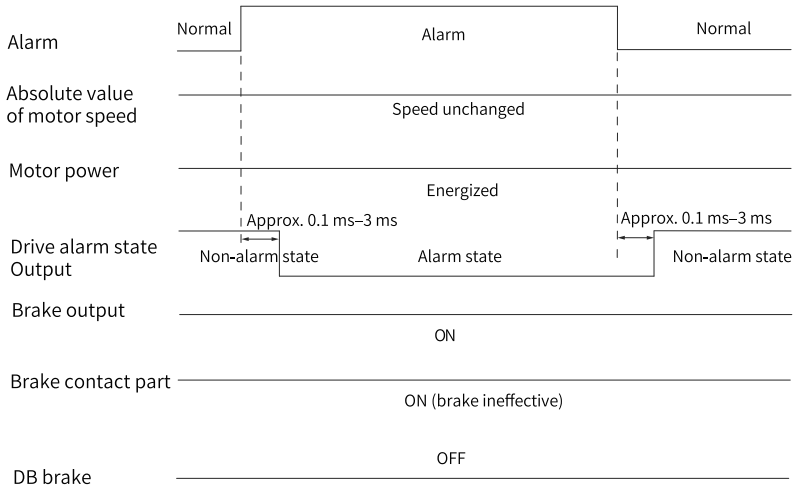


Figure 9-25 Sequence for alarms that do not cause stop

- Fault reset

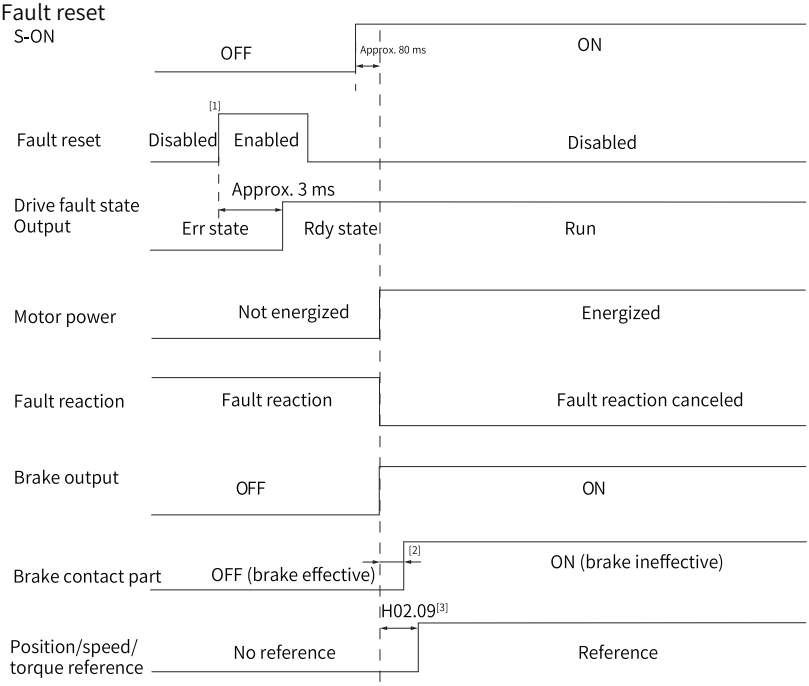


Figure 9-26 Sequence for fault reset

Note

- [1] The DI signal used for fault reset (FunIN.2: ALM-RST) is edge triggered.
- [2] For the delay of brake contactor operation, see the technical data of the motor for details.
- [3] If the brake is not used, H02.09 is invalid.

9.11 Drive stops

Five type of stop modes are available for the servo drive: coast to stop, stop at zero speed, ramp to stop, stop at emergency-stop torque, and dynamic braking stop, along with three kinds of stop status: de-energized, position lock, and dynamic braking. See the following table for details.

Table 9–9 Comparison of the stop modes

Stop Mode	Description	Feature
Coast to stop	The motor is de-energized and coasts to 0 RPM. The deceleration time is affected by the mechanical inertia and mechanical friction.	This mode features smooth and slow deceleration with small mechanical shock.
Stop at zero speed	The motor decelerates to 0 rpm immediately and stops.	Features quick deceleration with obvious mechanical shock.
Ramp to stop	The motor decelerates to 0 rpm smoothly upon position/speed/torque reference input.	Features smooth and controllable deceleration with small mechanical shock.
Stop at emergency-stop torque	The servo drive outputs reverse braking torque to stop the motor.	Features quick deceleration with obvious mechanical shock.
Dynamic braking	The motor is in the dynamic braking status.	Features quick deceleration with obvious mechanical shock.

Table 9–10 Comparison of the stop status

Stop Status	Description
De-energized	The motor is de-energized and the motor shaft can be rotated freely after the motor stops rotating.
Position Lock	The motor shaft is locked and cannot be rotated freely after the motor stops rotating.
DB state	The motor is de-energized and the motor shaft cannot be rotated freely after the motor stops rotating.

The stop events can be divided into the following types: stop at S-ON OFF, stop at fault, stop at overtravel, emergency stop, quick stop, and halt. See the following descriptions for details.

Stop at S-ON OFF

Deactivate the S-ON signal through communication to make the drive stop according to the stop mode at S-ON OFF.

☆ Related parameters [P]:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.05	2002-06h	Stop mode at S-ON OFF	-4: Stop based on ramp 2, keeping dynamic braking state -3: Stop at zero speed, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Dynamic braking stop, keeping de-energized state	0	-	Real-time

☆ Related parameters [N]:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.05	2002-06h	Stop mode at S-ON OFF	–4: Ramp to stop as defined by 6085h, keeping dynamic braking state –3: at zero speed, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Dynamic braking stop, keeping de-energized state	0	-	Real-time

Fault reaction

The stop mode varies according to the fault type. For fault classification, see section Description of Fault Codes in the parameter guide.

☆ Related parameters [P]:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.06	2002-07h	Stop mode at No. 2 fault	-5: Stop at zero speed, keeping dynamic braking state -4: Stop at emergency stop torque, keeping dynamic braking state -3: Stop based on ramp 2, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Stop based on ramp 2, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state	2	-	Real-time

☆ Related parameters [N]:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.06	2002-07h	Stop mode at No. 2 fault	–5: Stop at zero speed, keeping dynamic braking state –4: Stop at emergency stop torque, keeping dynamic braking state –3: Ramp to stop as defined by 6085h, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state	2	-	Real-time

Stop at overtravel

★ Definition of terms:

- "Overtravel": The mechanical motion exceeds the designed range of safe movement.
- Stop at overtravel: When a motion part moves beyond the range of safe movement, the limit switch outputs a level change signal, and the servo drive forcibly stops the motor.

☆ Related parameters [P]:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.07	2002-08h	Stop mode at overtravel	0: Coast to stop, keeping de-energized state 1: Stop at zero speed, keeping position lock state 2: Stop at zero speed, keeping de-energized state 3: Stop based on ramp 2, keeping de-energized state 4: Stop based on ramp 2, keeping position lock state 5: Dynamic braking stop, keeping de-energized state 6: Dynamic braking stop, keeping dynamic braking state 7: Not responding to overtravel	1	-	At stop

☆ Related parameters [N]:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.07	2002-08h	Stop mode at overtravel	0: Coast to stop, keeping de-energized state 1: Stop at zero speed, keeping position lock state 2: Stop at zero speed, keeping de-energized state 3: Stop based on ramp, keeping de-energized state 4: Stop based on ramp, keeping position lock state 5: Dynamic braking stop, keeping de-energized state 6: Dynamic braking stop, keeping dynamic braking state 7: Not responding to overtravel	1	-	At stop

When overtravel occurs on a motor used to drive a vertical axis, the workpiece may fall. To prevent the risk of falling, set H02.07 (Stop mode at overtravel) to 1. When the workpiece moves linearly, install the limit switch to prevent mechanical damage. When overtravel occurs, input a reverse running command to make the motor (workpiece) run in the opposite direction.

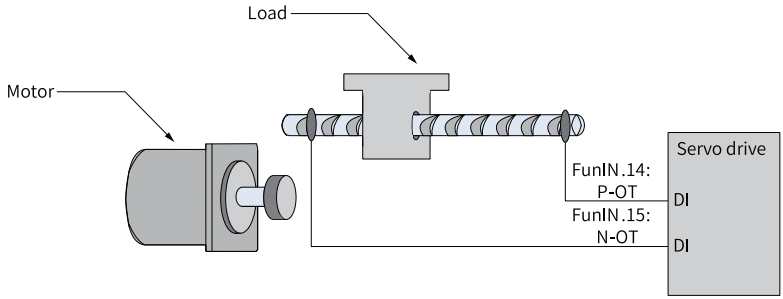


Figure 9-27 Installation of limit switches

To use the limit switches, assign FunIN.14 (P-OT, positive limit switch) and FunIN.15 (N-OT, negative limit switch) to two DIs of the servo drive and set the active logic of these DIs. This is to enable the servo drive to receive the level signals input from the limit switches. The servo drive determines whether to enable the limit switch function based on the state of the DI terminal level.

☆ Related parameters:

Code	Name	Function Name	Function
FunIN.14	P-OT	Positive limit switch	When the machine moves beyond the specified range, overtravel prevention applies. Inactive: Forward drive permitted Active: Forward drive inhibited
FunIN.15	N-OT	Negative limit switch	When the machine moves beyond the specified range, overtravel prevention applies. Inactive: Reverse drive permitted Active: Reverse drive inhibited

Emergency stop

The servo drive supports two emergency stop modes:

- Using DI function 34: FunIN.34 (EmergencyStop)
  ☆ Related parameters:

Code	Name	Function Name	Function
FunIN.34	Emergency Stop	Braking	Inactive: Current operating state unaffected Active: The servo drive stops according to the stop mode defined by H02.18 or 605Ah.

- Using the auxiliary function: emergency stop (H0d.05)
  When emergency stop is enabled, the servo drive stops immediately in the stop mode defined by H02.05 or 605Ch regardless of the operating status.

When emergency stop is enabled, the motor stops according to the mode specified by the parameter H02.18.

☆ Related parameters [P]:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0d.05	200d-06h	Emergency stop	0: No operation 1: Emergency stop	0	-	Real-time
H02.05	2002-06h	Stop mode at S-ON OFF	–4: Stop based on ramp 2, keeping dynamic braking state –3: Stop at zero speed, keeping dynamic braking state –2: Stop based on ramp 1, keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Dynamic braking stop, keeping de-energized status	0	-	Real-time
H02.15	2002-10h	LED Alarm Display	0: Warning information outputted immediately 1: Warning information not outputted	0	-	Real-time
H02.18	2002-13h	Quick stop mode	0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Stop based on ramp 2, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized status 5: Stop based on ramp 1, keeping position lock state 6: Stop based on ramp 2, keeping position lock state 7: Stop at emergency stop torque, keeping position lock state	2	-	Real-time

☆ Related parameters [N]:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0d.05	200d-06h	Emergency stop	0: No operation 1: Emergency stop	0	-	Real-time
H02.05	2002-06h	Stop mode at S-ON OFF	–4: Ramp to stop as defined by 6085h, keeping dynamic braking state –3: Stop at zero speed, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized status 2: Dynamic braking stop, keeping de-energized status	0	-	Real-time
H02.15	2002-10h	LED Alarm Display	0: Warning information outputted immediately 1: Warning information not outputted	0	-	Real-time
H02.18	2002-13h	Quick stop mode	0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized status 2: Ramp to stop as defined by 6085h, keeping de-energized status 3: Stop at emergency stop torque, keeping de-energized status 5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock status 6: Ramp to stop as defined by 6085h, keeping position lock status 7: Stop at emergency stop torque, keeping position lock state	2	-	Real-time

Quick stop

Quick stop applies when bit 2 (Quick stop) of the control word 6040h is set to 0 (Active) during operation of the servo drive. The stop mode is defined by 605Ah.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
605Ah	605Ah	Quick stop mode	0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state 6: Ramp to stop as defined by 6085h, keeping position lock state 7: Stop at emergency stop torque, keeping position lock state	2	-	Real-time

Halt

The halt function applies when bit 8 of the control word 6040h is set to 1 (Halt) during operation of the servo drive. The halt mode is defined by 605Dh.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
605Dh	605Dh	Halt mode	1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping position lock state 2: Ramp to stop as defined by 6085h, keeping position lock state 3: Stop at emergency stop torque, keeping position lock state	1	-	Real-time

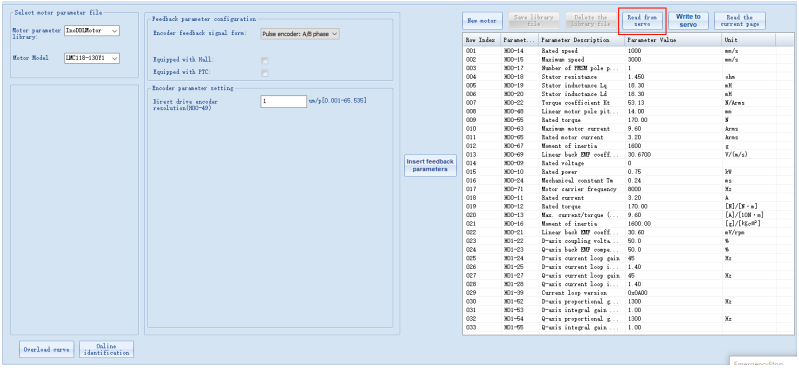


Do not set the deceleration time to an excessively low value. An excessively low value will lead to a long stop distance, incurring the risk of collision.

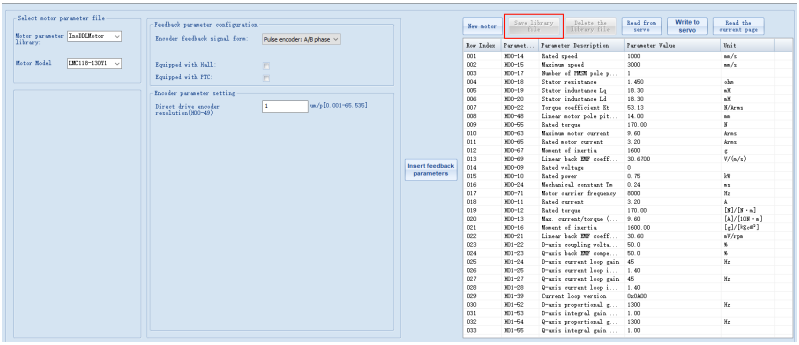
9.12 Quick Transfer of Motor Parameters

If you want to import the motor parameters from a drive to another which will connect to a motor of the same type, do the following:

1. On the **Motor Management Library** page, connect the old drive and click **Read from Drive**.



2. After parameters are read, click Save Library File to save the parameters.



3. Connect the new drive. Click User Motor Library from the motor parameter library on the left. Select the library file saved in step 2 in the motor model, and click Write to Drive.
4. Click Online Auto-tuning. Select the angle auto-tuning interface and perform the auto-tuning.

10 List of Parameters

Functions of the servo drive are listed below. See details in corresponding chapters.

Function		Description	Reference
Selection table		Servo motors, DDL motors, DDR motors, and third-party motors supported by the SV680-INT drive.	*SV680-INT series flagship servo drive*
Second encoder		ABZ incremental encoder, Inovance communication encoder, BiSS-C encoder, SSI encoder and EnDat 2.2 encoder.	-
High-resolution encoder		The servo drive supports a high-performance encoder with resolution up to 2^{26} (67108864) PPR.	-
AI, AO		Supports AI and AO.	-
Built-in brake		Used to monitor the brake status in real time.	*SV680-INT Series Servo Drive Hardware Guide*
External braking resistor		Used in case of insufficient braking capacity of the built-in braking resistor.	*SV680-INT Series Servo Drive Hardware Guide*
Electronic gear ratio		Decreasing or increasing the pulse input by: 0.001–4000 x encoder resolution/10000.	*SV680-INT Series Servo Drive Hardware Guide*
Status display		Used to display the drive status through the LED on the keypad.	*SV680-INT Series Servo Drive Quick Start Guide*
External I/O display		Used to display ON/OFF status of external I/O signals.	-
Inertia Auto-tuning	Offline	The servo drive calculates the load inertia ratio automatically through inertia auto-tuning.	
	Online	The host controller sends a command to make the motor rotate, and the servo drive calculates the load inertia ratio in real time.	
Auto Gain Tuning	STune and ETune.	The servo drive generates a group of gain parameters based on the correct inertia ratio.	
Manual Gain Tuning	Basic gains	If the auto-tuned gain values fail to deliver desired performance, fine-tune the gains manually to improve the performance.	
	Gain switchover	Used to apply different gains to different status (operating or stop) of the motor. Gains can also be switched by external terminals during operation.	
	Reference filter	Smoothens the position, speed, and torque references.	
	Feedforward gain	Improves the follow-up behavior.	
	PDFF Control	Adjusts the speed loop control mode to improve the anti-interference capability at low frequency range.	
	Torque disturbance observer	Improves the resistance against torque disturbance.	

Function		Description	Reference
	Speed Observer	The speed observer, which facilitates quick positioning, applies in applications with slight load characteristic change and constant inertia.	
	Model Tracking	The model tracking can be used to improve responsiveness and shorten the positioning time. It is only available in the position control mode.	
	Friction Compensation	Friction compensation is used to provide positive/ negative compensation values according to the direction of operation. Friction compensation is valid only in the position control mode.	
	Encoder Scale Ripple Suppression	It avoids the operation noise caused by the position for speed ripple in the control loop, and suppresses the output ripple caused by controlled speed ripple.	
	Motor Cogging Torque Ripple Compensation	It ensures the stability margin of the system and reduce the speed fluctuation.	
Parameter Adjustment in Different Control Modes	Parameter adjustment in speed/ torque/position mode	-	
Vibration suppression	Mechanical Resonance Suppression	It enables the notch to suppress the mechanical resonance that may be generated when the response speed is excessively high.	
	Low-Frequency Resonance Suppression at the Mechanical End	Activate the filter used to suppress low-frequency resonance.	
Mechanical Characteristic Analysis		Used to analyze the resonance frequency and characteristics of the mechanical system through a PC installed with Inovance software tool.	
High-performance Tuning		High performance tuning is an upgraded function of mechanical characteristic analysis, which can not only judge the mechanical resonance point and system bandwidth, but also simulate the influence of adding filters and adjusting parameters on loop control.	
Profile Position Mode (PP)		The host controller sets parameters through the bus, and the servo drive generates position references and performs positioning control.	
Profile Velocity Mode (PV)		The host controller sets parameters through the bus, and the servo drive generates speed references and performs speed control.	
Profile Torque Mode (PT)		The host controller sets parameters through the bus, and the servo drive generates torque references and performs torque control.	
Homing Mode (HM)		The host controller selects the homing mode through parameters, and the servo drive performs homing	

Function		Description	Reference
		automatically with the position feedback set to the preset value.	
Process Segment Mode		It enables the servo drive to perform positioning control, constant speed control and parameter writing operations according to servo self-planning commands and process segment setting commands.	
Position Control Mode		Used to make the servo drive operate in the position control mode. **Note: Model N only supports multi-position.**	
Speed Control Mode		Used to make the servo drive operate in the speed control mode.	
Torque Control Mode		Used to make the servo drive operate in the torque control mode.	
Mixed Control Mode [P]	Position/Speed Control Switchover Mode [P]	Used to switch between position control and speed control through external input signals.	
	Speed/Torque Control Switchover Mode [P]	Used to switch between speed control and torque control through external input signals.	
	Torque/Position Control Switchover Mode [P]	Used to switch between torque control and position control through external input signals.	
	Torque/Speed/ Position Control Switchover Mode [P]	Used to switch among torque control, speed control and position control through external input signals.	
Interpolated Position (IP) Mode [P]		The interpolation mode can be used to achieve synchronous operations of multi-axis servo drives or single-axis servo drives.	
Cyclic Synchronous Position Mode (CSP) [N]		The host controller generates position references and sends the references cyclically through the bus. The servo drive performs positioning control.	
Cyclic Synchronous Velocity Mode (CSV) [N]		The host controller generates speed references and sends the references cyclically through the bus. The servo drive performs speed control.	
Cyclic Synchronous Torque Mode (CST) [N]		The host controller generates torque references and sends the references cyclically through the bus. The servo drive performs torque control.	
Position Reference Filter		Used to achieve smooth acceleration and deceleration.	
Interrupt positioning		Used to interrupt present position reference and execute the set displacement.	
Frequency-Division Output		Used to output the position reference pulses or the position pulses fed back by the encoder in the form of phase A/phase B quadrature pulses.	
Homing		Used to search for the mechanical home automatically to locate the relative position between the mechanical home and mechanical zero	

Function	Description	Reference
Zero Clamp	Used to keep the motor speed below a certain value in the speed control mode to lock the position.	
DI signal assignment	Used to assign functions such as S-ON to corresponding pins.	-
Forced DO	Used to output signals not related to the drive status forcibly or used to check the wiring of output signals.	
Touch Probe	It is the same as the position latch function.	
Black box	The black box function is used to capture and save the data generated upon occurrence of faults or under designated conditions.	
SEMI F47 Voltage Drop	With combination of this function and H0A.84 (instantaneous power outage holding time), the drive can continue to run when the power supply voltage decreases.	
Accuracy Compensation	It compensates and corrects the physical accuracy of the motor. It is only available for DDL and DDR motors.	
Gantry synchronization	Used to achieve synchronization of two axes.	
Position comparison output	Used to output a DO signal with designated pulse width after the drive reaches the preset target position.	
STO function	The safe torque off (STO) function brings the machine safely into a no-torque state and prevents it from unexpected start.	

11 Adjustment

11.1 Overview

The servo drive must drive the motor as quick and accurate as possible to follow the commands from the host controller or internal setting. Gain adjustment needs to be performed to meet such requirement.

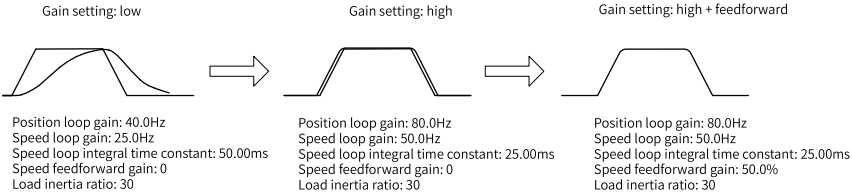


Figure 11-1 Example of gain tuning

The gain is defined by a combination of multiple parameters that affect each other. Such parameters include the position loop gain, speed loop gain, filter and load moment of inertia ratio. The values of these parameters must be balanced against each other during gain tuning.

Note

Before gain tuning, perform a trial run through jogging to ensure the motor operates properly.

The following figure shows the general flowchart for gain tuning.

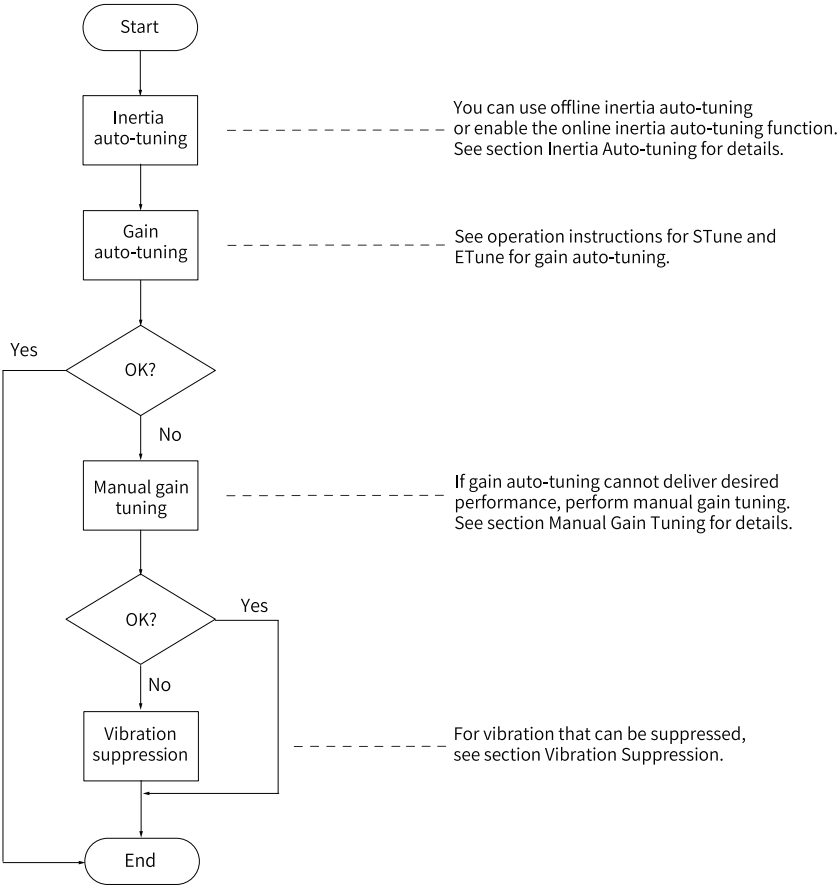


Figure 11-2 Steps

11.2 Current Loop Adjustment

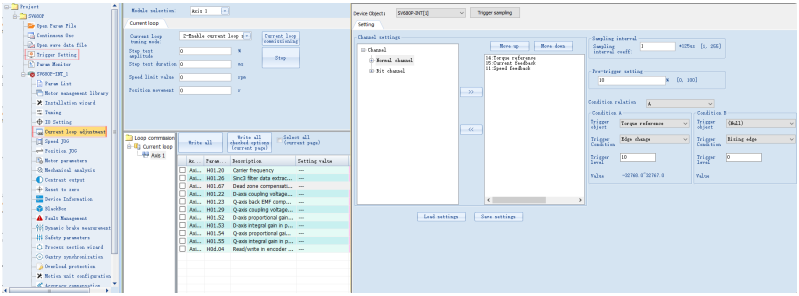
Current loop parameter adjustment

As the innermost loop of the servo control system, the response and stability of the current loop play a vital role in the performance of the whole system.

To facilitate users to quickly commission the gain parameters of the current loop and ensure the high bandwidth and fast response of the current loop, the current loop adjustment control is provided in InoDriverShop.

This module integrates the **Current Loop Adjustment** window" and the **Trigger Setting Observation** window. The window functions are interrelated. After you select the commissioning mode and click Start, the drive completes the relevant test

adjustment by itself, and the **Trigger Setting** window also collects the relevant waveforms synchronously.

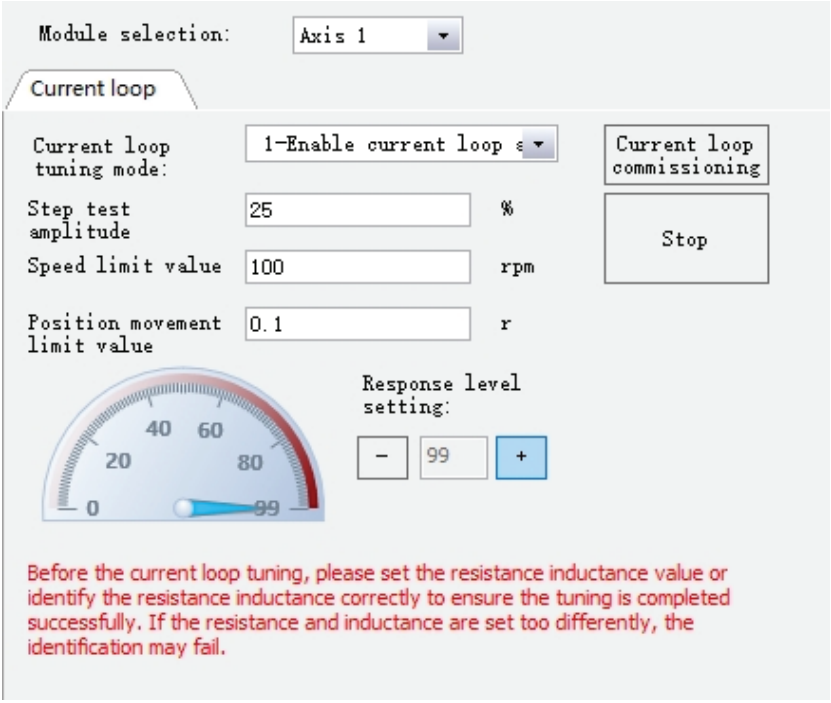


Current loop tuning provides three modes, which are described below.

1. **Current loop auto-tuning**

   This mode provides a static way to automatically tune the current loop. After starting, the drive can adjust the related gain parameters of the current loop by itself.

   You can set the response level. The larger the response level, the stronger the responsiveness and the higher the bandwidth of the final adjusted current loop.



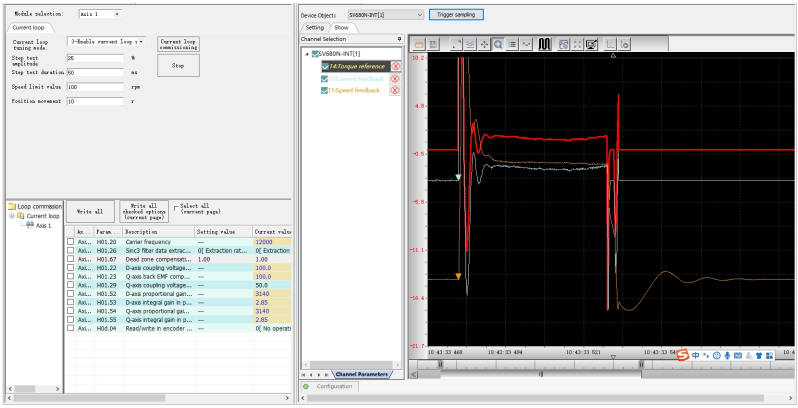
Note

Over-high current loop response may also excite current loop control noise. In actual use, you should set the response level as needed to obtain the balance between current loop responsiveness and noise.

Related parameters	Description
Auto-tuning step test amplitude	Auto-tuning excitation signal amplitude
Speed limit value	The maximum speed that can be achieved by stable current excitation
Position movement limit value	Maximum distance that can be achieved by stable current excitation
Response level setting	Expected current loop response level setting

2. **Static step test**

   This mode provides a static current loop step response observation mode, which enables you to manually adjust the related current loop gain parameters and then observe and verify the current loop response.



Related parameters	Description
Static step test amplitude	Step excitation signal amplitude
Step test duration	Step excitation signal duration
Speed limit value	The maximum speed that can be achieved by stable current excitation
Position movement limit value	Maximum distance that can be achieved by stable current excitation

3. **Step test**

This mode provides a dynamic current loop step response observation mode, which is used in the same way as static step test. You can use this mode to manually adjust the relevant current loop gain parameters and then observe and verify the current loop response.

Note

In this mode, the motor will move a certain distance. You can restrict the movement by setting the speed limit value and the position movement limit value.

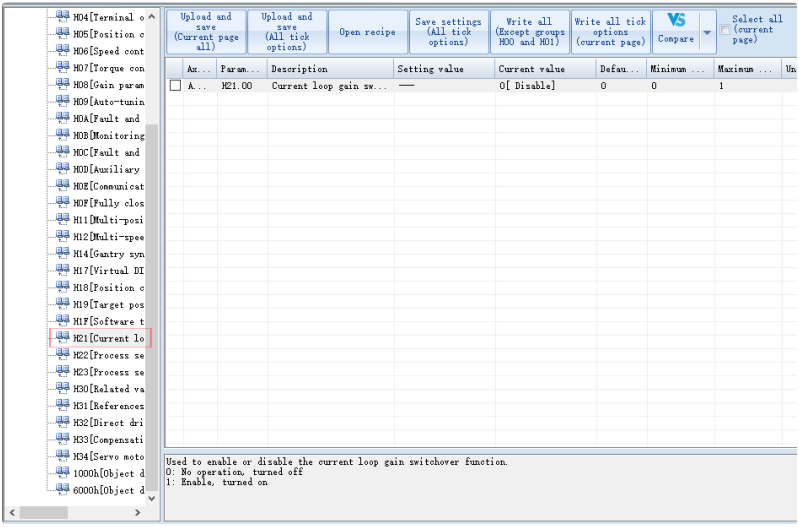
Current loop gain switching

Current loop gain switching is an advanced and supplementary mode of current loop commissioning. With this mode, you can cope with the current loop response deterioration or instability caused by the difference of inductance saturation characteristics of some motors.

When the controlled motor has inductance saturation characteristics in the normal working range, because the current loop gain is usually theoretically calculated and matched through inductance parameters, the large difference of inductance saturation may lead to poor or unstable current loop response under a single set of gains, and you can use the current loop gain switching to adjust it.

The SV680-INT provides 32 current loop gain switching coefficients which are not enabled by default. You can enable and use them as needed.

- Theoretically, the gain switching coefficients under different loads can be obtained directly from the inductance saturation characteristic curve provided by the motor manufacturer.
- In practical application, the gain coefficient can be adjusted manually according to the actual effect under different load rates.



11.3 Inertia Auto-tuning

The load inertia ratio (H08.15) is calculated through the following formula:

$$\text{Load inertia ratio} = \frac{\text{Total moment of inertia of mechanical load}}{\text{Moment of inertia of the motor}}$$

The inertia ratio is an important parameter of the servo system, and quick commissioning can be implemented with the correct setting of this parameter.

You can set the load inertia ratio manually or get the inertia ratio through inertia auto-tuning.

The following two inertia auto-tuning modes are available:

- Offline Inertia Auto-tuning
  To enable offline inertia auto-tuning, use H0d.02 (Offline inertia auto-tuning) and make the motor rotate and execute inertia auto-tuning through the keypad. Offline inertia auto-tuning does not involve the host controller
- Online Inertia Auto-tuning
  Send a command to the servo drive through the host controller to make motor act accordingly to finish inertia auto-tuning. Online inertia auto-tuning involves the host controller.

Note

The following requirements must be met to ensure correct calculation of the inertia ratio:

- The actual maximum speed of the motor is higher than 150 rpm.
- The acceleration rate during acceleration/deceleration of the motor is higher than 3000 rpm/s.
- The load torque is stable without dramatic changes.
- The actual inertia ratio does not exceed 120.
- Inertia auto-tuning may fail in case of a large backlash of the transmission mechanism.

11.3.1Offline Inertia Auto-tuning

Check the following before performing offline inertia auto-tuning:

The motor must meet the following requirements:

- A travel distance of more than one revolutions in the forward/reverse direction is available between the mechanical limit switches.



Ensure limit switches are installed to the machine and a travel distance as described above is reserved to prevent overtravel during inertia auto-tuning.

- The required number of revolutions (H09.09) is fulfilled.
  View the values of H09.06 (Maximum speed of inertia auto-tuning), H09.07 (Time constant for accelerating to the maximum speed during inertia auto-tuning), and H09.09 (Number of revolutions per inertia auto-tuning) to ensure the travel distance that starts from the stop position is larger than the value of H09.09. Otherwise, decrease the value of H09.06 or H09.07 until this requirement is met.

To preform offline inertia auto-tuning:

1. Switch off the S-ON signal.
2. In parameter display mode, switch to H0d.02 and press SET to enable offline inertia auto-tuning.
3. Press the UP/DOWN key to perform offline inertia auto-tuning.
4. To make the motor stop at zero speed, release the UP/DOWN key. Pressing the UP/DOWN key again starts a new inertia auto-tuning. The initial direction of operation is determined by the UP/DOWN key. For applications allowing unidirectional operations only, set H09.05 to 1.

5. Wait until the value displayed on the keypad is stabilized.
6. Hold the SET key down until the operating panel displays "SAVE".
7. Press the MODE key to exit.

For applications requiring large load inertia, set H08.15 (Load moment of inertia) to the approximate value, preventing intense system vibration caused by a low initial inertia.

The offline inertia auto-tuning flowchart is shown as follows.

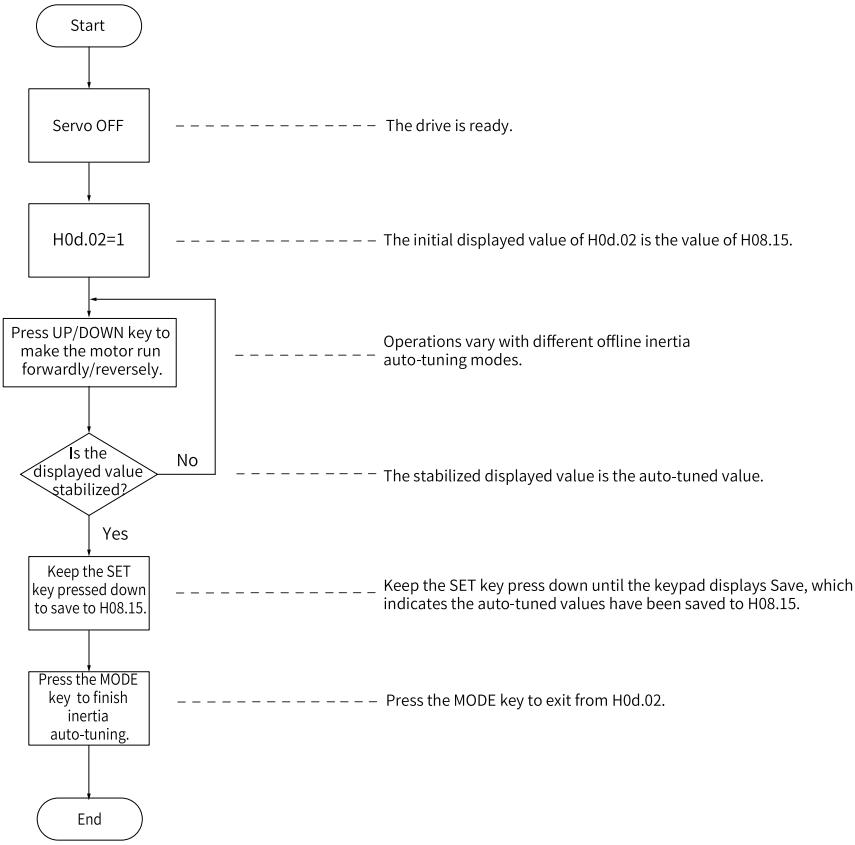


Figure 11-3 Offline inertia auto-tuning flowchart

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H09.05	2009-06h	Offline inertia auto-tuning mode	0: Bi-directional 1: Unidirectional	0	-	At stop
H09.06	2009-07h	Max. speed of inertia auto-tuning	100[mm/s]/[rpm]–1000[mm/s]/[rpm]	500	[mm/s]/[rpm]	At stop
H09.07	2009-08h	Time constant for accelerating to max. speed during inertia auto-tuning	10 ms–5000 ms	125	ms	At stop
H09.08	2009-09h	Interval time after an individual inertia auto-tuning	50 ms–10000 ms	800	ms	At stop
H09.09	2009-0Ah	Motor rotating distance per inertia auto-tuning	0.00[mm]/[Rev]–100.00[mm]/[Rev]	1.00	[mm]/[Rev]	Real-time
H0d.02	200d-03h	Inertia auto-tuning enable	0–65	0	-	Real-time

11.3.2Online Inertia Auto-tuning

The servo drive supports online inertia auto-tuning. The online inertia auto-tuning flowchart is shown as follows.

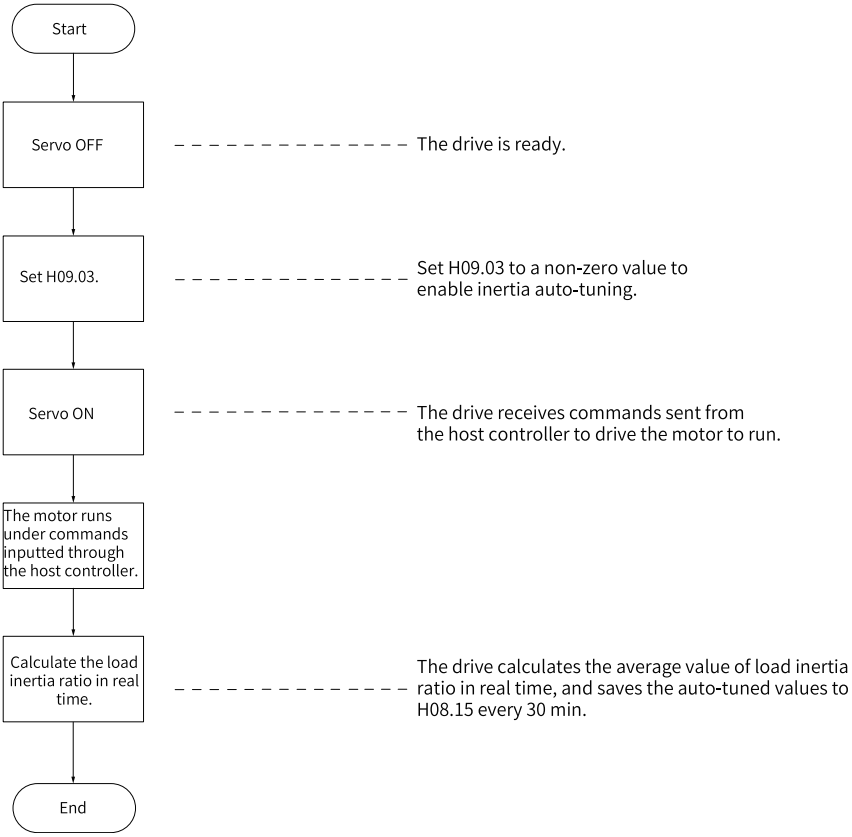


Figure 11-4 Online inertia auto-tuning flowchart

Note

H09.03 defines the real-time updating speed of the load inertia ratio (H08.15).

- H09.03 = 1: Applicable to cases where the actual load inertia ratio rarely changes, such as the machine tool and wood carving machine.
- H09.03 = 2: Applicable to cases where the load inertia ratio changes slowly.
- H09.03 = 3: Applicable to cases where the actual inertia ratio changes rapidly, such as handling manipulators.

☆Related parameter

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H09.03	2009-04h	Online inertia auto-tuning mode	0: Disabled 1: Enabled, changing slowly 2: Enabled, changing normally 3: Enabled, changing quickly	0	-	Real-time

11.4 Auto Gain Tuning

11.4.1STune

Overview

STune performs gain auto-tuning based on the set stiffness level to fulfill the needs for rapidity and stability.

STune (mode 4) is turned on by default and will be turned off automatically after the drive operates as commanded for 5 min.

STune is intended to be used in applications featuring slight load inertia change. For applications featuring dramatic inertia change or where inertia auto-tuning is unavailable (due to low operating speed or low acceleration rate), turn off STune after initial power-on.

Note

In STune modes 3, 4, 5, 6, 8 and 9, you need to perform load inertia auto-tuning through on-line inertia auto-tuning and ensure the following conditions are met:

- The load inertia changes quickly.
- The load torque changes quickly.
- Low-speed operation (less than 100 rpm for ROT, less than 20 rpm for DDR, and less than 20 mm/s for DDL).
- Acceleration/Deceleration is slow (lower than 1000 rpm per second).
- The acceleration/deceleration torque is lower than the unbalanced load/viscous friction torque.

If the conditions for online inertia auto-tuning cannot be fulfilled, set the correct inertia ratio manually.

Description of ITune operation

- **Operation flowchart**

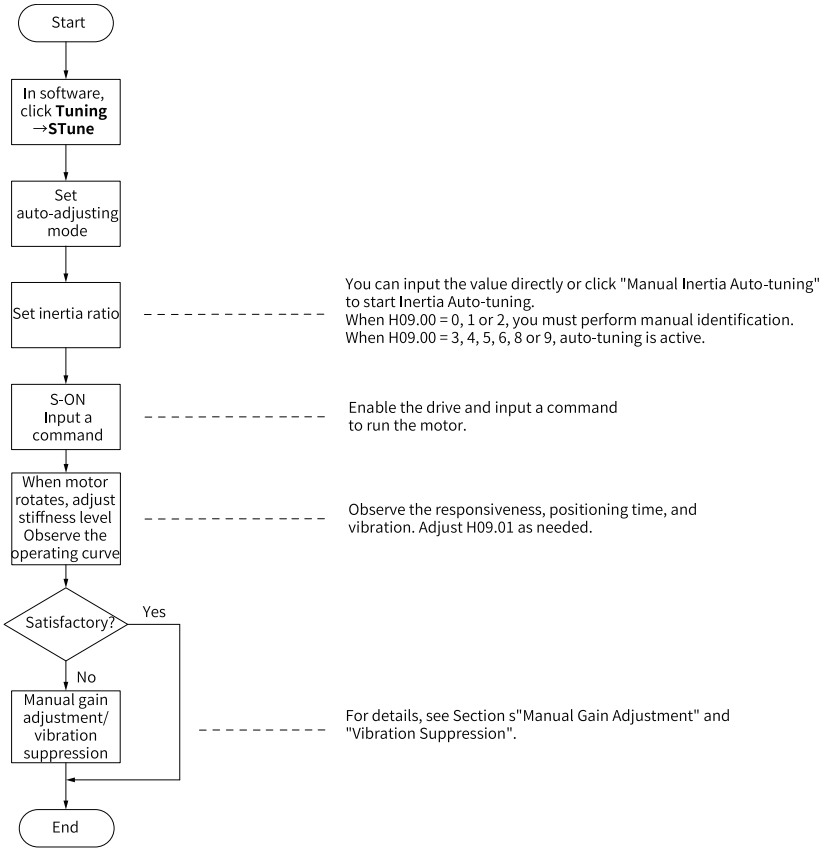


Figure 11-5 Operation flowchart

- **Description**

  You can set the gain auto-tuning mode through the keypad or the software tool.

  1. Select the gain auto-tuning mode.

     - In modes 0, 1 and 2 shown in the following table, you need to set the inertia ratio before stiffness tuning. If the inertia is unknown, adjust the inertia manually. If vibration occurs on the machine, decrease the stiffness level before adjusting the inertia manually.
     - In modes 3, 4, 5, 6, 8 and 9 shown in the following table, you can perform adjustment through the wizard-type interface directly, without the need for setting an inertia ratio.

mode	Name	Function
0	Inactive	The gains need to be adjusted manually.
1	Standard stiffness level mode	Gains are set automatically based on the set stiffness level.
2	Positioning mode	Gains are set automatically based on the set stiffness level. This mode is applicable to occasions requiring quick positioning.
3	Interpolation mode + Inertia auto-tuning	Gains are set automatically based on the set stiffness level. In this mode, inertia is auto-tuned and vibration is suppressed automatically. This mode is applicable to multi-axis interpolation.
4	Normal mode + Inertia auto-tuning	Gains are set automatically based on the set stiffness level. The inertia is auto-tuned and vibration is suppressed automatically.
5	STune mode 5	Gains are set automatically based on the set stiffness level. Inertia is auto-tuned and vibration is suppressed automatically. This mode is applicable to linear motors.
6	Quick positioning mode + Inertia auto-tuning	Gains are set automatically based on the set stiffness level. Inertia is auto-tuned and vibration is suppressed automatically. This mode is applicable to occasions requiring quick positioning.
8	New model tracking mode + Inertia auto-tuning	Gains are set automatically based on the set stiffness level. Suitable for quick positioning. New model control, inertia auto-tuning, vibration suppression are enabled. The friction compensation coefficient is set.
9	Model tracking B + Inertia auto-tuning + Friction compensation	Gains are set automatically based on the set stiffness level. Automatic Inertia auto-tuning, vibration suppression and friction compensation coefficient setting. This mode is applicable to occasions requiring quick positioning.

2. Adjust the stiffness level gradually during operation of the load. The present stiffness level value will be written to the drive automatically. Keep monitoring the operating waveform after increasing the stiffness level (increase by one level at a time) until desired performance is achieved.
3. In STune modes 3, 4, 5, 6, 8 and 9, when the speed keeps higher than 100 r/min for more than 5 min, H09.00 returns to 0 automatically. In this case, the drive will exit from the STune mode.

   After tuning, you can set H09.00 to 0 to exit the STune mode.

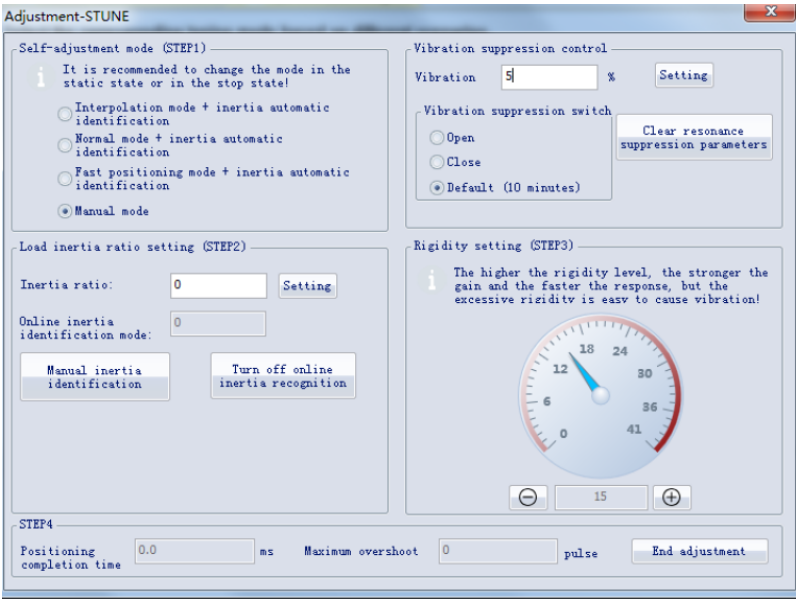
   To modify the STune time, set H09.37.
4. In STune modes 3, 4, 5, 6, 8 and 9, resonance will be suppressed automatically. If the performance of automatic resonance suppression is inadequate, set

H09.58 to 1 to clear resonance suppression parameters, reduce the stiffness level, and perform STune again.

5. For multi-axis trajectories, perform single-axis commissioning first to determine the highest response of each axis and modify the response of each axis manually to ensure position responses of different axes are consistent.

   In STune modes 3, 4 and 5, determine the minimum value of H08.02 (Position loop gain). Then set H09.00 of each axis to 0 and set H08.02 of each axis to the same value.

   In STune modes 6, 8 and 9, determine the minimum value of H08.43 (Model gain). Then set H09.00 of each axis to 0, and set H08.43 of each axis to the same value.



Note

To ensure a stable operation of STune modes 3, 4, 5, 6, 8 and 9, gain parameters will be adjusted along with the inertia ratio when the inertia ratio is higher than 13. In multi-axis trajectories, responses may be inconsistent under the same stiffness level.

Remarks

Load inertia ratio range

- In scenarios requiring high response, the inertia ratio must be lower than 500% and should not exceed 1000%.
  - For belt pulley or gear rack requiring not high rigidity and accuracy, the inertia ratio should not exceed 1000%.
  - For lead screw or cardan shaft requiring high rigidity and accuracy, the inertia ratio should not exceed 500%.
  - In scenarios where high positioning accuracy or response is required, the inertia ratio should not exceed 200%.
- In scenarios requiring a certain accuracy and dynamic response, the inertia ratio should not exceed 3000%.
- When the inertia ratio exceeds 3000%, it is hard to adjust and the trajectory control cannot be performed. It is only applicable to mechanisms for point-to-point control and rotary motion but the acceleration/deceleration time should be large.

Rigidity meter setting

The setting range of H09.01 (Stiffness level selection) is 0–41. The level 0 indicates the weakest stiffness and lowest gain and level 41 indicates the strongest stiffness and highest gain.

The following table lists the stiffness levels for different load types for your reference.

Table 11–1 Reference of stiffness levels

Recommended Stiffness Level	Load Mechanisms
Level 8 to level 12	Large-scale machineries
Level 12 to level 18	Applications with low stiffness such as the conveyors
Above level 18	Applications with high stiffness such as the ball screws and direct-connected motors

The following 7 gain auto-tuning modes are available.

- Standard rigidity meter mode (H09.00 set to 1)
  The 1st gain parameters (H08.00 to H08.02 and H07.05) are automatically updated and saved based on the rigidity level set in H09.01.

  Table 11–2 Parameters updated automatically in the standard mode

Parameter	Name
H08.00	Speed loop gain
H08.01	Speed loop integral time constant
H08.02	Position loop gain
H07.05	Filter time constant of torque reference

- Positioning mode (H09.00 = 2)

Based on *"Table 11–2 " on page 371*, the 2nd gain parameters (H08.03 to H08.05 and H07.06) are also automatically updated and saved based on the rigidity level set in H09.01. In addition, the position loop gain in the 2nd gain parameters is two rigidity levels higher than that in the 1st gain parameters.

Table 11–3 Parameters updated automatically in the positioning mode

Parameter	Name	Description
H08.03	2nd speed loop gain	-
H08.04	2nd speed loop integral time constant	If H08.04 is set to remain at 512.00 ms, the 2nd speed loop integral action is invalid and only proportional control is used in the speed loop.
H08.05	2nd position loop gain	-
H07.06	2nd torque reference filter time constant	-

Speed feedforward parameters have an initial value, which can be modified by the user:

Table 11–4 Parameters with fixed values in the positioning mode

Parameter	Name
H08.19	Speed feedforward gain
H08.18	Speed feedforward filter time constant

Gain switchover parameters also have an initial value, which can be modified by the user:

Gain switchover is activated automatically in the positioning mode.

Parameter	Name	Value	Description
H08.08	2nd gain mode setting	1	Switchover between the 1st gain set (H08.00...H08.02, H07.05) and 2nd gain set (H08.03...H08.05, H07.06) is active in the positioning mode. In other modes, the original setting is used.
H08.09	Gain switchover condition	10	In positioning mode, the gain switchover condition is that H08.09 is set to 10. In other modes, the original setting is used.
H08.10	Gain switchover delay	5.0ms	In positioning mode, the gain switchover delay is 5.0 ms. In other modes, the original setting is used.

Parameter	Name	Value	Description
H08.11	Gain switchover level	50	In the positioning mode, the gain switchover level is 50. In other modes, the original setting is used.
H08.12	Gain switchover hysteresis	30	In the positioning mode, the gain switchover dead time is 30. In other modes, the original setting is used.

Note

In the gain auto-tuning mode, parameters updated along with H09.01 and those with fixed setpoints cannot be modified manually. To modify these parameters, set H09.00 (Gain auto-tuning mode) to 0 first.

- In STune mode 3, 4, 5, 6, 8, or 9
  resonance suppression will be performed automatically. When the load changes or the mechanical structure is re-installed, the system resonance frequency changes accordingly. Set H09.58 to 1 (Enable) and enable the STune mode again after clearing resonance suppression parameters.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H09.18	2009-13h	Frequency of the 3rd notch	50 Hz–8000 Hz	8000	Hz	Real-time
H09.19	2009-14h	Width level of the 3rd notch	0 to 20	2	-	Real-time
H09.20	2009-15h	Depth level of the 3rd notch	0 to 99	0	-	Real-time
H09.21	2009-16h	Frequency of the 4th notch	50 Hz–8000 Hz	8000	Hz	Real-time
H09.22	2009-17h	Width level of the 4th notch	0 to 20	2	-	Real-time
H09.23	2009-18h	Depth level of the 4th notch	0 to 99	0	-	Real-time
H09.58	2009-3Bh	STune resonance suppression reset selection	0: Disabled 1: Enabled	0	-	Real-time

Note

- If H09.00 is set to 3, 4, 5, 6, 8 or 9, the servo drive will suppress the vibration and perform inertia auto-tuning automatically within 10 min (or other time defined by H09-37) after power-on or stiffness level setting, and then the servo drive exits from automatic adjustment. The time can be adjusted by the vibration suppression switch (H09.37). If the inertia auto-tuning function is deactivated automatically, switching to modes 3, 4, 5, 6, 8 or 9 will not activate inertia auto-tuning.
- Do not set H09.00 to 3, 4, 5 or 6 in applications with slow acceleration/ deceleration, large vibration, and unstable mechanical couplings.
- In applications where the inertia does not change, set H09.03 (Online inertia auto-tuning mode) to 1 (Enabled, changing slowly). In applications where the inertia changes quickly, set H09.03 to 3 (Enabled, changing quickly).

Solutions to Common Faults

E661.0: STune failure

During STune operation, the gain drops to the lower limit. Position loop gain < 5; velocity loop gain < 5; model loop gain < 10.

- Set the notch manually when vibration cannot be suppressed automatically.
- Modify the electronic gear ratio to improve the command resolution, increase the command filter time constant in the parameter configuration interface.
- Increase the value of H09.11 as appropriate.
- Check whether the current of the machine fluctuates periodically.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H09.58	2009-3Bh	STune resonance suppression reset selection	0: Disabled 1: Enabled	0	-	Real-time

11.4.2ETune

Overview

ETune is a wizard-type auto-adjustment function used to guide users to set corresponding curve trajectories and response parameters. After the curve trajectories and response parameters are set, the servo drive performs auto-tuning automatically to generate the optimal gain parameters. The auto-tuned parameters can be saved and exported as a recipe for use in other devices of the same model.

The ETune function is intended to be used in applications featuring slight load inertia change.

Description of ITune operation

- **Operation flowchart**

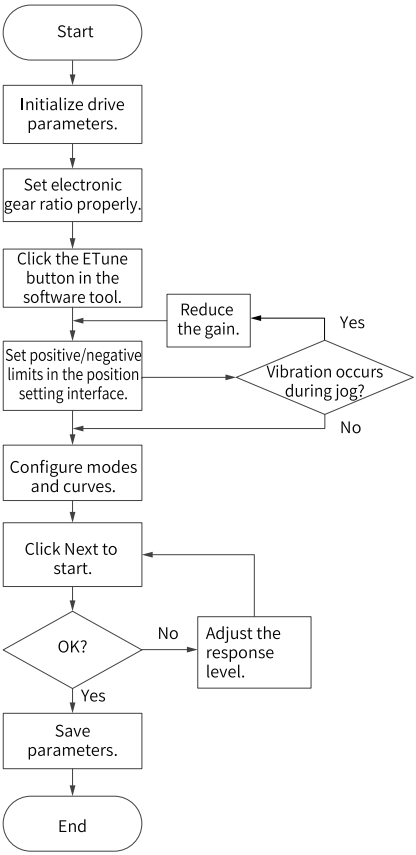
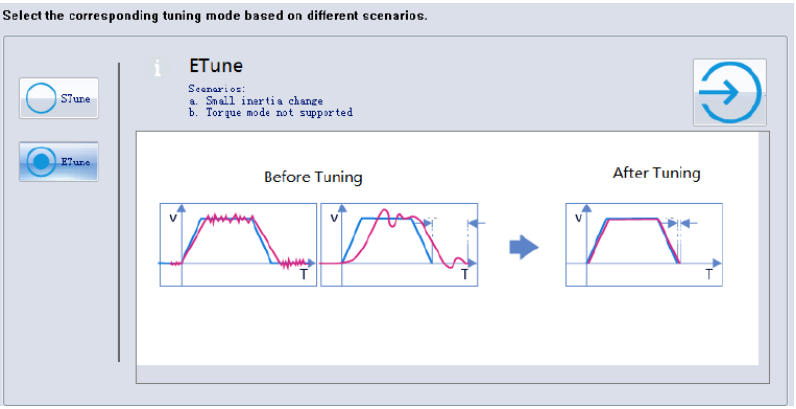


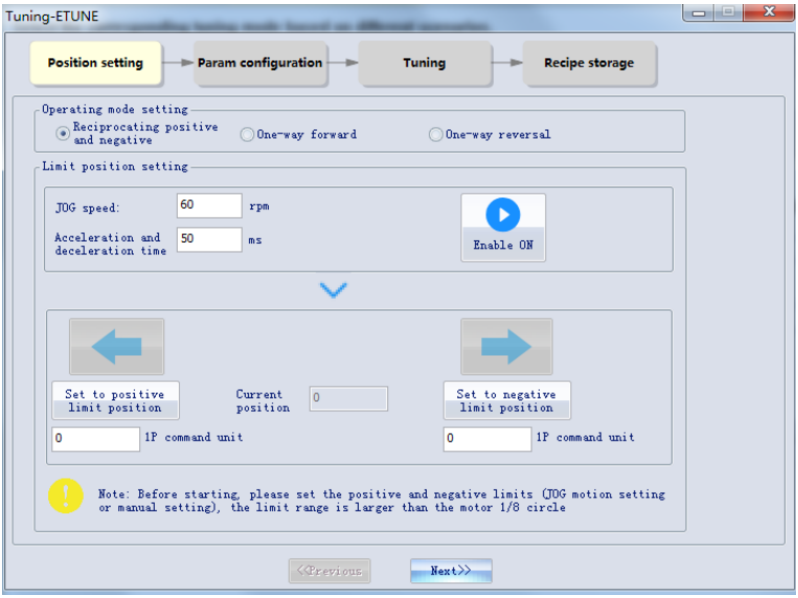
Figure 11-6 Operation flowchart

- **Description**

1. Click Usability adjustment in the software tool, and then click ETune.



2. Select any of the following three operation modes based on the operating direction allowed by the machine.
   - In the Reciprocating po... mode, the motor keeps reciprocating within the positive and negative position limits.
   - In the One-way forward mode, the motor takes the difference between the positive and negative position limits as the maximum distance per action and keeps running in the forward direction.
   - In the One-way forward mode, the motor takes the difference between the positive and negative position limits as the maximum distance per action and keeps running in the reverse direction.



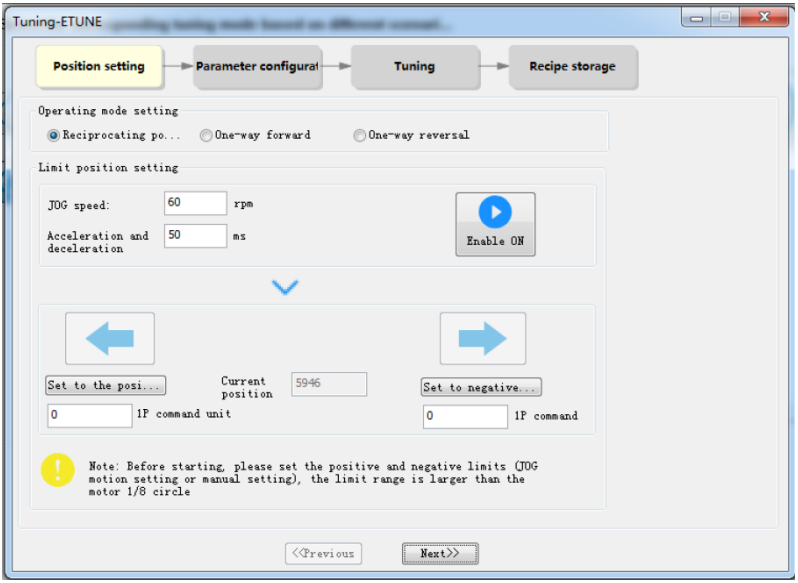
3. Designate the positive and negative limit positions allowed by the motor. The difference between the positive and negative limits defines the position reference pulses for the motor, which is also the value before multiplication/ division by the electronic gear ratio.

   You can set the positive and negative position limits through the following two methods.

   - Method 1: Click "Enable ON", and then click ⬅ to make the motor move to the positive position limit. Next, click "Set to positive limit position". Follow the same procedure for setting the negative position limit, and click "Enable OFF" (the "Enable ON" button turns to "Enable OFF" after a click).
   - Method 2: Enter the positive and negative limits directly.

Note

The difference between the positive and negative position limits must be larger than 1/8 of one revolution. The larger the value of the limit position, the better the adaptability of the auto-tuned parameters, but the longer will ETune adjustment take.

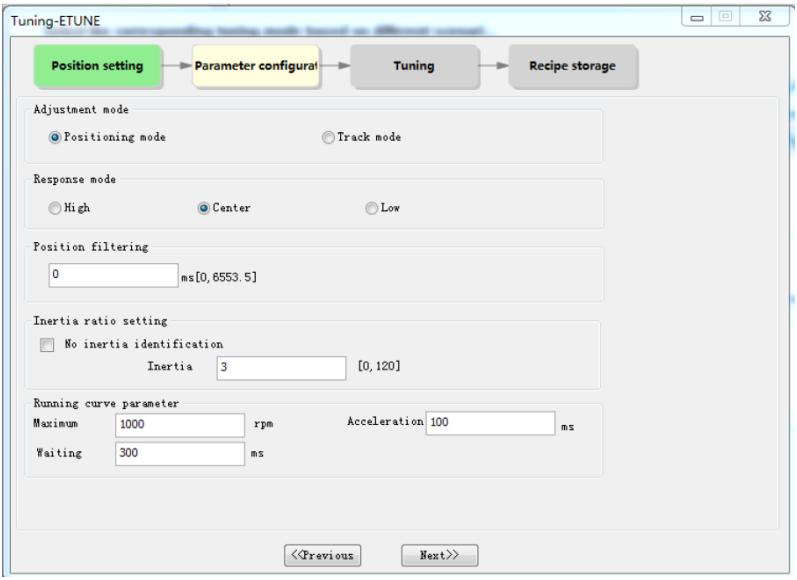


4. Click Next to switch to the mode parameter setting interface.

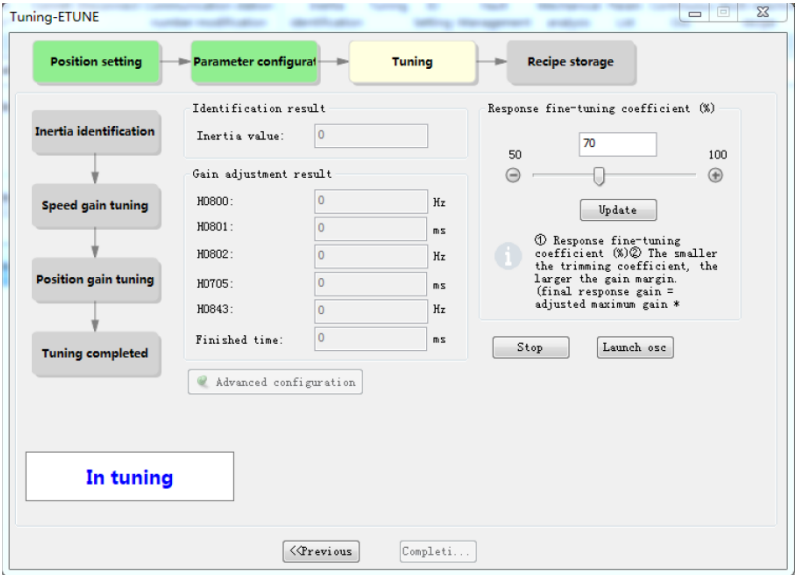
   The adjustment mode is divided into Positioning mode and Track mode.

   Auto-tuning of the inertia ratio is optional. If you choose not to perform inertia auto-tuning, set the correct inertia ratio (the inertia ratio can be

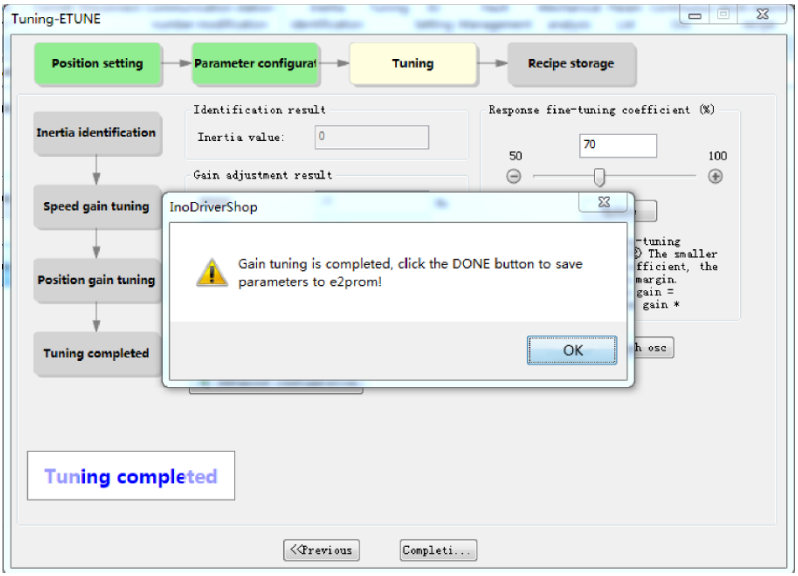
modified directly). You can adjust the response level and position filter time constant based on the responsiveness needed and the position reference noise generated during operation. Then configure the motion profile by setting the maximum speed, acceleration/deceleration time and interval time for auto-tuning.

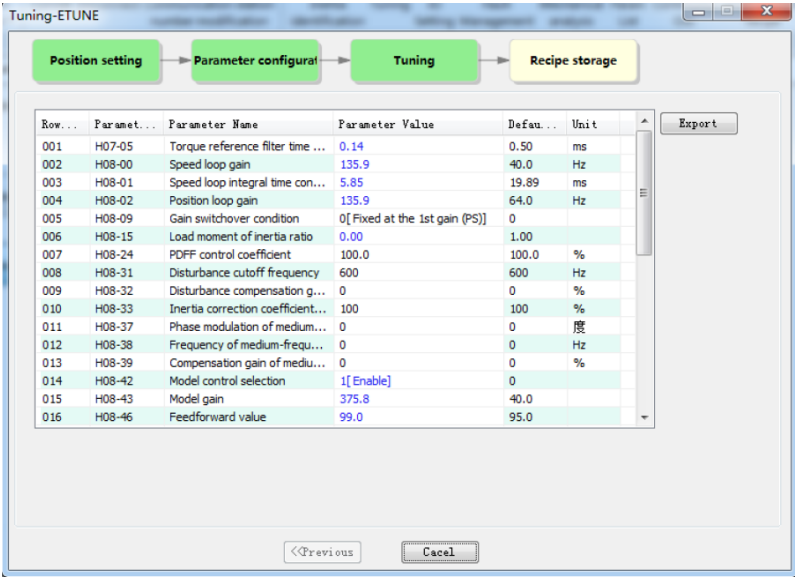


5. Click **"Next"** to start auto-tuning.
   - If you choose to perform inertia auto-tuning, the drive starts inertia auto-tuning based on the set motion profile. After inertia auto-tuning is done, the drive starts gain auto-tuning.
   - If you choose not to perform inertia auto-tuning on the start page, the drive starts gain auto-tuning directly after start.



6. During gain auto-tuning, if you modify the Response fine-tuning coefficient and click **"Update"**, gain auto-tuning will be continued based on the fine-tuning coefficient entered. After gain auto-tuning is done, you can click **"Done"** to save parameters to EEPROM and export parameters as a recipe file.





Row...	Paramet...	Parameter Name	Parameter Value	Defau...	Unit
001	H07-05	Torque reference filter time ...	0.14	0.50	ms
002	H08-00	Speed loop gain	135.9	40.0	Hz
003	H08-01	Speed loop integral time con...	5.85	19.89	ms
004	H08-02	Position loop gain	135.9	64.0	Hz
005	H08-09	Gain switchover condition	0[Fixed at the 1st gain (PS)]	0	
006	H08-15	Load moment of inertia ratio	0.00	1.00	
007	H08-24	PDFF control coefficient	100.0	100.0	%
008	H08-31	Disturbance cutoff frequency	600	600	Hz
009	H08-32	Disturbance compensation g...	0	0	%
010	H08-33	Inertia correction coefficient...	100	100	%
011	H08-37	Phase modulation of medium...	0	0	度
012	H08-38	Frequency of medium-frequ...	0	0	Hz
013	H08-39	Compensation gain of mediu...	0	0	%
014	H08-42	Model control selection	1[Enable]	0	
015	H08-43	Model gain	375.8	40.0	
016	H08-46	Feedforward value	99.0	95.0	

Precautions

- You can adjust the maximum speed and acceleration/deceleration time of the motion profile based on actual conditions. The acceleration/deceleration time can be increased properly because positioning will be quickened after auto-tuning.
- If the acceleration/deceleration time is too short, overload may occur. In this case, increase the acceleration/deceleration time properly.
- For vertical axes, take anti-drop measures beforehand and set the stop mode upon fault to "Stop at zero speed".
- For lead screw transmission, shorten the travel distance if the tuning duration is too long.

Solutions to Common Faults

Fault	Cause	Solution
E662.0: ETune failure	Check whether resonance that occurred during ETune operation cannot be suppressed.	• Set the notch manually when vibration cannot be suppressed automatically. • Modify the electronic gear ratio to improve the command resolution, increase the command filter time constant or in the parameter configuration interface. • Increase the value of H09.11 as appropriate. • Check whether the current of the machine fluctuates periodically. • Check whether the positioning threshold is too low. Increase the reference acceleration/deceleration time.
E600.0: Inertia auto-tuning failure	• Continuous vibration occurs during auto-tuning. • The auto-tuned values fluctuate dramatically. • Mechanical couplings of the load are loose or eccentric. • An alarm occurs during auto-tuning and causes interruption. • The vibration cannot be suppressed if the load carries large inertia. In this case, increase the acceleration/ deceleration time to ensure the motor current is unsaturated. • The position following-up is too poor. That is, the maximum speed of the motor is less than the speed setpoint of the inertia auto-tuning.	• Rectify the fault and perform inertia auto-tuning again. • For vibration that cannot be suppressed, enable vibration suppression. • Ensure mechanical couplings are connected securely. • Increase the maximum operating speed, reduce the acceleration/deceleration time, and shorten the stroke of the lead screw during ETune operation. • Ensure that the speed setpoint is less than the maximum speed of the motor.

11.5 Manual Gain Tuning

11.5.1Basic Parameters

When gain auto-tuning cannot fulfill the application needs, perform manual gain tuning. to achieve better result.

The servo system consists of three control loops, which are position loop, speed loop, and current loop from external to internal. The basic control diagram is shown in the following figure.

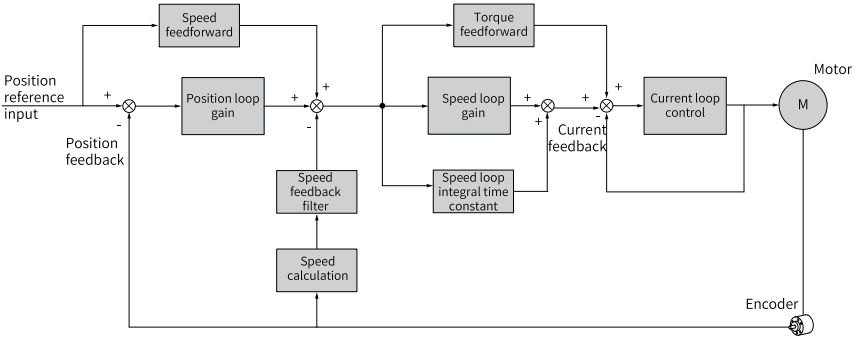


Figure 11-7 Basic control for manual gain tuning

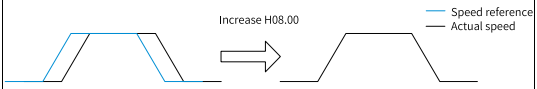
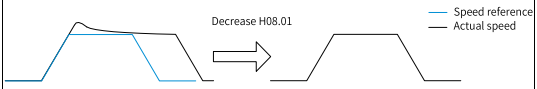
Caution

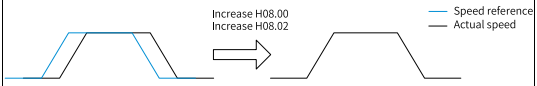
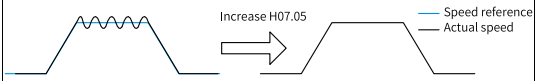
The response level of the inner loop must be higher than that of the outer loop. If it is not observed, the system may be unstable.

The current loop gain has been set with the highest level of responsiveness by default, avoiding the need for adjustment. you only need to adjust the position loop gain, speed loop gain and other auxiliary gains. When you choose a third party motor, the default current loop gain may not be suitable. You must perform auto-tuning for the current loop gain. For gain tuning in the position control mode, the position loop gain must be increased together with the speed loop gain, and the responsiveness of the former must be lower than the latter.

The following table describes how to adjust the basic gain parameters.

Table 11–5 Adjustment of gain parameters

Step	Parameter	Name	Description
1	H08.00	Speed loop gain	Function: Determines the maximum frequency of a variable speed reference that can be followed by the speed loop. When H08.15 (Load inertia ratio) is set correctly, the maximum frequency that can be followed by the speed loop is the setpoint of H08.00.  Note: • Increasing the setpoint without incurring extra noise or vibration shortens the positioning time, stabilizes the speed, and improves the follow-up behavior. • If noise occurs, decrease the setpoint. • If mechanical vibration occurs, enable mechanical resonance suppression.
2	H08.01	Speed loop integral time constant	Function: Eliminates the speed loop deviation.  Note: Set H08.01 according to the following formula: 500 ⩽ H08.00 x H08.01 ⩽ 1000 For example, if H08.00 is set to 40.0 Hz, the setpoint of H08.01 must meet the following requirement: 12.50 ms ⩽ H08.01 ⩽ 25.00 ms Decreasing the setpoint strengthens the integral action and shortens the positioning time, but an excessively low setpoint may easily lead to mechanical vibration. An excessively high setpoint prevents the speed loop deviation from being cleared. When H08.01 is set to 512.00 ms, the integral is invalid.

Step	Parameter	Name	Description
3	H08.02	Position loop gain	Function: It sets the position reference maximum frequency followed by the position loop. The maximum follow-up frequency of the position loop equals the value of H08.02.  Note: To ensure system stability, the maximum follow-up frequency of the speed loop must be 3 to 5 times higher than that of the position loop. $3 \leqslant \frac{2 \times \pi \times H08.00}{H08.02} \leqslant 5$ For example, when H08.00 is set to 40.0 Hz, H08.02 must meet the following requirement: 50.2 Hz ⩽ H08.02 ⩽ 83.7 Hz Adjust the setting based on the positioning time. Increasing the setpoint shortens the positioning time and improves the anti-interference capacity of a motor at standstill. An excessively high setpoint may easily lead to system instability and oscillation.
4	H07.05	Torque reference filter time constant	Function: Eliminates the high-frequency noise and suppresses mechanical resonance.  Note: Ensure the cutoff frequency of the torque reference low-pass filter is 4 times higher than the maximum follow-up frequency of the speed loop, as shown in the following formula: $\frac{1000}{2 \times \pi \times H07.05} \geqslant (H08.00) \times 4$ For example, when H08.00 is set to 40.0 Hz, the setpoint of H07.05 must be lower than or equal to 1.00 ms. If vibration occurs after H08.00 is increased, adjust H07.05 to suppress the vibration. An excessively high setpoint weakens the responsiveness of the current loop.

Step	Parameter	Name	Description
			To suppress vibration upon stop, increase the setpoint of H08.00 and decrease the setpoint of H07.05. If strong vibration occurs upon stop, decrease the setpoint of H07.05.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.05	2007-06h	Torque reference filter time constant 1	0.00 ms–30.00 ms	0.50	ms	Real-time
H08.00	2008-01h	Speed loop gain	0.0 Hz–2000.0 Hz	40.0	Hz	Real-time
H08.01	2008-02h	Speed loop integral time constant	0.15 ms–512.00 ms	19.89	ms	Real-time
H08.02	2008-03h	Position loop gain	0.0 Hz–2000.0 Hz	64.0	Hz	Real-time

11.5.2Gain Switchover

Gain switchover, which is active in the position control and speed control modes only, It is only effective in position and speed control modes. achieve the following purposes:

- Switching to the lower gain when the motor is at a standstill (servo ON) to suppress vibration
- Switching to the higher gain when the motor is at a standstill to shorten the positioning time
- Switching to the higher gain during operation of the motor to achieve better reference tracking performance
- Switching between different gain settings through an external signal to fit different conditions of the load devices

H08.08 = 0

When H08.08 is set to 0, the 1st gain (H08.00 to H08.02 and H07.05) is used, but you can switch between proportional control and proportional integral control through FunIN.3 (GAIN_SEL, gain switchover) for the speed loop.

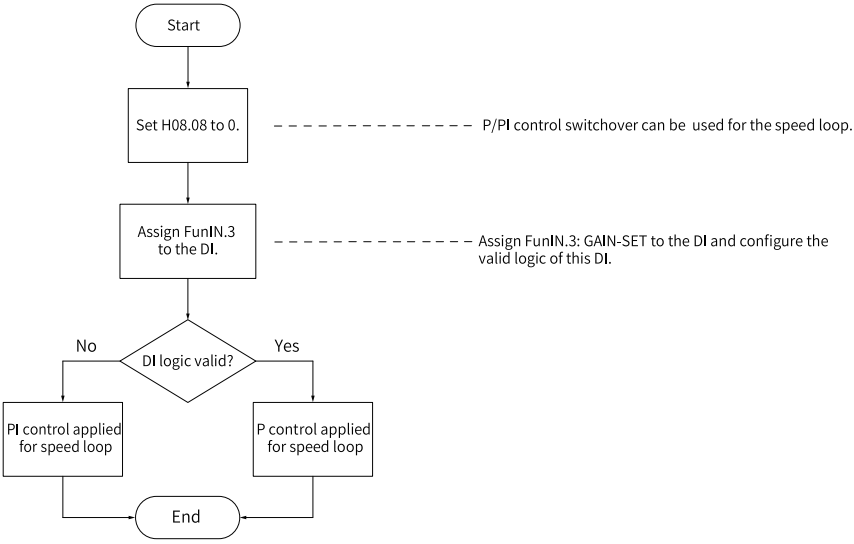


Figure 11-8 Gain switchover flowchart when H08.08 is set to 0

H08.08 = 1

You can switch between the 1st gain set (H08.00...H08.02, H07.05) and 2nd gain set (H08.03...H08.05, H07.06) based on the condition defined by H08.09.

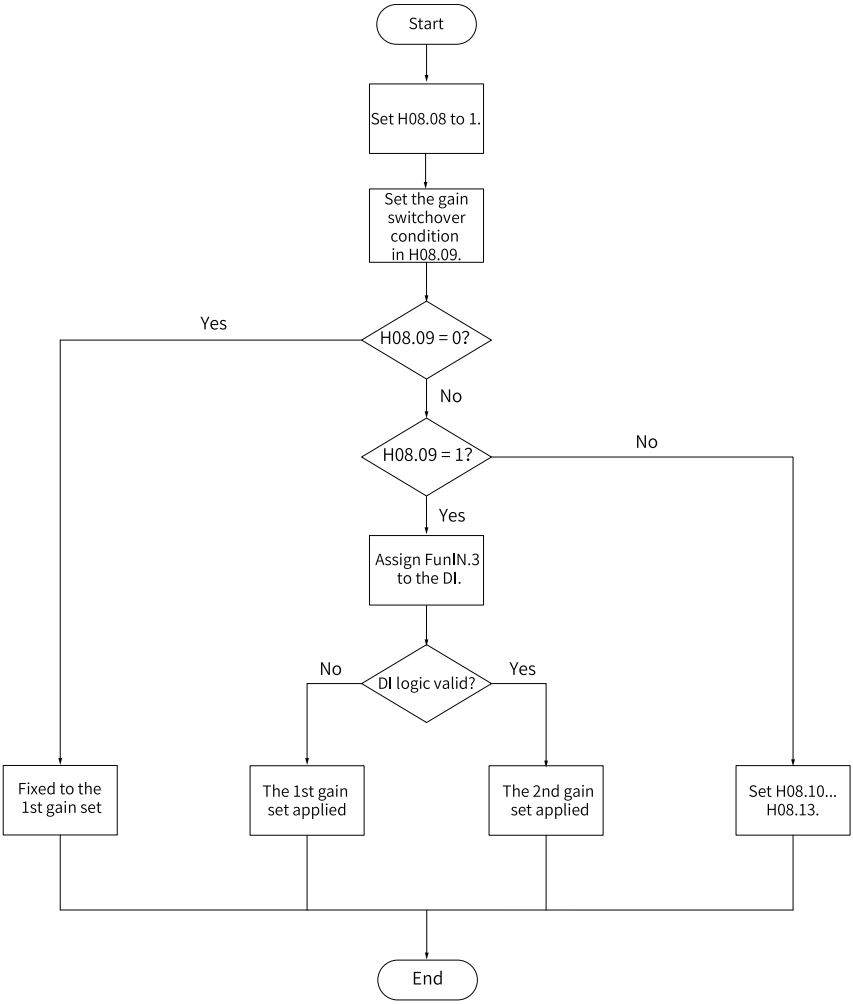
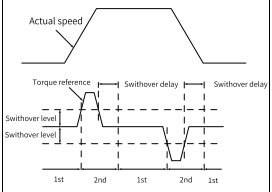
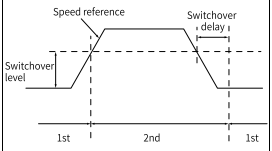
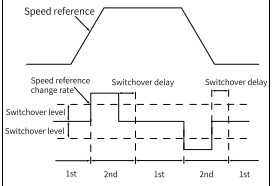
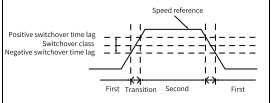
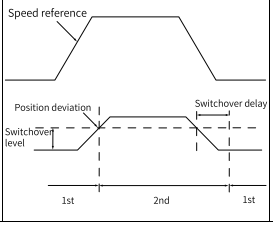
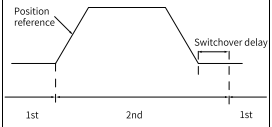
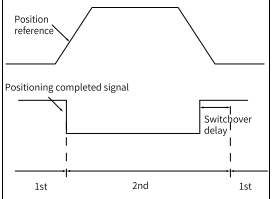
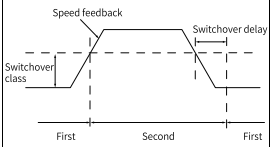


Figure 11-9 Gain switchover flowchart when H08.08 is set to 1

There are 10 2nd gain switchover modes. The following table describes the diagrams and related parameters of different conditions.

Table 11–6 Conditions for gain switchover

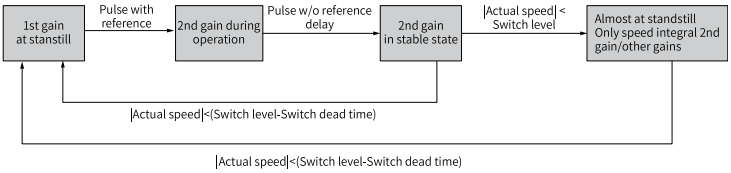
Gain Switchover Condition			Related parameters		
H08.09 Value	Condition	Diagram	Delay Time (H08.10)	Gain switchover level (H08.11)	Switchover Dead Time (H08.12)
0	Fixed to the 1st gain set	-	Inactive	Inactive	Inactive
2	Torque reference		Active	Active (%)	Active (%)
3	Speed reference		Active	Active	Active
4	Speed reference change rate		Active	Active (10 rpm/s)	Inactive (10 rpm/s)
5	Speed reference high/ low-speed threshold		Inactive	Active (rpm)	Active (rpm)
6	Position deviation		Active	Active (encoder unit)	Active (encoder unit)

Gain Switchover Condition			Related parameters		
H08.09 Value	Condition	Diagram	Delay Time (H08.10)	Gain switchover level (H08.11)	Switchover Dead Time (H08.12)
7	Position reference		Active	Inactive	Inactive
8	Positioning uncompleted		Active	Inactive	Inactive
9	Actual speed		Active	Active (rpm)	Active (rpm)
10	Position reference + Actual speed	See the following note for details.	Active	Active (rpm)	Active (rpm)

Caution

H08.10 (Gain switchover delay) is valid only during switching to the 1st gain.

Note



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H08.08	2008-09h	2nd gain mode setting	0: Fixed to the 1st gain, switched between P and PI as defined by bit26 of external 60FEh 1: Switched between the 1st and 2nd gain sets as defined by H08.09	1	-	Real-time
H08.09	2008-0Ah	Gain switchover condition	0: Fixed to the 1st gain set (PS) 1: Switched as defined by bit26 of 60FEh 2: Torque reference too large (PS) 3: Speed reference too large (PS) 4: Speed reference change rate too large (PS) 5: Speed reference low/high speed threshold (PS) 6: Position deviation too large (P) 7: Position reference available (P) 8: Positioning unfinished (P) 9: Actual speed (P) 10: Position reference + Actual speed (P)	0	-	Real-time
H08.10	2008-0Bh	Gain switchover delay	0.0 ms–1000.0 ms	5.0	ms	Real-time
H08.11	2008-0Ch	Gain switchover level	0–20000	50	-	Real-time
H08.12	2008-0Dh	Gain switchover hysteresis	0–20000	30	-	Real-time
H08.13	2008-0Eh	Position gain switchover time	0.0 ms–1000.0 ms	3.0	ms	Real-time

11.5.3Position Reference Filter

Name	Function	Applicable Occasion	Impact of Excessive Filtering
Position reference filter	Filters the position references (encoder unit) divided or multiplied by the electronic gear ratio to smoothen the operation process of the motor and reduce shock to the machine.	• The acceleration/ deceleration process is not performed on the position references sent from the host controller. • The pulse reference frequency is low. • The electronic gear ratio is larger than 10.	The response delay is prolonged.

11.5.4Feedforward gain

Speed feedforward can be applied to the position control mode. The speed feedforward function can be used to improve the speed reference responsiveness and reduce the position deviation at fixed speed.

Speed feedforward

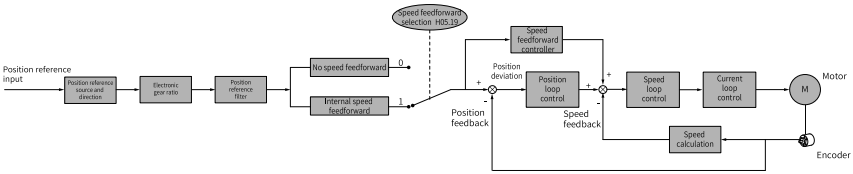


Figure 11-10 Operating procedure for speed feedforward control

Operating procedure for speed feedforward:

1. Set the speed feedforward signal source.
   Set H05.19 (Speed feedforward control) to a non-zero value to enable the speed feedforward function. The corresponding signal source will be selected as well.

Parameter	Name	Value	Remarks
H05.19	Speed feedforward control	0: No speed feedforward	-
		1: Internal speed feedforward	Defines the speed corresponding to the position reference (encoder unit) as the speed feedforward signal source.

Parameter	Name	Value	Remarks
		2: 60B1h used as speed offset	-
		3: Zero phase control	-

2. Set speed feedforward parameters.
   Set the speed feedforward gain (H08.19) and speed feedforward filter time constant (H08.18).

   ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H08.18	2008-13h	Time constant of speed feedforward filter	0.00 ms–64.00 ms	0.50	ms	Real-time
H08.19	2008-14h	Speed feedforward gain	0.0% to 100.0%	0.0	%	Real-time

Zero phase control

Zero phase control is used to compensate for the position deviation generated upon start delay of the position reference, reducing the position deviation upon start/stop in the position control mode.

The loop calculation model is shown in the following figure.

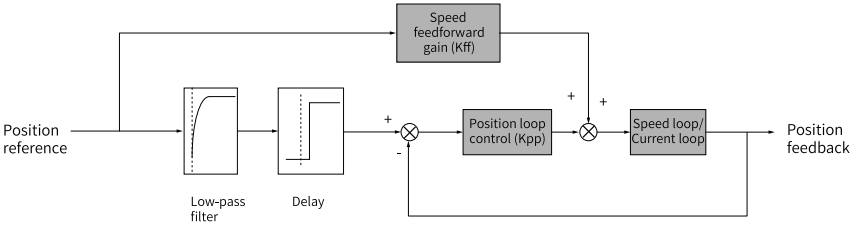


Figure 11-11 Zero phase control

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.04	2005-05h	First-order low-pass filter time constant	0.0 ms–6553.5 ms	0.0	ms	At stop
H05.19	2005-14h	Speed feedforward control	0: No speed feedforward 1: Internal speed feedforward 2: H05.72 3: Zero phase	1	-	At stop
H08.17	2008-12h	Zero phase delay	0.0 ms–4.0 ms	0.0	ms	Real-time

Torque feedforward

In the position control mode, torque feedforward can be used to improve torque reference responsiveness and reduce the position deviation during operation at constant acceleration/deceleration rate.

In the speed control mode, torque feedforward can be used to improve speed reference responsiveness and reduce the speed deviation during operation at constant speed.

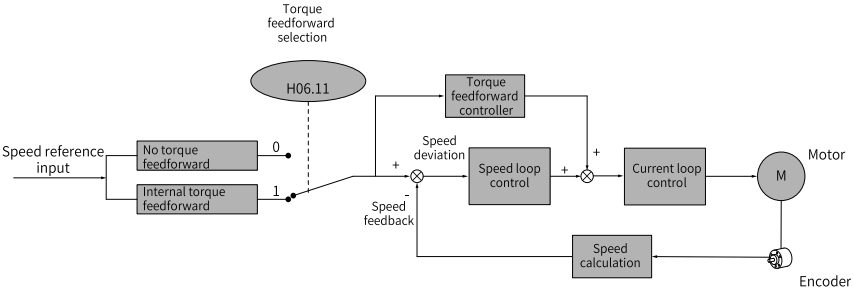


Figure 11-12 Operation diagram of torque feedforward control

The procedure for setting torque feedforward is as follows:

1. Set the torque feedforward signal source.
   Set H06.11 (Torque feedforward control) to 1 to enable the torque feedforward function. The corresponding signal source will be selected as well.

Parameter	Name	Value	Remarks
H06.11	Torque feedforward control	0: No torque feedforward	-

Parameter	Name	Value	Remarks
		1: Internal torque feedforward	Use the speed reference as the source of the torque feedforward signal. In the position control mode, the speed reference is outputted from the position controller.

2. Set torque feedforward parameters.

Parameter	Name	Description
H08.20	Torque feedforward filter time constant	Function: • Increasing the value of H08.21 improves the response but may cause overshoot during acceleration/deceleration. • Decreasing the value of H08.20 suppresses overshoot during acceleration/deceleration. Increasing the value of H08.20 suppresses the noise. Note: • Keep H08.20 to the default value, and then gradually increase the value of H08.21 from 0 to a certain value at which torque feedforward achieves the desired effect. • Adjust H08.20 and H08.21 repeatedly until a balanced performance is achieved.
H08.21	Torque feedforward gain	See this section for details.

11.5.5PDFF Control

The pseudo derivative feedback and feedforward (PDFF) control can be used to adjust speed loop control in the non-torque control modes.

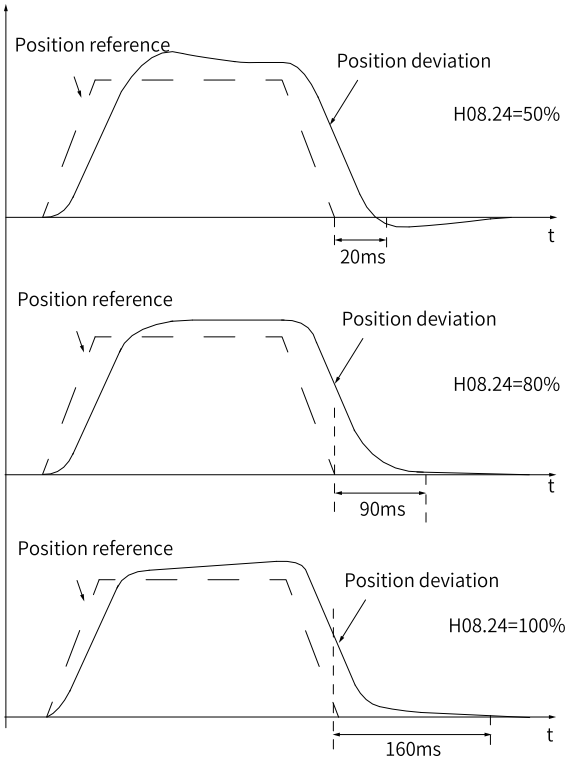


Figure 11-13 Example of PDFF control

Through adjusting the speed loop control method, PDFF control enhances the anti-disturbance capacity of the speed loop and improves the performance in following the speed references.

Parameter	Name	Description
H08.24	PDFF control coefficient	Function: • Defines the control method of the speed loop in the non-torque control modes. Note: • Setting H08.24 to an excessively low value slows down the responsiveness of the speed loop. • When the speed feedback overshoots, gradually decrease the setpoint of H08.24 from 100.0 to a certain value at which the PDFF control achieves the desired effect. • When H08.24 is set to 100.0, the speed loop control method does not change and the default proportional integral control is used.

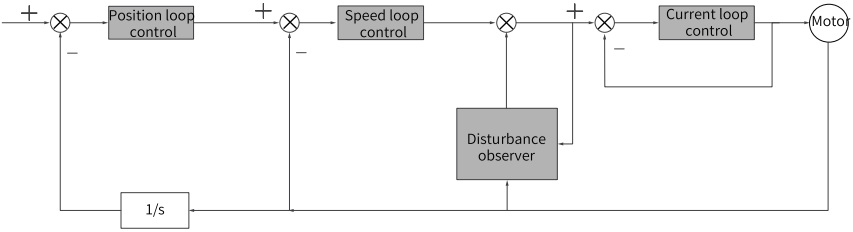
11.5.6Torque disturbance observer

This function is intended to be used in the non-torque control modes.

Disturbance observer

The disturbance observer is used to observe external disturbance. You can set different cutoff frequencies and compensation values to observe and suppress the disturbance within the frequency range.

The following figure depicts the control block diagram for disturbance observer.



Note

1/s: Integral element

Parameter	Name	Description
H08.31	Disturbance cutoff frequency	The higher the cutoff frequency, the more easily will vibration occur.
H08.32	Disturbance compensation gain	Defines the compensation percentage for the observer.
H08.33	Disturbance observer inertia correction coefficient	H08.33 needs to be changed only when the inertia ratio does not reflect the actual condition. The acting inertia is the product of the set inertia and H08.33. It is recommended to use the default value of H08.33.

☆ Related parameters:

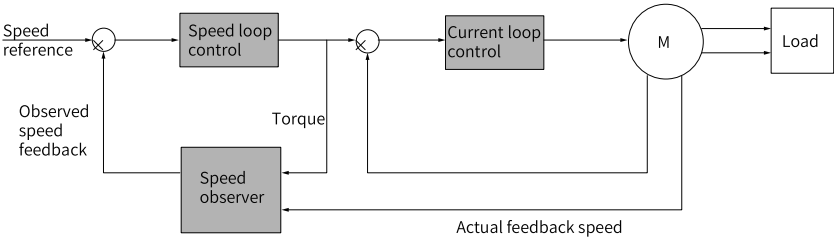
Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H08.31	2008-20h	Disturbance cutoff frequency	1 Hz–4000 Hz	600	Hz	Real-time
H08.32	2008-21h	Disturbance compensation gain	0% to 100%	0	%	Real-time
H08.33	2008-22h	Disturbance observer inertia correction coefficient	1% to 1600%	100	%	Real-time

11.5.7Speed Observer

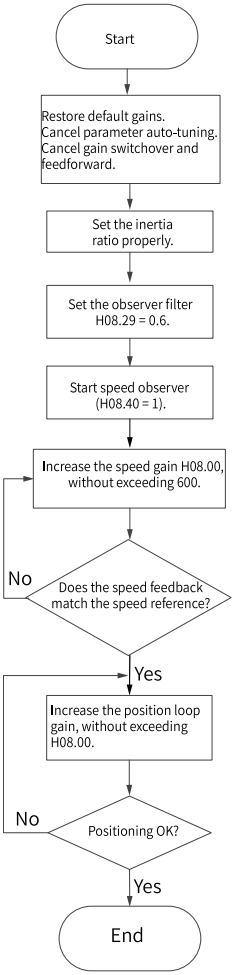
The speed observer, which facilitates quick positioning, applies in applications with slight load characteristic change and constant inertia.

It improves the responsiveness and filters high frequencies automatically, improving the gains and shortening the positioning time without incurring high-frequency vibration.

The block diagram for the speed observer is as follows.



Commissioning Steps



Note

- Before using the speed observer, set H08.15 (Load inertia ratio) to a proper value or perform inertia auto-tuning. A wrong inertia ratio can cause vibration.
- Setting H08.27, H08.28, or H08.29 to excessively low or high values can result in motor vibration.

Related parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H08.00	2008-01h	Speed loop gain	0.0 Hz–2000.0 Hz	40.0	Hz	Real-time
H08.27	2008-1Ch	Speed observer cutoff frequency	50 Hz–600 Hz	170	Hz	Real-time
H08.28	2008-1Dh	Speed observer inertia correction coefficient	1% to 1600%	100	%	Real-time
H08.29	2008-1Eh	Speed observer filter time	0.00 ms–10.00 ms	0.80	ms	Real-time
H08.40	2008-29h	Speed observer selection	0: Disabled 1: Enabled	0	-	Real-time

11.5.8Model Tracking

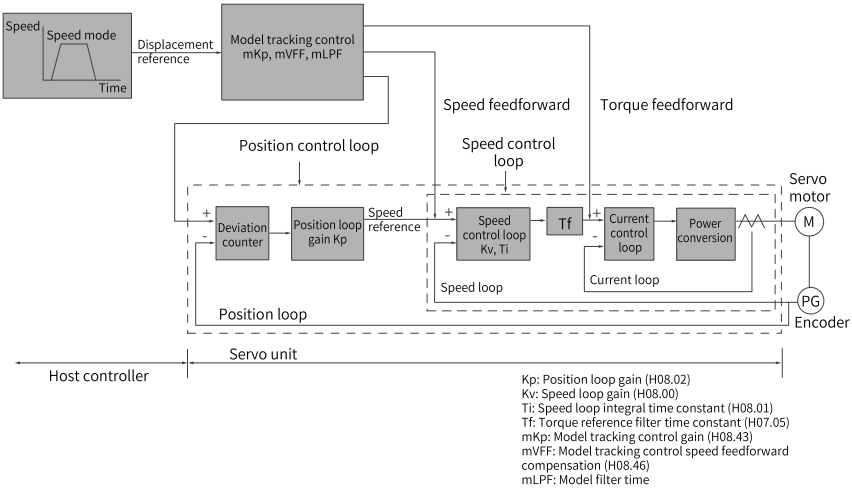
The model tracking control, which is only available in the position control mode, can be used to improve responsiveness and shorten the positioning time. It is only available in the position control mode.

Parameters used by model tracking are normally set automatically through ITune or ETune along with the gain parameters.

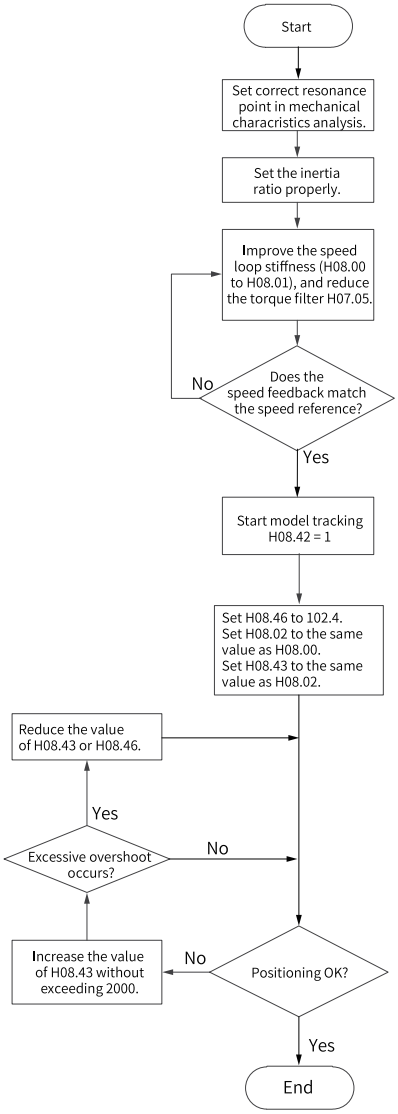
However, manual tuning is needed in the following situations:

- The auto-tuned values cannot deliver desired performance.
- Improving the responsiveness takes priority over the auto-tuned or customized values.
- User-defined gain parameters or model tracking control parameters are needed.

The block diagram for model tracking control is as follows.



Commissioning Steps



Note

Ensure the set inertia is accurate. Otherwise, motor vibration may occur.

Related parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.05	2007-06h	Torque reference filter time constant 1	0.00 ms–30.00 ms	0.50	ms	Real-time
H08.00	2008-01h	Speed loop gain	0.0 Hz–2000.0 Hz	40.0	Hz	Real-time
H08.01	2008-02h	Speed loop integral time constant	0.15 ms–512.00 ms	19.89	ms	Real-time
H08.02	2008-03h	Position loop gain	0.0 Hz–2000.0 Hz	64.0	Hz	Real-time
H08.42	2008-2Bh	Model control selection	0: Disabled 1: Enabled 2: Reserved	0	-	Real-time
H08.43	2008-2Ch	Model gain	0.1–2000.0	40.0	-	Real-time
H08.46	2008-2Fh	Feedforward value	0.0–102.4	95.0	-	Real-time

11.5.9Friction Compensation

Friction compensation is used to reduce the impact of the friction on the operating effect during mechanical transmission. Use different positive/negative compensation values according to the direction of operation.

Note

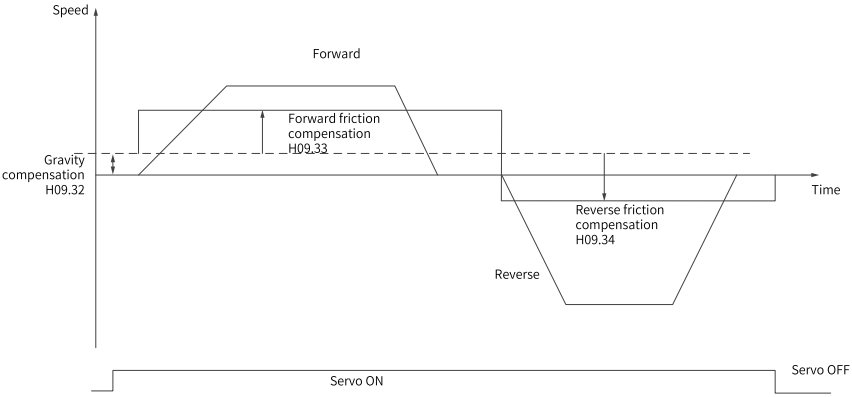
Friction compensation is effective only in the position mode.

☆Related parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H09.32	2009-21h	Gravity compensation value	-100.0% to 100.0%	0.0	%	Real-time
H09.33	2009-22h	Positive friction compensation value	0.0% to 100.0%	0.0	%	Real-time
H09.34	2009-23h	Negative friction compensation value	-100.0% to 0.0%	0.0	%	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H09.35	2009-24h	Friction compensation speed	0.0–20.0	2.0	-	Real-time
H09.36	2009-25h	Friction compensation speed	0: Slow mode+Speed reference 1: Slow mode+Model speed 2: Slow mode+Speed feedback 3: Slow mode+Observe speed 16: Quick mode +Speed reference 17: Quick mode +Model speed 18: Quick mode +Speed feedback 19: Quick mode+Observe speed	0	-	Real-time

The diagram for friction compensation is as follows.



Note

Note: When the speed is less than the speed threshold, static friction applies. When the speed exceeds the speed threshold, dynamic friction applies. The compensation direction is determined by the direction of the position reference. Forward direction requires a positive compensation value. Reverse direction requires a negative compensation value.

11.5.10Encoder Scale Ripple Suppression

Usually, we think that in the ideal encoder feedback, the fed back position information corresponds to the position of the motor mover (rotor) linearly. However, due to the physical characteristics of the encoder scale, position information of the ripple will be introduced. See the following figure for details.

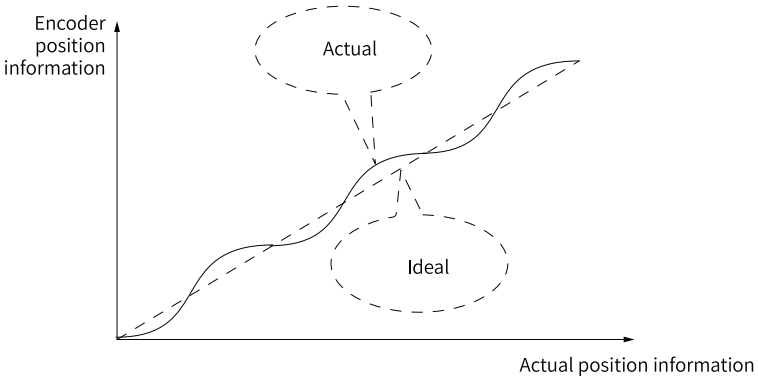


Figure 11-14 Encoder feedback

Therefore, the actual position information can be equivalent to the superposition of linear transmission Gliner and ripple transmission Gwave. The ripple transmission part is usually associated with the encoder scale spacing. The ripple frequency is linearly and positively correlated with the running speed.

This ripple position information will be converted into position feedback and speed feedback and introduced into the control loop, which will lead to ripple in the output of the whole control system. When the gain of the control loop is strong, this ripple will be amplified and cause additional vibration noise.

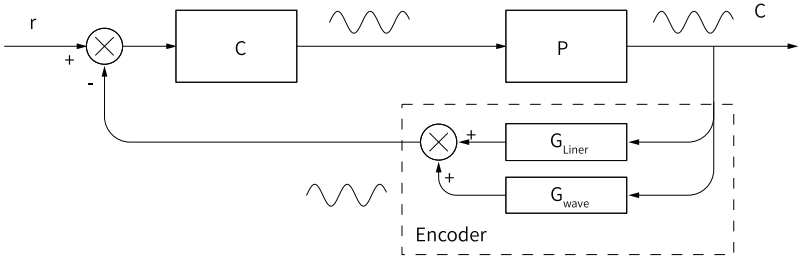


Figure 11-15 Control system loop with ripple

Therefore, the SV680-INT provides a scale ripple suppressor, which "isolates" the scale ripple introduced by encoder feedback, avoids the operation noise caused by the position for speed ripple in the control loop, and suppresses the output ripple caused by controlled speed ripple. The principle is as follows.

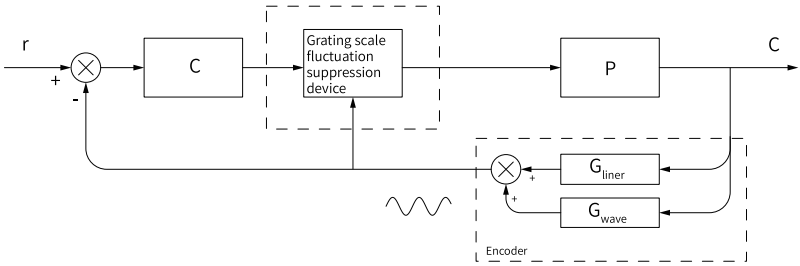


Figure 11-16 Principle block diagram of SV680-INT scale ripple suppressor

To use the suppressor:

1. Check the scale spacing and set H00.45 and H00.46. Usually, you can obtain the scale spacing by inquiring the scale information. If it is uncertain, you can determine it according to the speed ripple frequency and average speed during uniform speed operation.
2. Turn on ripple suppression. You can turn on the number of suppressors and corresponding mode as needed. Among them, the adaptive mode is used for reciprocating operation with unequal speed or unidirectional operation with variable speed. The hysteretic mode is used for reciprocating operation with constant speed.

Parameter	Name	Default	Value Range	Description
H00.45	Encoder pitch 1	2 mm	0.00–655.35	Unit: [mm]/[deg]
H00.46	Encoder pitch 2	0.5 mm	0.00–655.35	Unit: [mm]/[deg]
H08.90	Encoder scale spacing ripple suppressor enable	0	0–4	Encoder scale spacing ripple suppressor enable 0: Disabled 1: Enable the first one, adaptive mode 2: Enable the first one, hysteretic mode 3: Enable two, adaptive mode 4: Enable two, hysteretic mode

Note

- This feature is more effective for applications with slow acceleration and deceleration in a long travel (especially those where DDL works with a magnetic grid encoder at a constant speed in a long travel, such as applications in the digital jet printing industry). It can significantly reduce speed fluctuation and noise caused by magnetic grid spacing.
- Other situations, such as small magnetic grid spacing or large amount of scale graduations, are usually less susceptible to magnetic grid spacing fluctuation and therefore do not benefit much from this feature. You can enable it as needed.

11.5.11 Motor Cogging Torque Ripple Compensation

Motor cogging torque ripple compensation is used to compensate the torque ripple caused by the motor cogging torque, so as to suppress the speed ripple caused by the cogging torque ripple under the low control loop gain without compromising the stability margin of the system.

The SV680-INT provides two types of application modes for rotary motors (general-purpose ROT/DDR)[1]):

Note

[1]: General-purpose ROT is servo motor; DDR is a direct drive torque motor.

- **ROT/DDR application mode with Inovance absolute encoder**
  In this mode, the motor has already obtained the compensation data before delivery. You only need to enable or disable the feature through H06.28.

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.28	2006-1Dh	Cogging torque ripple compensation	0 to 1	1	-	At stop

- **ROT/DDR application mode with incremental encoder (incremental encoder with Inovance communication T5 interpolator, ABZ incremental encoder (TTL signal)))**
  When this mode is applied, it is necessary to carry out auto-tuning of motor cogging torque ripple and obtain the compensation list before enabling compensation. Auto-tuning and the compensation can only take effect after angle auto-tuning and homing are completed. The process is as follows:

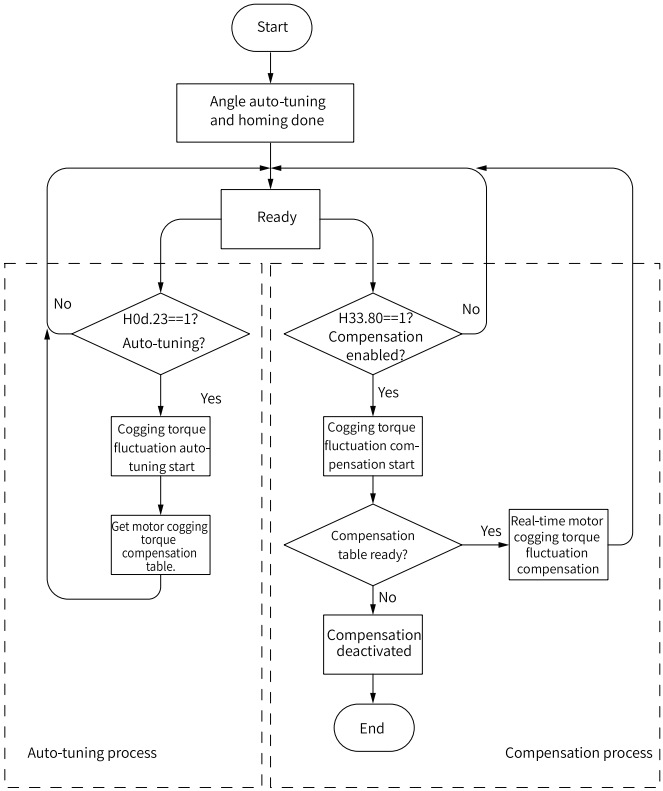


Figure 11-17 Flow chart of ROT/DDR application mode with incremental encoder

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H33.80	2033-51h	Medium to save motor cogging Torque ripple compensation data	0: Encoder 1: Flash	0	-	At stop
H0d.23	200d-18h	Motor cogging torque ripple auto-tuning enable	0: Disabled 1: Enabled	0	-	At stop

When motor cogging torque ripple auto-tuning is enabled (H0d.23=1), the SV680-INT will control the motor to rotate for several revolutions to obtain the cogging torque ripple compensation list.

Note

During this process, you need to ensure that the motor has enough operating range to avoid collision. It is recommended to perform auto-tuning when the motor is unloaded, to avoid external disturbance.

After auto-tuning is completed, compensation is enabled automatically (H06.28= 1). The drive is powered off and restarted to perform angle auto-tuning and homing. You can disable this feature manually when you do not need it (H06.28= 0).

11.6 Parameter Adjustment in Different Control Modes

Perform parameter adjustment in the sequence of "Inertia auto-tuning" => "Gain auto-tuning => "Manual gain tuning" in all the control modes.

11.6.1Parameter Adjustment in the Speed Control Mode

Parameter adjustment in the speed control mode is the same as that in the position control mode, except for the position loop gain (H08.02 and H08.05).

11.6.2Parameter Adjustment in the Position Control Mode

Obtain the value of H08.15 (Load inertia ratio) through inertia auto-tuning.

2) Perform gain adjustment.

- 1st gain set:

Parameter	Name	Function	Default
H07.05	Torque reference filter time constant 1	Defines the torque reference filter time constant.	0.50ms
H08.00	Speed loop gain	Defines the speed loop proportional gain.	40.0 Hz
H08.01	Speed loop integral time constant	Defines the integral time constant of the speed loop.	19.89ms
H08.02	Position loop gain	Defines the position loop proportional gain.	64.0 Hz

- 2nd gain set:

Parameter	Name	Function	Default
H07.06	Torque reference filter time constant 2	Defines the torque reference filter time constant.	0.27ms
H08.03	2nd speed loop gain	Defines the speed loop proportional gain.	75.0 Hz
H08.04	2nd speed loop integral time constant	Defines the integral time constant of the speed loop.	10.61ms
H08.05	2nd position loop gain	Defines the position loop proportional gain.	120.0 Hz
H08.08	2nd gain mode setting	Defines the mode of the 2nd gain set.	1
H08.09	Gain switchover condition	Used to set the condition for gain switchover.	0
H08.10	Gain switchover delay	Defines the gain switchover delay.	5.0ms
H08.11	Gain switchover level	Defines the gain switchover level.	50
H08.12	Gain switchover hysteresis	Defines the dead time of gain switchover.	30
H08.13	Position gain switchover time	Defines the position loop gain switchover time.	3.0ms

- Common gain set

Parameter	Name	Function	Default
H08.18	Time constant of speed feedforward filter	Defines the filter time constant of the speed feedforward signal.	0.50ms
H08.19	Speed feedforward gain	Defines the speed feedforward gain.	0.0%
H08.20	Torque feedforward filter time constant	Defines the filter time constant of the torque feedforward signal.	0.50ms
H08.21	Torque feedforward gain	Defines the torque feedforward gain.	0.0%
H08.22	Speed feedback filtering option	Defines the speed feedback filtering function.	0
H08.23	Cutoff frequency of speed feedback low-pass filter	Defines the cutoff frequency of the first-order low-pass filter for speed feedback.	8000 Hz
H08.24	PDFF control coefficient	Defines the coefficient of the PDFF controller.	100.0%

Parameter	Name	Function	Default
H09.30	Torque disturbance compensation gain	Defines the torque disturbance compensation gain.	0.0%
H09.31	Filter time constant of torque disturbance observer	Defines the filter time constant of the disturbance observer.	0.5ms
H09.04	Low-frequency resonance suppression mode	Defines the low-frequency resonance suppression mode.	0
H09.38	Frequency of low-frequency resonance suppression 1 at the mechanical end	Defines the frequency of the low-frequency resonance suppression filter.	100.0 Hz
H09.39	Low-frequency resonance suppression 1 at the mechanical end	Defines the setting of low-frequency resonance suppression filter.	2

Perform gain auto-tuning to get the initial values of the 1st gain set (or 2nd gain set) and the common gain set.

Fine-tune the following gains manually.

Parameter	Name	Function	Default
H07.05	Torque reference filter time constant 1	Defines the torque reference filter time constant.	0.50ms
H08.00	Speed loop gain	Defines the speed loop proportional gain.	40.0 Hz
H08.01	Speed loop integral time constant	Defines the integral time constant of the speed loop.	19.89ms
H08.02	Position loop gain	Defines the position loop proportional gain.	64.0 Hz
H08.19	Speed feedforward gain	Defines the speed feedforward gain.	0.0%

11.6.3Parameter Adjustment in the Torque Control Mode

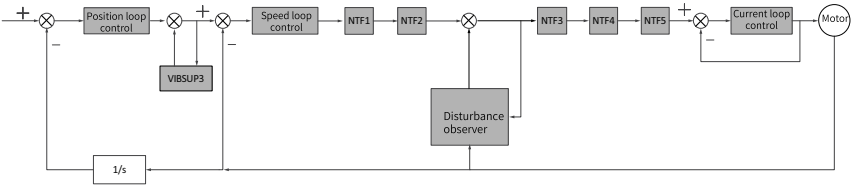
Parameter adjustment in the torque control mode are differentiated based on the following conditions:

- If the actual speed reaches the speed limit, the adjustment method is the same as that described in the related section.

- If the actual speed does not reach the speed limit, the adjustment method is the same as that described in the related section, except the position/ speed loop gain and speed loop integral time constant.

11.7 Vibration suppression

The block diagram for vibration suppression is as follows.



Where:

- NTF1–5: 1st notch to 5th notch
- VIBSUP3: Suppression of medium- and low-frequency vibration
- 1/s: Integral element

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H08.53	2008-36h	Medium- and low-frequency jitter suppression frequency 3	0.0 Hz–300.0 Hz	0.0	Hz	Real-time
H08.54	2008-37h	Medium- and low-frequency jitter suppression compensation 3	0% to 200%	0	%	Real-time
H08.56	2008-39h	Medium- and low-frequency jitter suppression phase modulation 3	0% to 600%	100	%	Real-time

Note

- jitter suppression phase modulation coefficient: synchronous phase adjustment of the compensation value and vibration. It is recommended to use the default value. Adjustment is needed when the compensation value phase differs greatly from the vibration phase.
- Jitter suppression frequency: Defines the jitter frequency that needs to be suppressed.
- Jitter suppression compensation coefficient: Defines the compensation coefficient for jitter suppression.

11.7.1Mechanical Resonance Suppression

Resonance frequency is present in the mechanical system. When the gain of the drive increases, resonance may occur near the resonance frequency, disabling further increase of the gain.

Mechanical resonance can be suppressed in the following two methods:

Torque reference filter (H07.05, H07.06)

To suppress the mechanical resonance, set the filter time constant to enable the torque reference to be attenuated in the frequency range above the cutoff frequency.

Filter cutoff frequency fc (Hz) = 1/[2π x H07.059 (ms) x 0.001]

Notch

The notch reduces the gain at certain frequencies to suppress mechanical resonance. After the vibration is suppressed by the notch, you can continue to increase the gain. The operating principle of the notch is shown in the following figure.

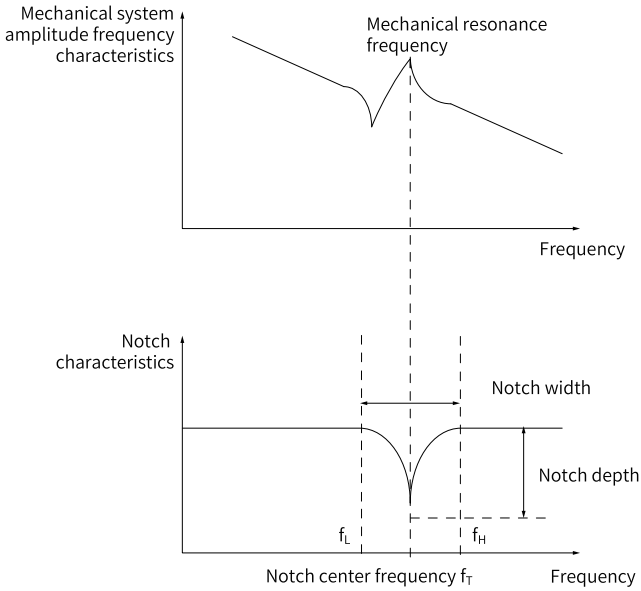


Figure 11-18 Operating principle of the notch

A total of 5 notches can be used, and each notch is defined by three parameters: frequency, width level, and depth level. The 1st, 2nd and fifth notches are manual notches whose parameters needs to be set by the user. Parameters of the 3rd and 4th notches can be either set by the user or set automatically after being configured as an adaptive notch (H09.02 =1 or 2).

Table 11–7 Description of notch parameters

Item	Manual Notch			Manual/Adaptive Notch	
	1st Notch	2nd Notch	5th Notch	3rd Notch	4th Notch
Frequency	H09.12	H09.15	H09.41	H09.18	H09.21
Width level	H09.13	H09.16	H09.42	H09.19	H09.22
Depth level	H09.14	H09.17	H09.43	H09.20	H09.23

Note

- When the frequency is 8000 Hz (default), the notch is inactive.
- The adaptive notch is preferred for resonance suppression. The manual notch can be used in cases where the adaptive notch cannot deliver desired performance.

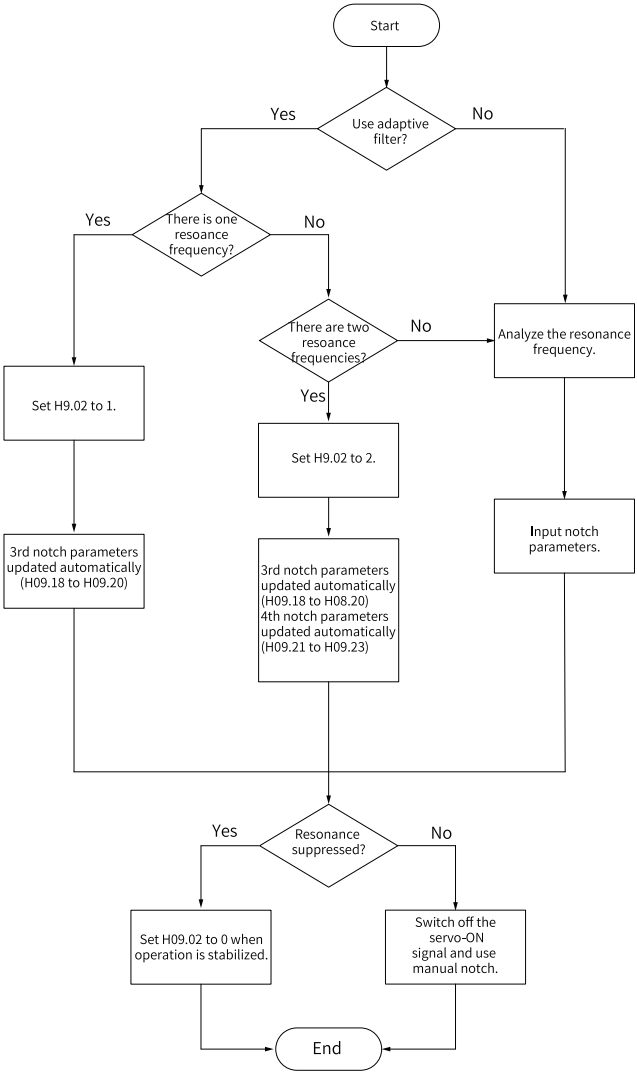


Figure 11-19 Using the notch

- Procedure for setting the adaptive notch:

  1. Set H09.02 (Adaptive notch mode selection) to 1 or 2 based on the number of resonance frequencies.
  2. When resonance occurs, set H09.02 to 1 first to enable one adaptive notch. If new resonance occurs after gain adjustment, set H09.02 to 2 to enable two adaptive notches.

3. Parameters of the 3rd, 4th and 5th notches are updated automatically during operation, and parameter values are saved automatically to the corresponding parameters in group H09 every 30 min.
4. If resonance is suppressed, the adaptive notch works. After the servo drive runs stably for a period of time, set H09.02 to 0 and the parameters of the adaptive notch are fixed to the last updated values.

   This is to prevent notch parameters from being updated to wrong values due to misoperation. Wrong values will intensity resonance.
5. If resonance persists after the notch is working for a period of time, switch off the S-ON signal.
6. If there are more than two resonance frequencies, the problem cannot be solved by only using the adaptive notches. In this case, add a manual notch, Additionally use the manual notch, or use all the 5 notches as manual ones (H09.02 = 0).

Note

- When adaptive notch is applied, if the S-OFF signal is activated within 30 min, the notch parameters will not be saved to the corresponding parameter
- When the resonance frequency is below 300 Hz, the suppression effect of the adaptive notch may be degraded.

- Procedure for setting the manual notch:

  1. Analyze the resonance frequency.
  2. When using the manual notch, set the notch frequency to same value as the actual resonance frequency obtained in the following ways: The resonance frequency can be obtained by using the following methods:
     - Use the "Mechanical characteristic analysis" function in Inovance software tool.
     - Calculate the resonance frequency based on the motor phase current displayed on the oscilloscope interface of the software tool.
     - Set H09.02 (Adaptive notch mode) to 3. The drive detects the resonance frequency and saves the detected value to H09.24 automatically during operation.
  3. Input the resonance frequency obtained in step 1 to the parameter of the selected notch, and input the width level and depth level of this notch.
  4. If resonance has been suppressed, it indicates the notch functions well and you can continue adjusting the gain. If resonance occurs again, repeat steps 1 and 2.
  5. If resonance persists after the notch is working for a period of time, switch off the S-ON signal.

- Notch width level
  The width level indicates the ratio of the notch width to the center frequency of the notch.

$$\text{Notch width level} = \frac{f_H - f_L}{f_T}$$

Figure 11-20

Where:

f_T : center frequency of the notch, which is also the mechanical resonance frequency

$f_H - f_L$ is the notch width, that is, the frequency bandwidth with an amplitude attenuation rate of –3 dB relative to the notch central frequency.

The following figure shows the correspondence. Use the default value 2 in normal cases.

- Depth level of the notch
  The notch depth level indicates the ratio of the input to the output at the center frequency.

  When the depth level is 0, the input is completely suppressed at the center frequency. When the depth level is 99, the input can be fully passed at the center frequency. Therefore, the lower the depth level is, the higher the notch depth is, and the stronger the suppression effect will be. Note that an excessively low depth level may lead to system oscillation.

Note

If the amplitude frequency characteristic curve obtained through the mechanical analysis function does not have obvious peak, it indicates that vibration occurs actually. Such vibration may not be mechanical resonance, and cannot be suppressed by the notch. It occurs because the gain reaches the limit, and can be suppressed only by reducing the gain or the filter time of torque reference.

The following figure shows the frequency characteristics of the notch.

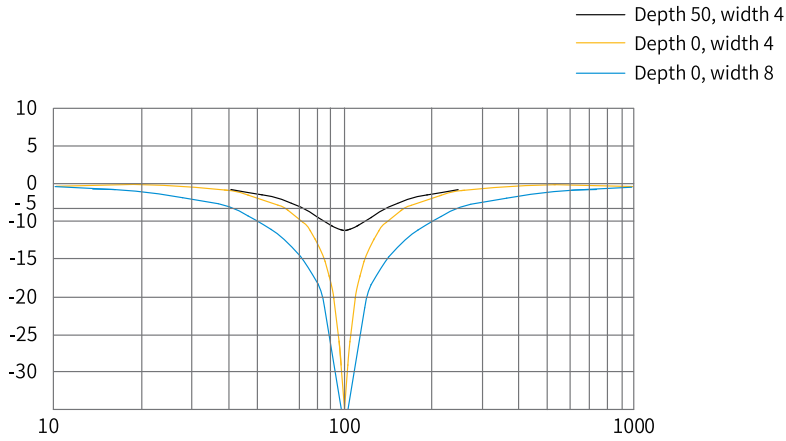


Figure 11-21 Notch frequency characteristics

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H09.02	2009-03h	Mode selection of adaptive notch	0: Adaptive notch no longer updated 1: One adaptive notch activated (3rd notch) 2: Two adaptive notches activated (3rd and 4th notches) 3: Resonance point tested only (displayed in H09.24) 4: Adaptive notch cleared, values of 3rd and 4th notches restored to default	0	-	Real-time
H09.12	2009-0Dh	Frequency of the 1st notch	50 Hz–8000 Hz	8000	Hz	Real-time
H09.13	2009-0Eh	Width level of the 1st notch	0–20	2	-	Real-time
H09.14	2009-0Fh	Depth level of the 1st notch	0–99	0	-	Real-time
H09.15	2009-10h	Frequency of the 2nd notch	50 Hz–8000 Hz	8000	Hz	Real-time
H09.16	2009-11h	Width level of the 2nd notch	0–20	2	-	Real-time
H09.17	2009-12h	Depth level of the 2nd notch	0–99	0	-	Real-time
H09.18	2009-13h	Frequency of the 3rd notch	50 Hz–8000 Hz	8000	Hz	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H09.19	2009-14h	Width level of the 3rd notch	0–20	2	-	Real-time
H09.20	2009-15h	Depth level of the 3rd notch	0–99	0	-	Real-time
H09.21	2009-16h	Frequency of the 4th notch	50 Hz–8000 Hz	8000	Hz	Real-time
H09.22	2009-17h	Width level of the 4th notch	0–20	2	-	Real-time
H09.23	2009-18h	Depth level of the 4th notch	0–99	0	-	Real-time
H09.24	2009-19h	Auto-tuned resonance frequency	0 Hz–5000 Hz	0	Hz	Unchangeable
H09.41	2009-2Ah	Frequency of the 5th notch	50 Hz–8000 Hz	8000	Hz	Real-time
H09.42	2009-2Bh	Width level of the 5th notch	0–20	2	-	Real-time
H09.43	2009-2Ch	Depth level of the 5th notch	0–99	0	-	Real-time

11.7.2Low-Frequency Resonance Suppression at the Mechanical End

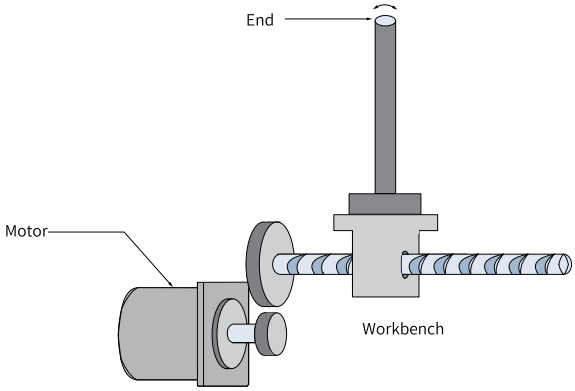


Figure 11-22 Low-frequency vibration at the mechanical end

If the mechanical load end is long and heavy, vibration may easily occur in this part during emergency stop, affecting the positioning effect. Such vibration is called low-frequency resonance as its frequency is generally within 100 Hz, which is lower than the mechanical resonance frequency mentioned in the related section. Use the low-frequency resonance suppression function to reduce such vibration.

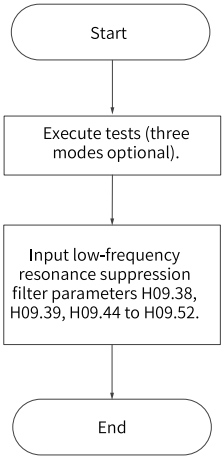


Figure 11-23 Procedure for setting low-frequency resonance suppression filter

First, use the oscilloscope function in the software tool to collect the position deviation waveform of the motor in the positioning state. Then calculate the position deviation fluctuation frequency, which is the low-frequency resonance frequency. Finally, input the value of H09.38 manually and use the default value of H09.39. Observe the resonance suppression effect after using the low-frequency resonance suppression filter.

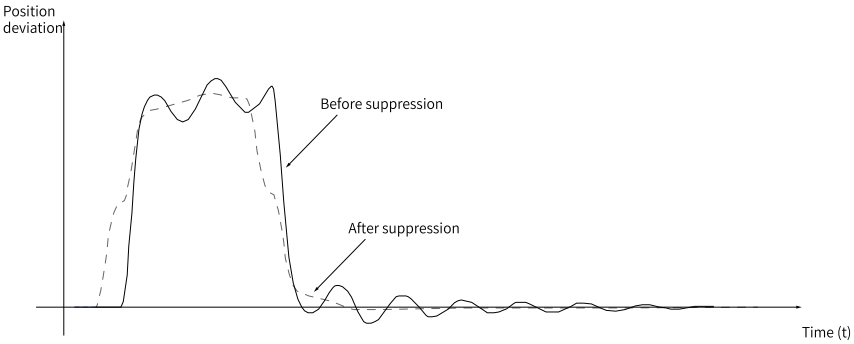


Figure 11-24 Low-frequency resonance suppression effect

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H09.38	2009-27h	Frequency of low-frequency resonance suppression 1 at the mechanical end	1.0 Hz–100.0 Hz	100.0	Hz	At stop
H09.39	2009-28h	Low-frequency resonance suppression 1 at the mechanical end	0–3	2	-	At stop
H09.44	2009-2Dh	Frequency of low-frequency resonance suppression 2 at mechanical load end	0.0–200.0	0.0	-	At stop
H09.45	2009-2Eh	Responsiveness of low-frequency resonance suppression 2 at mechanical load end	0.01–10.00	1.00	-	At stop
H09.47	2009-30h	Width of low-frequency resonance suppression 2 at mechanical load end	0.00–2.00	1.00	-	At stop
H09.49	2009-32h	Frequency of low-frequency resonance suppression 3 at mechanical load end	0.0–200.0	0.0	-	At stop
H09.50	2009-33h	Responsiveness of low-frequency resonance suppression 3 at mechanical load end	0.01–10.00	1.00	-	At stop
H09.52	2009-35h	Width of low-frequency resonance suppression 3 at mechanical load end	0.00–2.00	1.00	-	At stop

11.8 Mechanical Characteristic Analysis

Overview

Mechanical characteristic analysis is used to determine the mechanical resonance point and system bandwidth. A maximum of 8 kHz response characteristic analysis is available and three modes including mechanical characteristic, speed open loop and speed closed loop are supported.

Steps

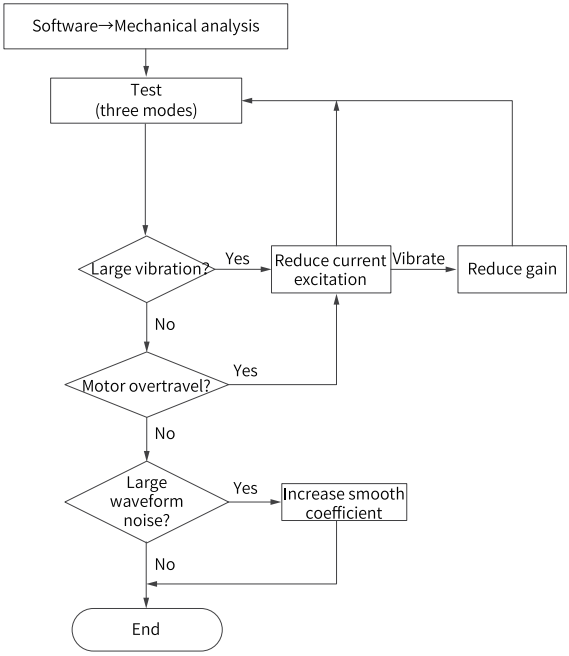


Figure 11-25 Operating procedure for mechanical characteristic analysis

Note

- To avoid large vibration during the test, set the current excitation to 10% during initial execution.
- The analysis waveform may be distorted if the current excitation is too low.
- If vibration generated during testing cannot be suppressed by reducing the current excitation, the causes and solutions may be: 1) The gain values are too high. Reduce the speed gain or set notch parameters based on the auto-tuned resonance point. 2) The set inertia ratio is too high. Set the inertia ratio properly.
- After setting the notch, the waveform under mechanical characteristic test mode is the same with that before the setting, but the speed closed loop and speed open loop modes will be attenuated.

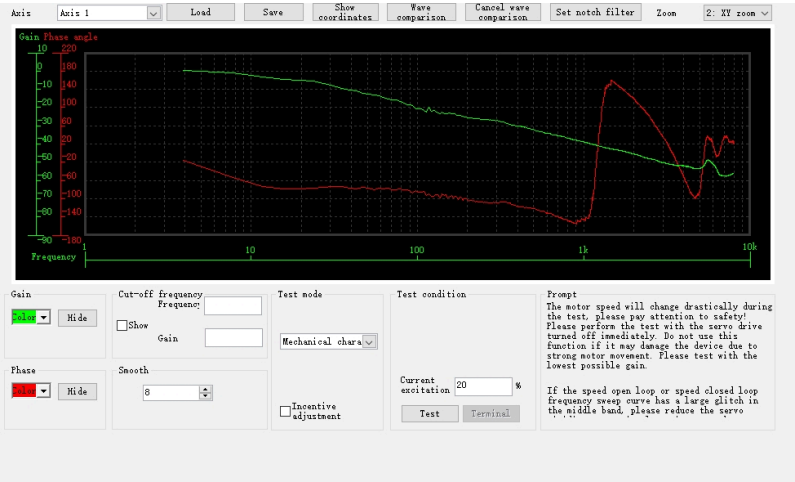


Figure 11-26 Example of the waveform obtained

An example of the waveform obtained with the mechanical characteristic analysis is shown in *"Figure 11–25 Example of the waveform obtained" on page 422*.

11.9 High-performance Tuning

Overview

High performance tuning is an upgraded function of mechanical characteristic analysis, which can not only judge the mechanical resonance point and system bandwidth, but also simulate the influence of adding filters and adjusting parameters on loop control. It supports response characteristic analysis up to 8 kHz and enables

you to measure and simulate mechanical characteristics, current loop, speed and position open/closed loop frequency domain characteristics.

Note

- Before frequency domain measurement, you need to set H02.00 to the corresponding speed mode or position mode. Other modes may trigger an abnormal servo state alarm.
- During the measurement, do not disconnect the drive from the software, otherwise the measurement process will be interrupted.

Steps

1. **Generation of measured image**

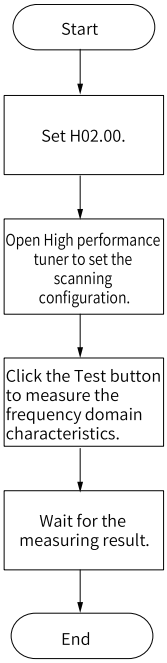


Figure 11-27 Flow chart of measured image generation

a. Select **High Performance Tuner** in **Workspace** and click **Sweep Frequency Config**.

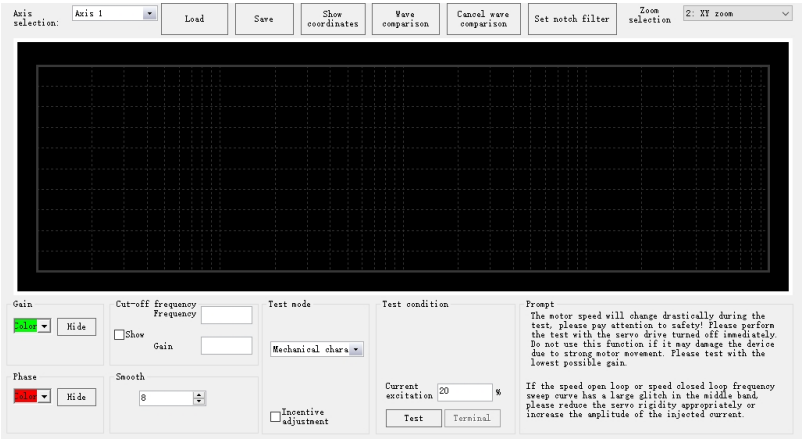


Figure 11-28 Sweep frequency configuration

☆ Related parameters:

Parameter	Name	Unit
H09.71	Low frequency starting frequency	Hz
H09.72	End frequency	Hz
H09.73	Low frequency interpolated points	-
H09.74	Excitation amplitude	%
H09.75	High frequency starting frequency	Hz
H09.76	High frequency interpolated points	-

b. After that, the measured frequency domain characteristics of the system are obtained. In the following figure, red and orange are measured and green and brown are simulated:

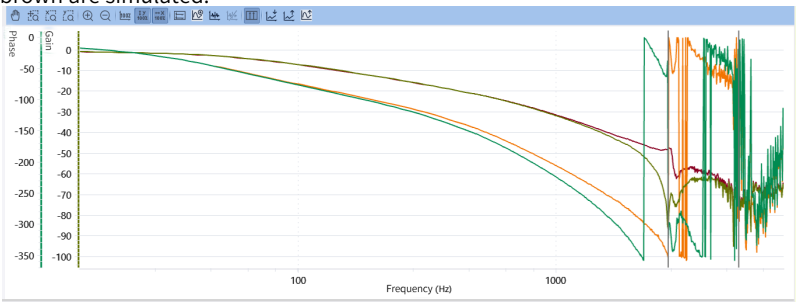


Figure 11-29 Frequency domain curve

Note

- To avoid large vibration during the test, set the current excitation to 10% during initial execution.
- The analysis waveform may be distorted if the current excitation is too low.
- If vibration is present during the test, and cannot be eliminated by reducing current excitation, possible causes and measures are:
  - 1) The gain is too high. Reduce the speed gain or set the notch based on the auto-tuned resonance point.
  - 2) The set inertia ratio is too high. Rectify the setting.

2. **Loop control adjustment**

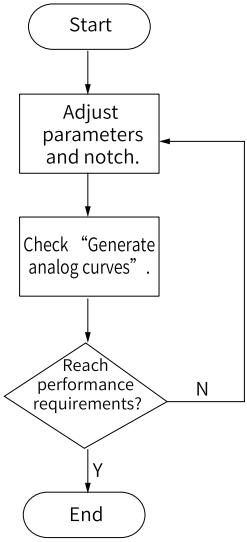


Figure 11-30 Flow chart of loop control adjustment

After adjusting parameter configuration and four notch filters, the simulation curve is generated again. You can see the influence of changing parameters on the system.

☆ Related parameters:

Parameter	Name	Parameter Type
H08.00	Speed loop gain	Gain
H08.01	Speed loop integral time	Gain
H08.02	Position loop gain	Gain
H08.05	Inertia ratio	Gain

Parameter	Name	Parameter Type
H07.05	Torque Reference Filter	Filter
H09.77 to H09.81	Biquad filter	Filter
H09.12 to H09.23	Notch	Filter

Note

Notch filter 1 becomes a notch only when it is not enabled. It can be configured as first-order low-pass, second-order low-pass, lead-lag, or custom biquad filter.

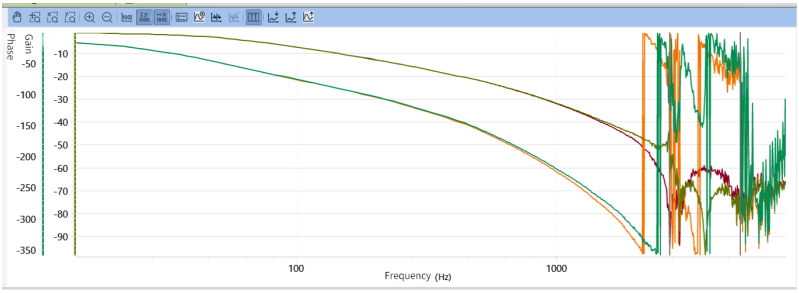


Figure 11-31 Comparison between simulated curve and measured curve

12 Control mode

The servo system consists of three major parts, the servo drive, servo motor, and feedback encoder.

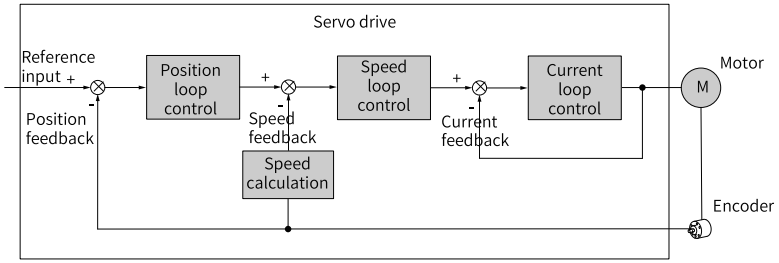


Figure 12-1 Structure of a basic servo system

As the control core of the servo system, the servo drive performs accurate position, speed, torque, or hybrid control on the servo motor by processing the input signals and feedback signals. Position control is the most important mode of a servo system.

Descriptions of the control modes are as follows:

- Position control In the position control mode, the target position of a motor is determined by the sum of position references, and the motor speed is determined by the position reference frequency. The servo drive performs quick and accurate position and speed control through the encoder installed on the motor or an external encoder (full closed-loop control). The position control mode mainly applies to applications requiring positioning control, such as manipulators, SMT machines, engraving and milling machines, and CNC machine tools.
- Speed control In the speed control mode, the servo drive performs quick and accurate speed control through the speed reference sent through communication. The speed control mode mainly applies to application requiring speed control or where a host controller is used for position control or the commands sent from the host controller are used as the speed references for the servo drive, such as the engraving and milling machine.
- In the torque control mode, the motor current is in linear relation with the torque. Therefore, torque control is implemented through current control. The servo drive controls the motor output torque based on torque references. The torque reference can be set through communication. This control mode is mainly applicable to the winding and unwinding devices with strict tension requirements. In these scenarios, the torque always changes with the winding radius so that the tension will not change along with the change of the winding radius.

12.1 Setting and Display of the Operation Modes

Introduction to the operation modes

The pre-operational mode of the servo drive is set in 6060h. The current operation mode of the servo drive can be viewed in 6061h.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6060h	6060h	Servo drive mode	SV680P-INT 1: Profile position mode (pp) 3: Profile velocity mode (PV) 4: Profile torque mode (PT) 6: Homing mode (HM) 7: Interpolation mode (IP) SV680N-INT 1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Real-time
6061h	6061h	Operation mode display	SV680P-INT 1: Profile position mode (pp) 3: Profile velocity mode (PV) 4: Profile torque mode (PT) 6: Homing mode (HM) 7: Interpolation mode (IP) SV680N-INT 1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Unchangeable

Communication cycle supported by each mode

The SV680P-INT supports 1ms or an integer multiple of 1 ms. The maximum synchronization period is 20 ms.

For the SV680N-INT, the min. sync period is 250 μs and the max. sync period is 20 ms.

12.2 Conversion Factor

Gear ratio refers to the motor displacement (encoder unit) corresponding to the load shaft displacement of one reference unit.

The gear ratio is comprised of the numerator 6091.01h and denominator 6091.02h. It determines the proportional relation between the load shaft displacement (reference unit) and the motor displacement (encoder unit), as shown below.

Motor displacement = Load shaft displacement x Gear ratio

The motor is connected to the load through the reducer and other mechanical transmission mechanism. The gear ratio is related to the mechanical reduction ratio, mechanical dimensions and motor resolution.

The calculation formula is as follows.

$$\text{Gear ratio} = \frac{\text{Encoder resolution}}{\text{Load shaft resolution}}$$

☆Related parameters

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6091.01h	6091-01h	Motor resolution	1 to 4294967295	1	-	At stop
6091.02h	6091-02h	Shaft resolution	1 to 4294967295	1	-	At stop

Calculation of servo motor position factor

Take the load ball screw as an example.

Minimum reference unit f_C = 1 mm

Lead P_B = 10 mm/r

Reduction ratio n = 5:1

Resolution of Inovance motor equipped with 26-bit serial-type encoder (P) = 67108864 PPR

The position factor is therefore calculated as follows:

Position factor:

$$\text{Position factor} = \frac{\text{Motor resolution P x n}}{P_B}$$

$$= \frac{67108864 \times 5}{10}$$

$$= \frac{335544320}{10}$$

$$= 33554432$$

Therefore, 6091.01h = 33554432; 6091.02h = 1. That means when the load shaft displacement is 1 mm, the motor displacement is 33554432.

Reduce the values of 6091.01h and 6091.02h to a point where there is no common divisor, and take the final value.

Calculation of direct drive motor position factor

Take the Inovance DDR communication encoder (H00.00 = 14201) directly connected without a reducer as an example:

Minimum reference unit f_C = 1°

Travel of one revolution P_B = 360°

Motor resolution P = 8388608 PPR

The position factor is therefore calculated as follows:

Position factor:

$$\text{Position factor} = \frac{\text{Motor resolution P}}{P_B} = \frac{8388608}{360}$$

Therefore, 6091.01h = 8388608; 6091.02h = 360. That means when the load shaft displacement is 360°, the motor displacement is 8388608.

Take the Inovance DDL communication encoder (H00.00 = 14202) directly connected without a reducer as an example:

Minimum reference unit f_C = 1 mm

Pole distance of motor (N-N) × P_B = 32mm x (2 x H00.48)

Motor resolution P = 8388608 PPR

The position factor is therefore calculated as follows:

Position factor:

$$\text{Position factor} = \frac{\text{Motor resolution P}}{P_B} = \frac{8388608}{32}$$

Therefore, 6091.01h = 8388608; 6091.02h = 32. That means when the load shaft displacement is 32 mm, the motor displacement is 8388608.

Reduce the values of 6091.01h and 6091.02h to a point where there is no common divisor, and take the final value.

Setting electronic gear ratio of the linear motor

Minimum reference unit 1 mm

Encoder resolution 0.5μm/pulse

Because the linear motor moves linearly, the reduction ratio is 1:1.

The position factor is therefore calculated as follows:

Position factor = 1 mm ÷ (0.5 um/pulse) = 2000

The load displacement is 1mm. The motor mover moves 1mm, and the encoder feeds back 2000 pulses.

12.3 Servo State

Abide by the process stipulated in the CiA402 protocol when operating the SV680-INT servo drive. Otherwise, the servo drive cannot run in the designated status.

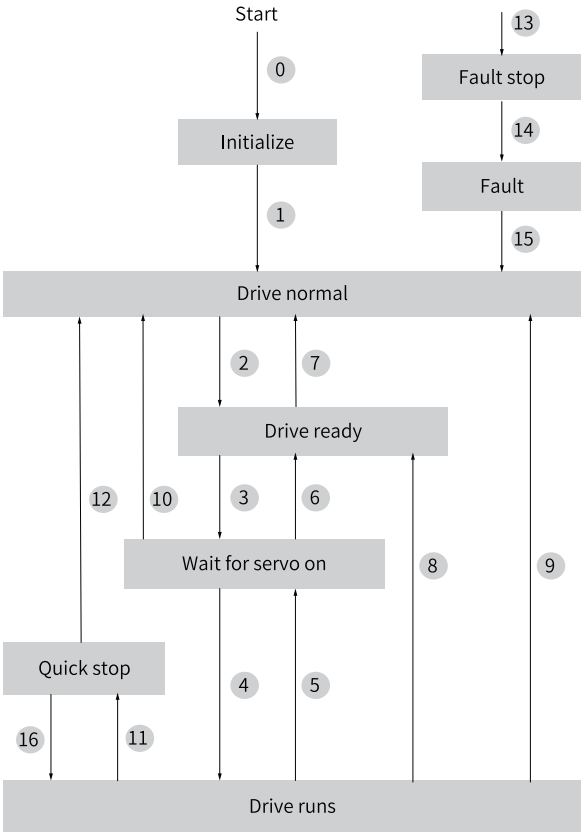


Figure 12-2 Switchover of CiA402 state machine

See the following table for descriptions of different status.

Initialization	Initialization of the servo drive and internal self-inspection are done. Parameters cannot be set. Drive functions cannot be executed.
No fault	No fault exists in the servo drive or the fault has been cleared.

	Parameters can be set.
Ready to switch on	The servo drive is ready to run. Parameters can be set.
Wait for the S-ON signal	The servo drive is waiting for the S-ON signal. Parameters can be set.
Enable operation	The servo drive is operating properly and a certain operation mode has been enabled. The motor is energized and starts rotating when the speed reference value inputted is not 0. Only parameters whose "Setting Condition" is "During running" can be set.
Quick stop	Quick stop is activated and the servo drive is in the process of quick stop. Only parameters whose "Setting Condition" is "During running" can be set.
Fault reaction	A fault occurs and the servo drive is in the process of stop. Only parameters whose "Setting Condition" is "During running" can be set.
Fault	The stop process is done and all the drive functions are disabled. Parameters can be modified for troubleshooting purpose.

The following table describes the control commands and status switchover.

CiA402 Status Switchover		Control Word 6040h	bit0 to bit9[1] of status word 6041h
0	Power-on → Initialization	Natural transition, control command not required	0x0000
1	Initialization → No fault	Natural transition, control command not required If an error occurs during initialization, the servo drive directly enters status 13.	0x0250/0x270
2	No fault → Servo ready	0x0006	0x0231
3	Servo ready→Waiting for the S-ON signal	0x0007	0x0233
4	Waiting for the S-ON signal→Servo running	0x000F	0x0237
5	Servo running→Waiting for the S-ON signal	0x0007	0x0233
6	Waiting for the S-ON signal→Servo ready	0x0006	0x0231
7	Servo ready → No fault	0x0000	0x0250

CiA402 Status Switchover		Control Word 6040h	bit0 to bit9[1] of status word 6041h
8	Servo running → Servo ready	0x0006	0x0231
9	Servo running → No fault	0x0000	0x0250
10	Waiting for the S-ON signal → No fault	0x0000	0x0250
11	Servo running → Quick stop	0x0002	0x0217
12	Quick stop → No fault	Quick stop mode 605Ah can be set to 0 to 3. The process is performed automatically and no control command is required.	0x0250
13	→ Stop at fault	If a fault occurs in any status other than "fault", the servo drive automatically switches to the stop-at-fault state, without the need for a control command.	0x021F
14	Stop at fault→Fault	Natural transition applies after stop and no control command is required.	0x0218
15	Fault→No fault	0x80 Bit7 is rising edge-triggered. bit7 is maintained at 1, and other control commands are ineffective.	0x0250
16	Quick stop → Servo running	Set 605A to a value between 5 and 7. 0x0F will be sent after stop.	0x0237

Note

[1]: bit10 to bit15 of 6041h are related to the operating state of the servo drive, and their values are represented as "0" in the preceding table. For details on the status of these bits, check the operation mode of the servo drive.

12.3.1Control Word 6040h

6040h **Control word**

Address: 6040h

Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time
Access:	RW	Mapping:	RPDO

Value Range:

0x0 to 0xFFFF

Description:

Defines the control command.

bit	Name		Description
0	S-ON	Switch on	1: Enabled, 0: Disabled
1	Enable voltage	Enable voltage	1: Enabled, 0: Disabled
2	Quick stop	Quick stop	0: Enabled, 1: Disabled
3	Operation enabled	Enable operation	1: Enabled, 0: Disabled
4–6	Operation mode specific	Operation mode specific	Related to the operation mode of the servo drive.
7	Fault reset	Fault reset	0: Disabled 0→1: Fault reset is available only for faults and alarms that can be reset. 1: Other control commands are invalid. 1→0: Inactive
8	Halt	Halt	1: Enabled, 0: Disabled
9	Operation mode specific	Operation mode specific	Related to the servo drive operation mode.
10	Reserved	Reverse	Undefined
11–15	Manufacturer-specific	Manufacturer-specific	Manufacturer-specific

Note

- All bits in the control word constitute a control command.
- The meanings of bit0...bit3 and bit7 are the same in each mode. The servo drive switches to the preset status according to the CiA402 state machine switchover process only when commands are sent in sequence. Each command corresponds to a certain status.
- bit4–bit6 are related to each mode (see the control commands in different modes for details).
- bit9 is not defined.

12.3.2Status Word 6041h

6041h **Status word**

Address:	6041h		
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable
Access:	RO	Mapping:	TPDO

Value Range:

0x0 to 0xFFFF

Description:

Indicates the servo drive status.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ms		oms		ila	tr	rm	ms	w	sod	qs	ve	f	oe	so	rtso
MSB															LSB

Note：ms=manufacturer-specific；oms=operation mode-specific；ila =internal limit active；tr=target reach；rm=remote；w=warning；sod=switch on disabled；qs=quick stop；ve=voltage enabled；f=fault；oe=operation enabled；so=switch on；rtso=ready to switch on

Table 12–1 Description of each bit of 6041h

bit	Name		Description
0	Ready to switch on	Ready to switch on	1: Enabled, 0: Disabled
1	Switch on	Switch on	1: Enabled, 0: Disabled
2	Operation enabled	Operation enabled	1: Enabled, 0: Disabled
3	Fault	Fault	1: Enabled, 0: Disabled
4	Voltage enabled	Voltage enabled	1: Enabled, 0: Disabled
5	Quick stop	Quick stop	0: Enabled, 1: Disabled
6	Switch on disabled	Switch on disabled	1: Enabled, 0: Disabled
7	Alarm	Alarm	1: Enabled, 0: Disabled

bit	Name		Description
8	Manufacturer-specific	Manufacturer-specific	Undefined
9	Remote	Remote	1: Enabled, control word activated 0: Disabled
10	Target reach	Target reach	1: Enabled, 0: Disabled
11	Internal limit active	Internal limit active	1: Enabled, 0: Disabled
12–13	Operation mode specific	Operation mode specific	Related to the servo drive operation mode.
14	Manufacturer-specific	Manufacturer-specific	Undefined
15	Home find	Home find	0: Home not found 1: Home found

Table 12–2 Descriptions of setpoints of 6041h

Binary Value	Description
xxxx xxxx x0xx 0000	Not ready to switch on
xxxx xxxx x1xx 0000	Switch on disabled
xxxx xxxx x01x 0001	Ready to switch on
xxxx xxxx x01x 0011	Switched on
xxxx xxxx x01x 0111	Operation enabled
xxxx xxxx x00x 0111	Quick stop active
xxxx xxxx x0xx 1111	Fault reaction active
xxxx xxxx x0xx 1000	Fault

Note

- The meanings of bit0 to bit9 are the same in each mode of the servo drive. After commands in 6040h are sent in sequence, the servo drive returns a feedback on the servo state.
- The meanings of bit12 to bit13 vary with the servo drive modes. For details, see parameters related to each mode.
- The meanings of bit10, bit11, and bit15 are the same in each servo mode. These three bits indicate the servo status after a certain servo mode is executed.

12.4 Process Segment Mode

Set H02.00 (Control mode) to 7 (Position control mode) through the keypad or Inovance software tool to make the drive operate in the process segment mode. The

process segment mode is a multi-function position mode integrated with homing, constant speed control, and positioning control.

16 process segments are available, in which process segment 0 is the homing mode and process segments 1 to 15 are defined by users. The interval time and linkage mode among process segments can also be selected as needed. The setting flowchart is as follows.

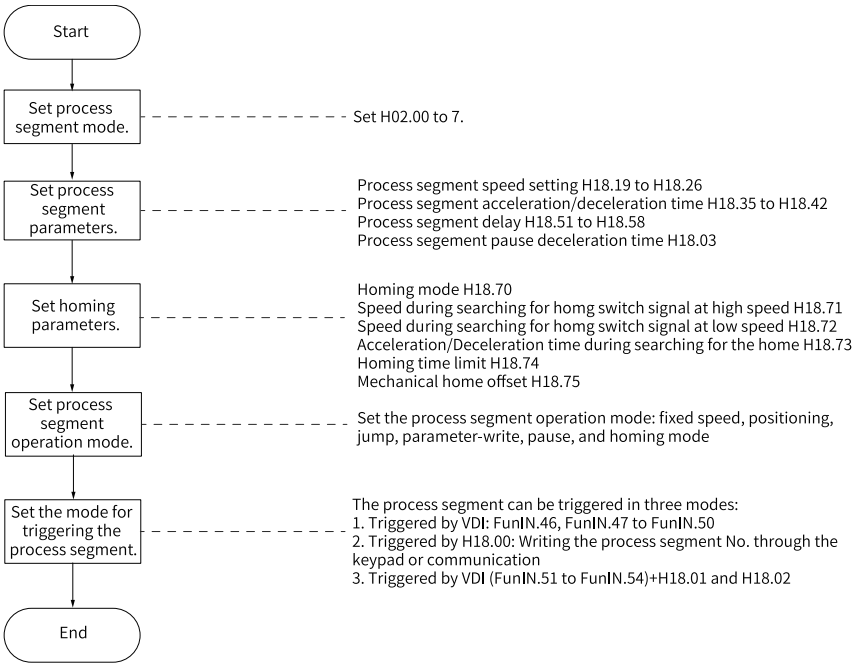


Figure 12-3 Flowchart for setting process segment mode

12.4.1Mode Triggering

The following table shows how to trigger the process segment mode.

Triggered By	Triggered From	Description
DI triggering	DI: FunIN.46 (PrEnable) + FunIN.47–50 (PrCMD1–4)	Combine FunIN.47–FunIN.50 to form the process segment number to be triggered. Trigger the process segment through the rising edge of FunIN.46.
Parameter	H22.00	Write the process segment number to H22.00 through the keypad or communication to trigger the process segment.

Triggered By	Triggered From	Description
DI + parameter triggering	DI: FunIN.51–54 (PrEvent1–4) + H22.01/H22.02	Set the process segment number to be triggered through H22.01 and H22.02. H22.01: DI: Triggered by the rising edge of FunIN.51...FunIN.54 H22.02: DI: Triggered by the falling edge of FunIN.51...FunIN.54
Homing	DI: FunIN.32 (HomingStart)	Trigger the process segment through the rising edge of FunIN.32.
	H22.00 = 0	Parameter H22.00 = 0.
	FunIN.46 + FunIN.47–50 (combined segment number being 0)	When the process segment is triggered by the rising edge of FunIN.46, the motor executes homing based on the set homing mode and home speed.
Halt	DI: FunIN.55 (PrSuspend)	Trigger the process segment through the rising edge of FunIN.55.
	H22.00 = 1000	When H22.00 is set to 1000, the process segment in progress is stopped immediately and the motor ramps to stop based on the deceleration time defined by H22.03. The motor remains enabled after stop.

When a DI is used to trigger the process segment, assign the DI of the servo drive with corresponding function and set the active logic of this DI.

Note

- PrEnable, PrSuspend, PrEvent1–4 signals are edge-triggered. When DI is used, the effective signal width of the DI must be at least 0.125 ms.
- In the process segment mode, FunIN.32 (HomingStart) is used to trigger the process segment homing mode.
- In the position mode, FunIN.32 (HomingStart) is used to trigger the local homing mode.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H22.00	2022-01h	Process segment command trigger	0 to 1000	0	-	Real-time
H22.01	2022-02h	Process segment triggered by the event rising edge	0 to 65535	0	-	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H22.02	2022-03h	Process segment triggered by the event falling edge	0 to 65535	0	-	Real-time
H22.03	2022-04h	Acceleration/ Deceleration time upon technology segment pause	0: Acceleration/Deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 5: Acceleration/Deceleration time 5 6: Acceleration/Deceleration time 6 7: Acceleration/Deceleration time 7	0	-	Real-time

Table 12–3 Description of function No.

Code	Name	Function Name	Function
FunIN.32	HomingStart	Homing enable	Active: Homing enabled (The HomingStart signal cannot be triggered repeatedly during homing.) Inactive: Homing inhibited
FunIN.46	PrEnable	Technology segment enable	The process segment can be enabled only when the rising edge of the PrEnable signal is active. Otherwise, the process segment function is ineffective.
FunIN.47	PrCMD1	Technology segment command switchover 1	The segment number is a 4-bit binary. The relationship between the segment number and PrCMD1–PrCMD4 is shown in *"Table 12–4 " on page 440*. The DI logic is level-triggered. The PrCMD value is 1 upon active level input or 0 upon inactive level input.
FunIN.48	PrCMD2	Technology segment command switchover 2	
FunIN.49	PrCMD3	Technology segment command switchover 3	
FunIN.50	PrCMD4	Technology segment command switchover 4	

Code	Name	Function Name	Function
FunIN.51	PrEvent1	Event trigger technology segment 1	The DI assigned with event trigger process segment is used together with H22.01 and H22.02.
FunIN.52	PrEvent2	Event trigger technology segment 2	
FunIN.53	PrEvent3	Event trigger technology segment 3	
FunIN.54	PrEvent4	Event trigger technology segment 4	
FunIN.55	PrSuspend	Process segment suspend	When the rising edge of the PrSuspend signal is active, the process segment in progress stops immediately and the motor ramps to stop based on the deceleration time defined by H22.03. The motor remains enabled after stop.

Table 12–4 Relationship between the segment number and CMD1 to CMD4

PrCMD4	PrCMD3	PrCMD2	PrCMD1	Segment No.
0	0	0	0	0
0	0	0	1	1
…				
1	1	1	1	15

12.4.2Related Parameters

The speed setpoint (SpdSet) and acceleration/deceleration time (AccTime/DecTime) for each segment in the process segment, and the interval time (DelayTime) upon completion of each process segment are set by three groups of parameters respectively, with each parameter group containing eight parameters.

During operation, you can select one parameters from these three parameter groups respectively to generate the process segment.

1. Speed setpoint (SpdSet) (0.1 rpm to 6000.0 rpm)
   Corresponding to H22.19 to H22.26 (unit: 0.1 rpm).

2. Acceleration/Deceleration time (AccTime/DecTime) (0 ms to 65535 ms)
   Corresponding to H22.35 to H22.42.

   The acceleration/deceleration time indicates the time for a motor to change from 0 rpm to 1000 rpm. The actual acceleration/deceleration time is therefore as follows:

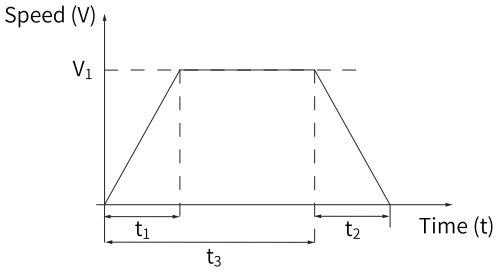


Figure 12-4 Example of the curve in fixed speed mode

As shown in the preceding figure, the speed reference is V_1 and the actual acceleration time t_1 is as follows:

$$t_1 = \frac{V_1}{1000} \times \text{Acceleration time set for this speed}$$

The actual deceleration time t_2 is:

$$t_2 = \frac{V_1}{1000} \times \text{Deceleration time set for this speed}$$

3. Interval time after completion of process segment (DelayTime) (0 ms to 65535 ms) Corresponding to H22.51 to H22.58.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H22.19	2022-14h	Target speed	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	50.0	[mm/s]/[rpm]	Real-time
H22.20	2022-15h	Target speed 1	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	200.0	[mm/s]/[rpm]	Real-time
H22.21	2022-16h	Target speed 2	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	500.0	[mm/s]/[rpm]	Real-time
H22.22	2022-17h	Target speed 3	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	1000.0	[mm/s]/[rpm]	Real-time
H22.23	2022-18h	Target speed 4	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	1500.0	[mm/s]/[rpm]	Real-time
H22.24	2022-19h	Target speed 5	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	2000.0	[mm/s]/[rpm]	Real-time
H22.25	2022-1Ah	Target speed 6	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	2500.0	[mm/s]/[rpm]	Real-time
H22.26	2022-1Bh	Target speed 7	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	3000.0	[mm/s]/[rpm]	Real-time
H22.35	2022-24h	Accel/Decel time	0 ms–65535 ms	50	ms	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H22.36	2022-25h	Acceleration/ Deceleration time 1	0 ms–65535 ms	200	ms	Real-time
H22.37	2022-26h	Acceleration/ Deceleration time 2	0 ms–65535 ms	500	ms	Real-time
H22.38	2022-27h	Acceleration/ Deceleration time 3	0 ms–65535 ms	1000	ms	Real-time
H22.39	2022-28h	Acceleration/ Deceleration time 4	0 ms–65535 ms	1500	ms	Real-time
H22.40	2022-29h	Acceleration/ Deceleration time 5	0 ms–65535 ms	2000	ms	Real-time
H22.41	2022-2Ah	Acceleration/ Deceleration time 6	0 ms–65535 ms	2500	ms	Real-time
H22.42	2022-2Bh	Acceleration/ Deceleration time 7	0 ms–65535 ms	3000	ms	Real-time
H22.51	2022-34h	Delay after completion of the process segment	0 ms–65535 ms	0	ms	Real-time
H22.52	2022-35h	Delay time 1 after completion of the process segment	0 ms–65535 ms	50	ms	Real-time
H22.53	2022-36h	Delay time 2 after completion of the process segment	0 ms–65535 ms	200	ms	Real-time
H22.54	2022-37h	Delay time 3 after completion of the process segment	0 ms–65535 ms	500	ms	Real-time
H22.55	2022-38h	Delay time 4 after completion of the process segment	0 ms–65535 ms	1000	ms	Real-time
H22.56	2022-39h	Delay time 5 after completion of the process segment	0 ms–65535 ms	1500	ms	Real-time
H22.57	2022-3Ah	Delay time 6 after completion of the process segment	0 ms–65535 ms	2000	ms	Real-time
H22.58	2022-3Bh	Delay time 7 after completion of the process segment	0 ms–65535 ms	3000	ms	Real-time

12.4.3operation mode

The process segment mode supports the homing mode, constant speed mode, and positioning mode. Six operation modes are available, which are homing mode, constant speed mode, positioning mode, jump mode, parameter-write mode, and halt mode.

The homing mode is set in process segment 0 and the halt mode is set in process segment 1000. Other modes are set in process segments 1 to 15.

Each group of process segments is comprised of two parts, process segment definition and process segment data. The process segment parameters are H23.00–H23.62 (16 groups in total), with each parameter group containing two 32-bit parameters.

<table>
<tr><th colspan="3">Definition of process segment</th></tr>
<tr><th>bit</th><th>Description</th><th>Value</th></tr>
<tr><td>3 to 0</td><td>Mode</td><td>
<table>
<tr><th>bit3 to bit0</th><th>Process segment mode</th><th>Description of Process Segment</th></tr>
<tr><td>0001</td><td>Constant speed mode</td><td>-</td></tr>
<tr><td>0010</td><td>Positioning mode</td><td>Stopped after positioning is done</td></tr>
<tr><td>0011</td><td>Positioning mode</td><td>Executing the next segment after positioning is done</td></tr>
<tr><td>0111</td><td>Jump mode</td><td>Jumping to the designated process segment</td></tr>
<tr><td>1000</td><td>Parameter-write mode</td><td>Writing specific parameters</td></tr>
</table>
</td></tr>
<tr><td>7 to 4</td><td>-</td><td>-</td></tr>
<tr><td>11 to 8</td><td>-</td><td>-</td></tr>
<tr><td>15 to 12</td><td>-</td><td>-</td></tr>
<tr><td>19 to 16</td><td>-</td><td>-</td></tr>
<tr><td>23 to 20</td><td>-</td><td>-</td></tr>
<tr><td>27 to 24</td><td>-</td><td>-</td></tr>
<tr><td>31 to 28</td><td>-</td><td>-</td></tr>
</table>

Process segment data	
bit	Value
31 to 0	-

Note

If segment 15 is the program block loaded automatically to the last, the first segment applies after segment 15 is done executing.

Homing mode

When process segment 0 is triggered, the homing function is triggered.

In the process segment mode, the software homing function cannot be enabled.

See the following table for definitions of the homing mode.

Definition of process segment		
bit	Description	Value
3 to 0	-	-
7 to 4	PathNum	0: The motor stops after homing is done
		1 to 15: After homing is done, the PathNum segment is executed automatically after the DelayTime elapses
11 to 8	-	-
15 to 12	-	-
19 to 16	-	-
23 to 20	DelayTime	0 to 8: Time interval index after process segment is done executing H22.51 to H22.58 For details, see *SV670-INT Series Servo Drive Parameter Guide*.
27 to 24	-	-
31 to 28	-	-

Process segment data	
bit	Value
31 to 0	Process segment data (32-bit) (unused)

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H22.70	2022-47h	Homing mode	-32768 to 32767	-2	-	Real-time
H22.71	2022-48h	Speed of high-speed search for home switch signal	0[mm/s]/[rpm]–3000[mm/s]/[rpm]	100	[mm/s]/[rpm]	Real-time
H22.72	2022-49h	Speed of low-speed search for home switch signal	0[mm/s]/[rpm]–1000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H22.73	2022-4Ah	Acceleration/ Deceleration time during homing	0 ms–1000 ms	1000	ms	Real-time
H22.74	2022-4Bh	Home search time limit	0 ms–65535 ms	10000	ms	Real-time
H22.75	2022-4Ch	Mechanical home offset	-2147483648 to 2147483647	0	reference unit	Real-time
H22.79	2022-50h	Relative/Absolute homing	0 to 65535	0	-	Real-time

☆ Related parameters:

Code	Name	Function Name	Function
FunOut.16	HomeAttain	Home find	Active: Homing completed in the process segment mode Inactive: Homing not completed

Constant speed mode

Mode 1 is the constant speed mode. When the constant speed mode is in progress, the motor operates to the set speed based on the set acceleration/deceleration time, and then keeps operating at the set speed.

<table>
<tr><th colspan="3">Definition of process segment</th></tr>
<tr><th>bit</th><th>Description</th><th>Value</th></tr>
<tr><td>3 to 0</td><td>Mode</td><td>1</td></tr>
<tr><td rowspan="5">7 to 4</td><td rowspan="5">Func</td><td>
<table>
<tr><th>bit</th><th>Description</th><th>Description</th></tr>
<tr><td>4</td><td>Updated immediately (ImmedUpd)</td><td>The present segment overrides the previous segment, which means the previous segment will be interrupted so as to execute present segment. See " Special mode" on page 453Special Modes for details.</td></tr>
<tr><td>5</td><td>Loading next segment (Auto)</td><td>The next process segment applies after the constant speed is reached and the DelayTime elapses.</td></tr>
<tr><td>6</td><td>Unit</td><td>0: 0.1 rpm
1: PPS (pulses/s) (reference unit)</td></tr>
<tr><td>7</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>11 to 8</td><td>AccTime</td><td rowspan="2">Index of the acceleration/deceleration time
Index H22.35 to H22.42.</td></tr>
<tr><td>15 to 12</td><td>DecTime</td></tr>
<tr><td>19 to 16</td><td>…</td><td>-</td></tr>
</table>

Definition of process segment		
bit	Description	Value
23 to 20	DelayTime	Index of the interval time after the process segment is done executing Index H22.51 to H22.58.
27 to 24	-	-
31 to 28	-	-

Process segment data	
bit	Value
31 to 0	Target speed (accurate to 0.1 RPM)

Where:

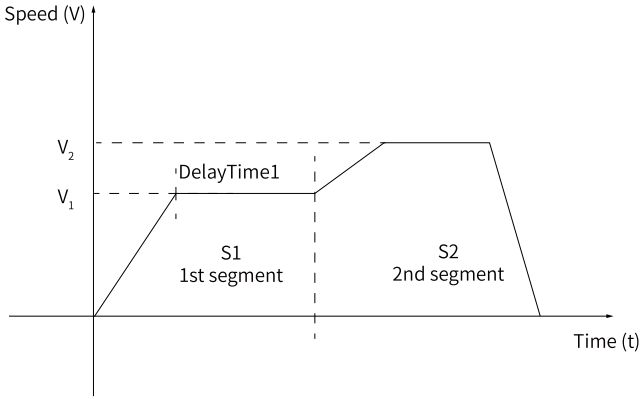


Figure 12-5 Time-Speed curve

Segment 1: Constant speed mode; DelayTime1: Time interval set for the constant speed mode; V_1: Speed set for the constant speed mode

Segment 2: Positioning mode; V_2: Speed set for the positioning mode

S1 represents displacement 1 and S2 represents displacement 2.

Positioning mode

Modes 2 and 3 indicate positioning mode. In mode 2, the servo drive stops after positioning is done. In mode 3, the next segment will be executed after positioning is done.

When positioning mode is in progress, the motor accelerates or decelerates at present speed to the set speed based on the set acceleration/deceleration time. After operating at constant speed for a period of time, the motor decelerates to 0 rpm based on the set deceleration time. Finally, the motor stops at the position set by the positioning mode.

<table>
<tr><th colspan="4">Definition of process segment</th></tr>
<tr><th>bit</th><th>Description</th><th colspan="2">Value</th></tr>
<tr><td>3 to 0</td><td>Mode</td><td colspan="2">Positioning mode 2: Stopped after positioning is done
Position mode 3: Executing the next segment after positioning is done</td></tr>
<tr><td rowspan="4">7 to 4</td><td rowspan="4">Func</td><td>bit</td><td>Description</td><td>Description</td></tr>
<tr><td>4</td><td>Updated immediately (ImmedUpd)</td><td>The present segment overrides the previous segment, which means the previous segment will be interrupted so as to execute present segment. See " Special mode" on page 453Special Modes for details.</td></tr>
<tr><td>5</td><td>Overlap (OverLap)</td><td>The present segment can overlap with the next segment. During overlapping, the interval time of present segment is set to 0 forcibly. See " Special mode" on page 453Special Modes for details.</td></tr>
<tr><td>6
7</td><td>Position reference type (CmdType)</td><td>Bit6 and bit7 set to 00: Absolute positioning command (Final position = Target position)
Bit6 and bit7 set to 10: Incremental positioning command (Final position = Previous final position + Target position)</td></tr>
<tr><td>11 to 8</td><td>AccTime</td><td colspan="2" rowspan="2">Index of the acceleration/deceleration time
Index H22.35 to H22.42.</td></tr>
<tr><td>15 to 12</td><td>DecTime</td></tr>
<tr><td>19 to 16</td><td>SpdSet</td><td colspan="2">Index of the speed setpoint
Index H22.19 to H22.26.</td></tr>
<tr><td>23 to 20</td><td>DelayTime</td><td colspan="2">Index of the interval time after the process segment is done executing
Index H22.51 to H22.58.</td></tr>
<tr><td>27 to 24</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>31 to 28</td><td>-</td><td colspan="2">-</td></tr>
</table>

Process segment data	
bit	Value
31 to 0	Target position (32-bit) (reference unit)

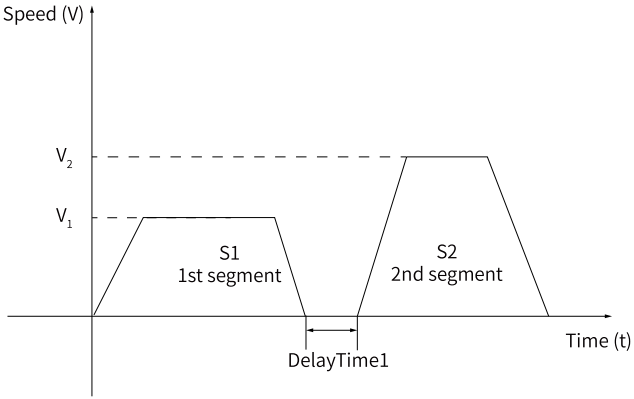


Figure 12-6 Time-Speed curve

Segment 1: positioning mode; Mode = 3; OverLap = 0; Delaytime1: interval time set for the positioning mode; V_1: speed set for the positioning mode.

Segment 2: positioning mode; Mode = 2; ImmedUpd = 0; V_2: speed set for the positioning mode.

S1 represents displacement 1 and S2 represents displacement 2.

Jump mode

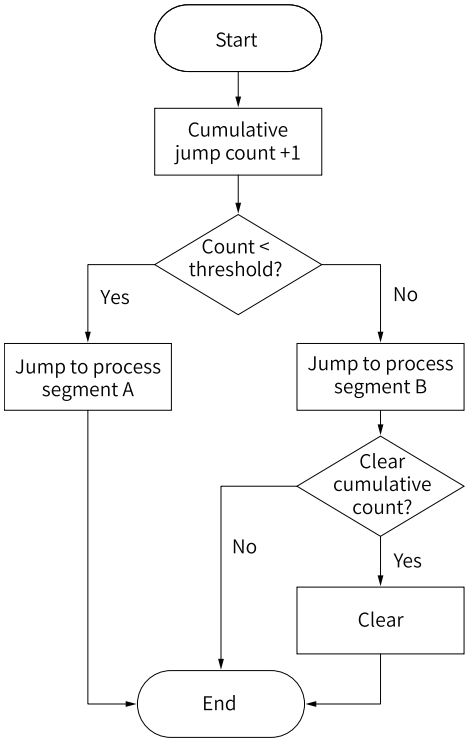
Mode 7 represents the jump mode. When the jump mode is in progress, the servo drive can jump to any process segment. When the target process segment exceeds the process segment range, E126.0 occurs.

Definition of process segment		
bit	Description	Value
3 to 0	Mode	7
4	Updated immediately (ImmedUpd)	The present segment overrides the previous segment, which means the previous segment will be interrupted so as to execute present segment. See *" Special mode" on page 453Special Modes* for details.
8 to 5	Jump evaluation threshold	Jump evaluation threshold index. Index H22.83 to H22.90.
9	Clear the cumulative count flag when jumping to process segment B	1: Clear the cumulative jump count when jumping to process segment B
19 to 10	-	-

Definition of process segment		
bit	Description	Value
23 to 20	DelayTime	Index of the interval time after the process segment is done executing Index H22.51 to H22.58.
31 to 24	-	-

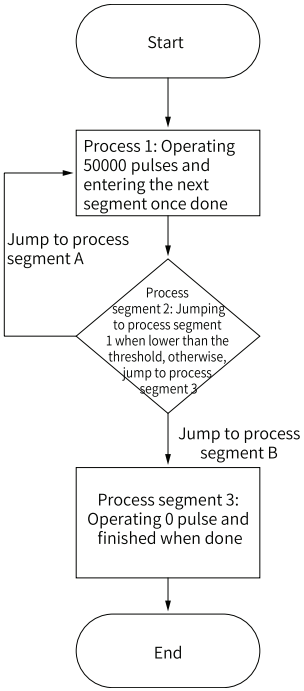
Process segment data	
bit	Value
7 to 0	Process segment B number
15 to 8	Process segment A number
31 to 16	Cumulative number of jumps

There is an evaluation condition for process segment jump. Each jump is counted to the cumulative number of jumps. When the counted number of jumps is smaller than this value, it will jump to process segment A, otherwise it will jump to process segment B. When jumping to process segment B, if bit9=1, this value will be cleared. The execution flow chart is as follows:

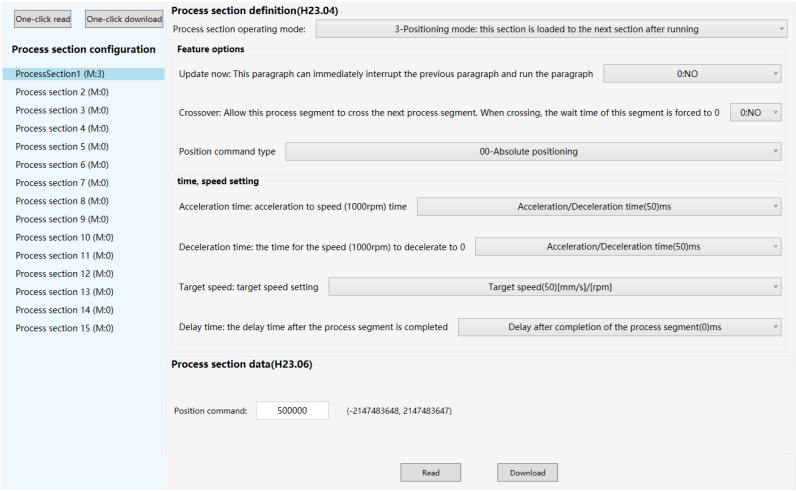


Application case

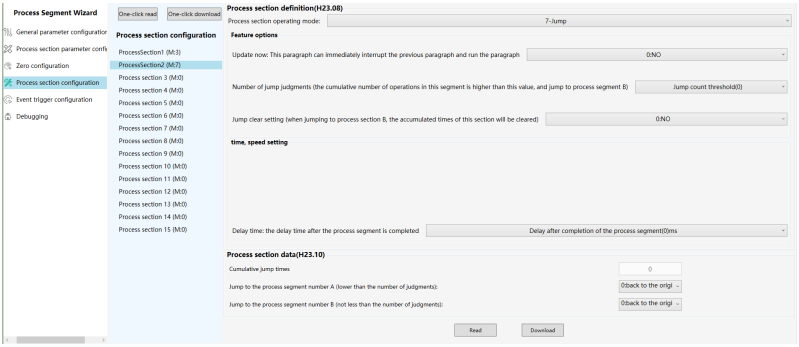
Achieving limited repetitive multi-position with process segment jump:



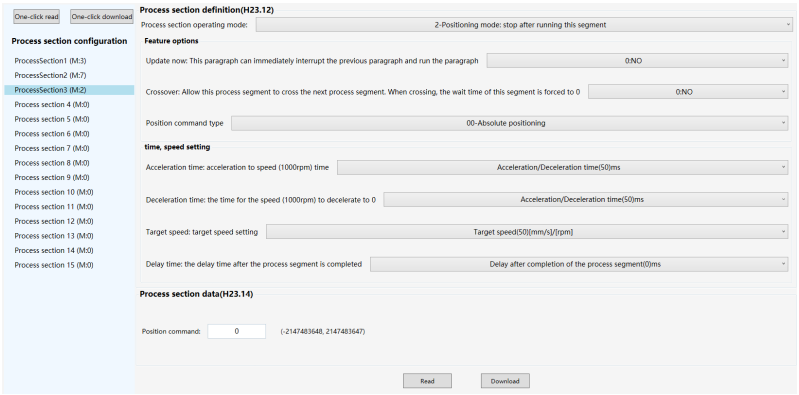
1. Configure process segment 1 to position mode, and run 50000pulse forward.



2. Configure process segment 2 to use jump.



3. Configure process segment 3 to positioning mode, and finish operation.



Parameter-write mode

Mode 8 represents the parameter-write mode. When parameter-write mode is in progress, you can re-write new parameters to the designated parameters and the new parameter can be saved to EEPROM as needed.

<table>
<tr><th colspan="3">Definition of process segment</th></tr>
<tr><th>bit</th><th>Description</th><th>Value</th></tr>
<tr><td>3 to 0</td><td>Mode</td><td>8</td></tr>
<tr><td>7 to 4</td><td>Func</td><td>
<table>
<tr><th>bit</th><th>Description</th><th>Description</th></tr>
<tr><td>4</td><td>Updated immediately (ImmedUpd)</td><td>The present segment overrides the previous segment, which means the previous segment will be interrupted so as to execute present segment. See "Special mode" on page 453Special Modes for details.</td></tr>
</table>
</td></tr>
</table>

Definition of process segment				
bit	Description	Value		
		5	Loading next segment (Auto)	The next process segment applies after the DelayTime elapses.
		6	Save (Save)	0: Do not save 1: Save
		7	-	-
11 to 8 15 to 12	No. (H_Idx)	Parameter number		
19 to 16 23 to 20	Tag group (H_Grp)	Group		
27 to 24	DelayTime	Index of the interval time after the process segment is done executing Index H22.51 to H22.58.		
31 to 28	-	-		

Process segment data	
bit	Value
31 to 0	Designated parameter data (32-bit)

Halt mode

During operation of the process segment (positioning mode, constant speed mode, or homing mode), if 1000 is written to H22.00 or FunIN.55 (PrSuspend) is triggered, the motor interrupts present operation mode immediately and ramps to stop based on the deceleration time defined by H22.03. After stop, the motor keeps enabled and stays at a standstill. When the process segment is triggered again, the motor resumes normal operation.

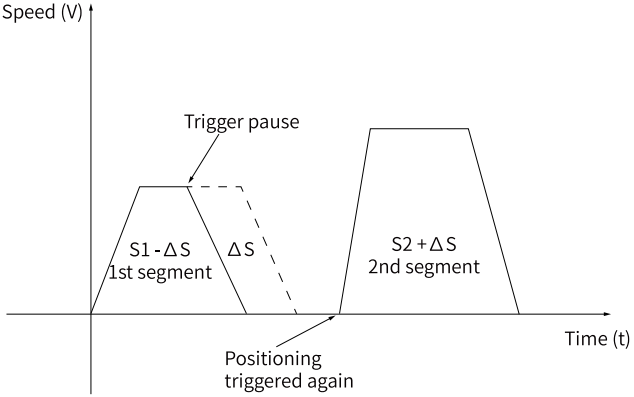


Figure 12-7 Time-Speed curve

Segment 1: positioning mode (The motor ramps to stop when pause is triggered during operation.)

Segment 2: Positioning mode

S1 represents the set displacement 1. S2 represents the set displacement 2. ΔS represents the remaining displacement after stop at specified position.

Special mode

ImmedUpd and OverLap functions are special functions which serve to generate complex process segment paths once triggered.

- **Overlap (OverLap)**
  When the overlap function is in progress, the present process segment can overlap with the next process segment. During overlapping, the interval time of present segment is set to 0 forcibly. The overlap function can be used in positioning control only.

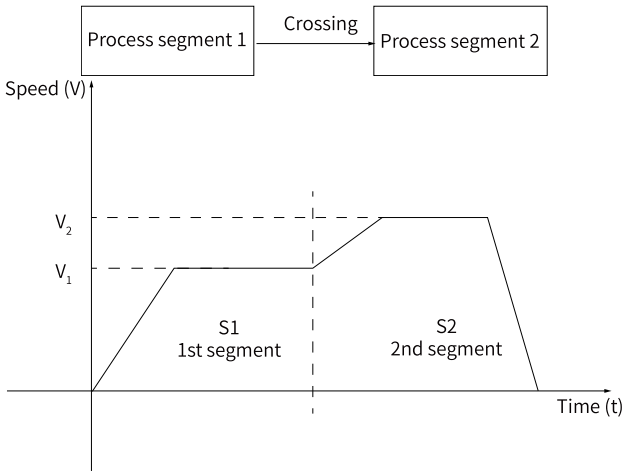


Figure 12-8 Time-Speed curve

Segment 1: positioning mode; Mode = 3; OverLap = 1; V_1 : speed set for the positioning mode.

Segment 2: positioning mode; ImmedUpd = 0; V_2 : speed set for the positioning mode.

S1 represents the displacement for segment 1 and S2 represents the displacement for segment 2.

- **Updated immediately (ImmedUpd)**
  When the ImmedUpd mode is in progress, the present segment overrides the previous segment, which means the previous segment will be interrupted so as to

execute present segment. The ImmedUpd mode can be used in positioning control and constant speed control.



The ImmedUpd mode can be further divided into internal ImmedUpd mode and external ImmedUpd mode.

- Internal ImmedUpd mode

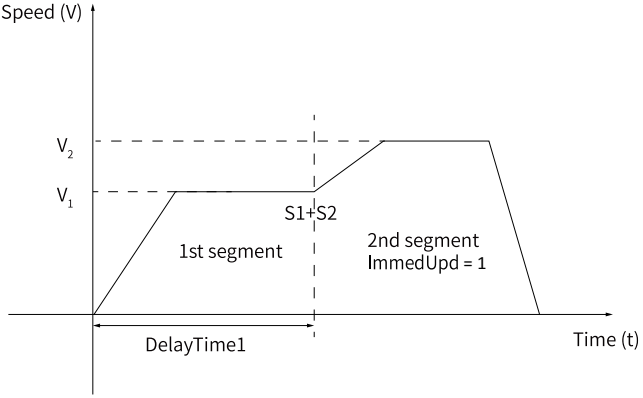


Figure 12-9 Time-Speed curve

Segment 1: positioning mode; Mode = 3; Delaytime1: interval time set for the positioning mode; V_1: speed set for the positioning mode

Segment 2: ImmedUpd = 1, V_2: speed set for segment 2

If segment 2 is positioning mode, S1 is the displacement for segment 1, and S2 is the displacement for segment 2, then the final positioning position is the sum of S1 and S2.

- External ImmedUpd mode

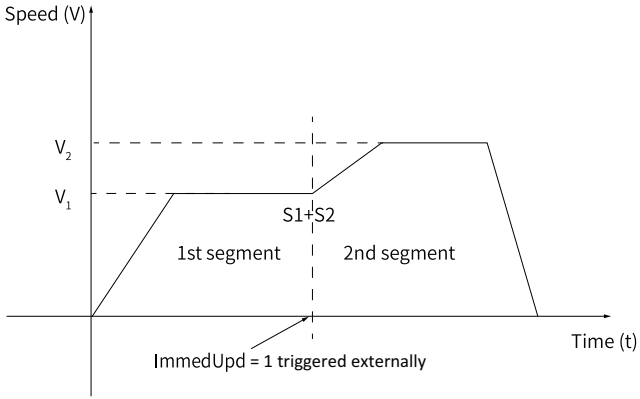


Figure 12-10 Time-Speed curve

Segment 1: positioning mode; V_1 : speed set for the positioning mode

Segment 2: ImmedUpd = 1, V_2 : speed set for segment 2

If segment 2 is positioning mode, S1 is the displacement for segment 1, and S2 is the displacement for segment 2, then the final positioning position is the sum of S1 and S2.

Note

- The ImmedUpd function has higher priority over the overlap function, which means when the overlap function is set for process segment 1 and the ImmedUpd function is set for process segment 2, the ImmedUpd function will be executed immediately when process segments 1 and 2 are in progress.
- The external ImmedUpd function has higher priority over the internal ImmedUpd function.

12.4.4DO and Sequence

FunOUT.22 (CmdOK, internal command completed) can be used to check whether the process segment command is done transmitting. FunOUT.5 (COIN, positioning completed) can be used to check whether positioning is done. FunOUT.24 (McOk, motion control completed) can be used to check whether motion control is done.

The sequence for process segment is shown as follows (taking positioning mode and H05.20 = 0 as example):

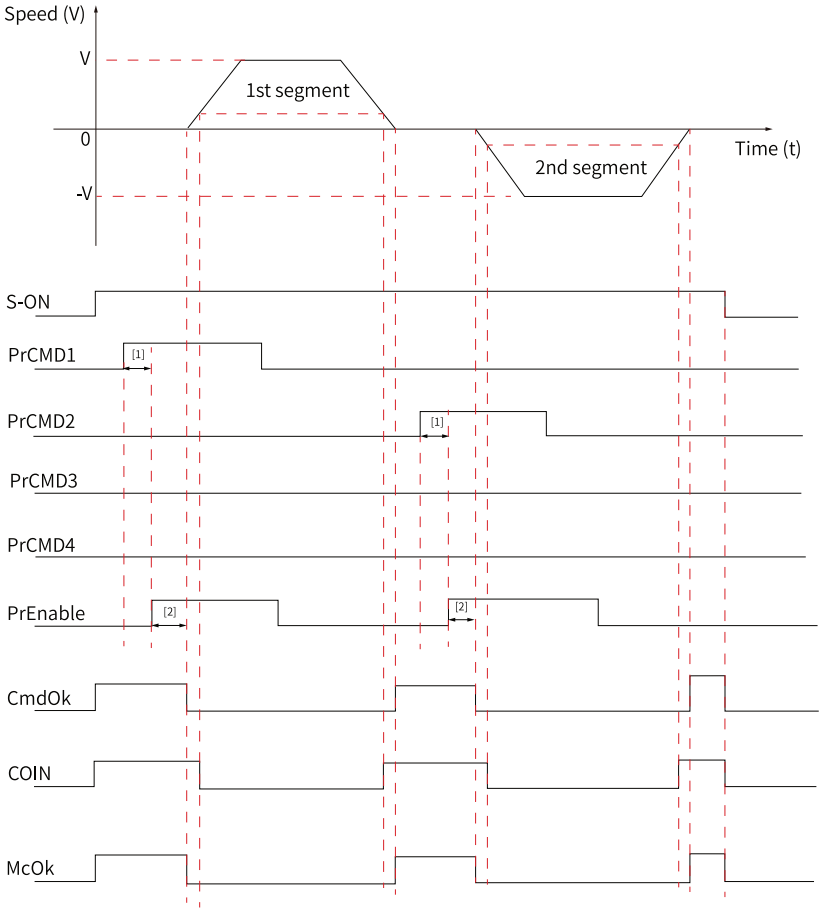


Figure 12-11 Sequence of process segment

Note

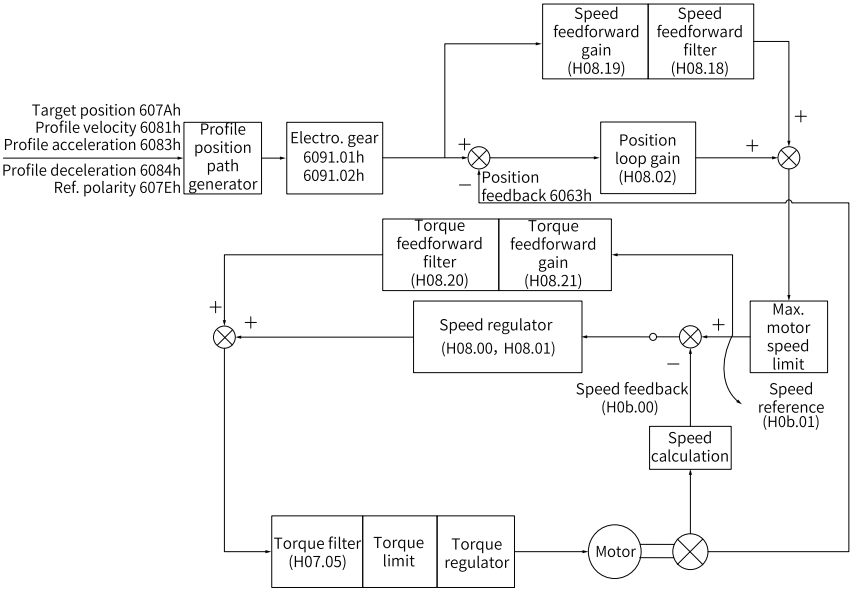
- [1] When DI is used, the effective signal width of the DI must be at least 0.125 ms.
- [2] The PrEnable signal is edge-triggered. The effective signal width of the DI must be at least 0.125 ms.

12.5 Profile Position Mode (PP)

The PP mode mainly applies to point-to-point positioning. In PP mode, the host controller sets the target position, operating speed, acceleration rate, and

deceleration rate. The position profile generator inside the servo drive generates position profiles based on preceding settings, and the servo drive executes position control, speed control, and torque control.

12.5.1Function Block Diagram



12.5.2Configuration Block Diagram

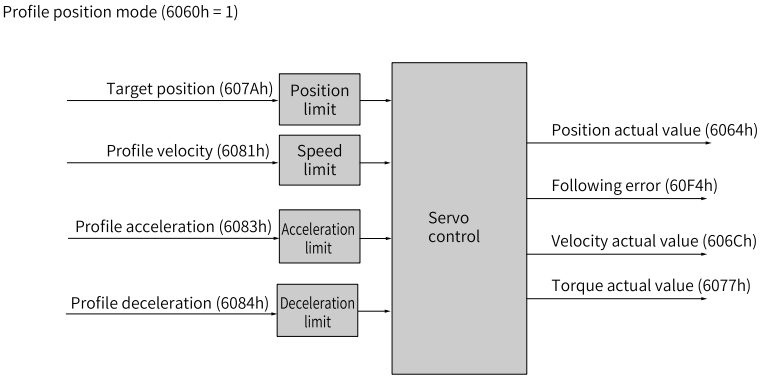


Figure 12-12 PP mode

In PP mode, the target position is triggered and activated based on the sequence of bit4 (New setpoint) of the control word and bit12 (Set-point acknowledge) of the status word.

The controller sets the New set-point bit (bit4 of the control word) to 1 to inform the servo drive of the new target position. The servo drive, after receiving the new target position, sets the Set-point acknowledge bit (bit12 of the status word) to 1. After the controller sets the New set-point to 0, if the servo drive can receive the new target position, the Set-point acknowledge bit will be set to 0. Otherwise, it is kept to 1.

The linkage mode of position references is determined by bit5 (Change set immediately) of the control word. When bit5 is set to 1 (Sequential mode), sequential linkage applies between position references, which is called sequential mode. When bit5 is set to 0 (Single-point mode), zero-cross linkage applies to position references, which is called single-point mode.

Sequential mode:

The target position of present segment is in the process of positioning. After the new target position is generated, the controller sets bit4 (New set-point) of the control word to 1, and the servo drive executes positioning towards the new target position.

In the sequential mode, the sequence of bit4 (New set-point) of the control word and bit12 (Set-point acknowledge) of the status word is as follows.

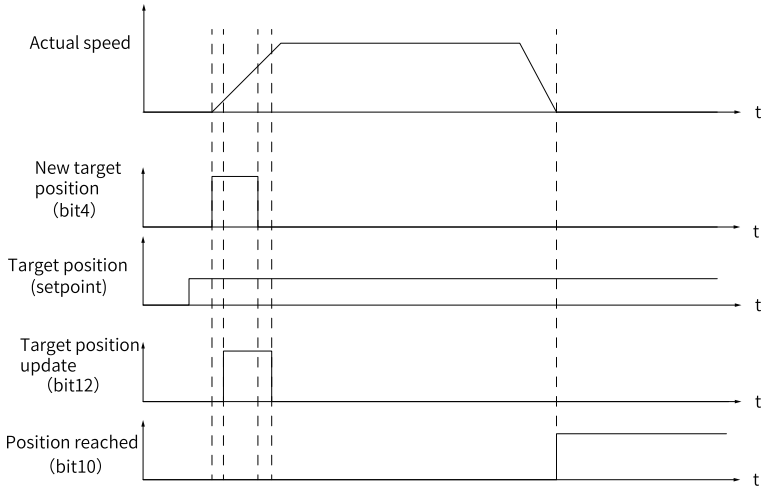


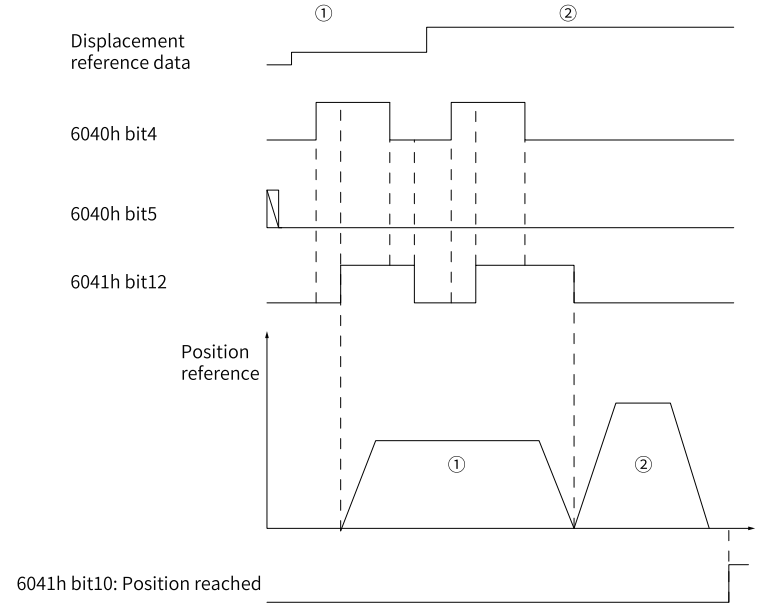
Figure 12-13 Sequence in sequential mode

Single-point mode:

The target position of present segment is in the process of positioning. After the new target position is prepared, the controller sets the new set-point bit to 1, and the

servo drive performs positioning based on the new target position after the position reference of present segment is transmitted.

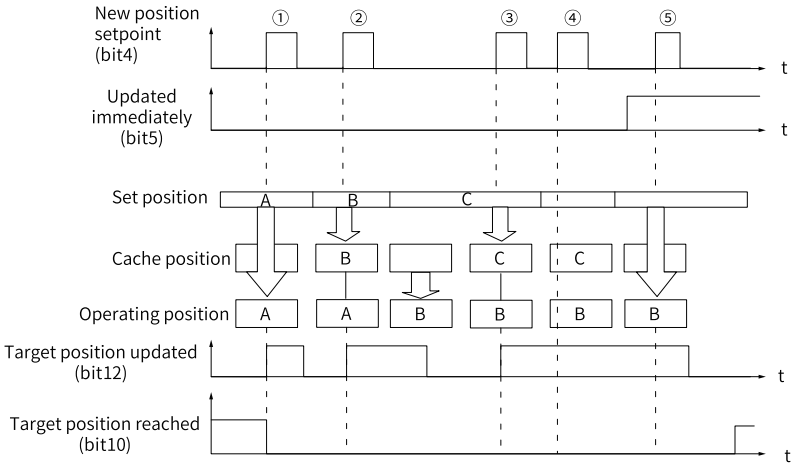
The sequence of bit4 (New set-point) of the control word and bit12 (Set-point acknowledge) of the status word is as follows.



Note: If you need to change any parameter of the displacement reference, send the trigger signal again.

Figure 12-14 Sequence in the single-point mode

In the single-point mode, the drive caches one target position, which is to cache a new segment of target position when current target position is under execution. The sequence diagram is as follows.



- ① If the cache position is empty, the set position will be executed immediately.
- ②③ If a position reference is under execution currently, the new position setpoint will be saved in the cache. After current position reference is done transmitting, the cached setpoint will be executed, after which a new setpoint can be received.
- ④⑤ The new setpoints cannot be received if the cache is full. In this case, you can set the attribute bit (Change set immediately) of the set value to 1 to activate the set value.

12.5.3Recommended Configuration

The basic configuration for the PP mode is described in the following table.

RPDO	TPDO	Remarks
6040h: control word	6041h: status word	Mandatory
607Ah: target position	6064h: position actual value	Mandatory
6081h: profile velocity	-	Mandatory
6083h: profile acceleration	-	Optional
6084h: profile deceleration	-	Optional
6060h: modes of operation	6061h: modes of operation display	Optional

12.5.4Related Parameters

6040h Control word

Address: 6040h

Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16

Default: 0x0 Change: Real-time
Access: RW Mapping: RPDO

Value Range:

0x0 to 0xFFFF

Description:

Defines the control command.

bit	Name		Description
0	Switch on	Switch on	1: Active, 0: Inactive
1	Enable voltage	Enable voltage	1: Active, 0: Inactive
2	Quick stop	Quick stop	0: Active, 1: Inactive
3	Enable operation	Enable operation	1: Active, 0: Inactive
4	New set-point	New set-point	0→1: Trigger new target position 1→0: clear bit12 of the status word
5	Change set immediately	Change set immediately	0: Not immediately 1: Immediately
6	abs/rel	abs/rel	0: abs 1: rel
8	Halt	Halt	0: Keep running 1: Halt

6041h Status word

Address: 6041h
Min.: 0x0 Unit: -
Max.: 0xFFFF Data Type: UInt16
Default: 0x0 Change: Unchangeable
Access: RO Mapping: TPDO

Setpoint:

-

Description:

Indicates the servo drive status.

bit	Name		Description
0	Ready to switch on	Ready to switch on	1: Active, 0: Inactive
1	Switch on	Switch on	1: Active, 0: Inactive
2	Enable operation	Operation enabled	1: Active, 0: Inactive
3	Fault	Fault	1: Active, 0: Inactive
4	Voltage enabled	Voltage enabled	1: Active, 0: Inactive
5	Quick stop	Quick stop	0: Active, 1: Inactive

bit	Name		Description
6	Switch on disabled	Switch on disabled	1: Active, 0: Inactive
7	Alarm	Alarm	1: Active, 0: Inactive
8	Manufacturer-specific	Manufacturer-specific	Undefined
9	Remote	Remote	1: Active, control word effective 0: Inactive
10	Target reach	Target reach	0: The target position is not reached. 1: The target position is reached.
11	Internal limit active	Internal limit active	0: Position reference within the limit 1: Position reference beyond the limit
12	Set-point acknowledge	Set-point acknowledge	0: Acknowledged 1: Not acknowledged
13	Following error	Following error	0: No error 1: Excessive deviation
14	Manufacturer-specific	Manufacturer-specific	Undefined
15	Home find	Home find	0: Homing completed 1: Homing done

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6060h	6060h	Servo drive mode	SV680P-INT 1: Profile position mode (pp) 3: Profile velocity mode (pv) 4: Profile torque mode (pt) 6: Homing mode (hm) 7: Interpolation mode (ip) SV680N-INT 1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Real-time
6061h	6061h	Operation mode display	SV680P-INT 1: Profile position mode (pp) 3: Profile velocity mode (pv) 4: Profile torque mode (pt) 6: Homing mode (hm) 7: Interpolation mode (ip)	0	-	Unchangeable

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
			SV680N-INT 1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode			
6064h	6064h	Position actual value	-2147483648 to 2147483647	0	reference unit	Unchangeable
6065h	6065h	Following error window	0 to 4294967295	219895614	reference unit	Real-time
6066h	6066h	Defines the time lapse to trigger excessive position deviation (EB00.0).	0 ms–65535 ms	0	ms	Real-time
6067h	6067h	Position window	0 to 4294967295	46976	reference unit	Real-time
6068h	6068h	Position window time	0 ms–65535 ms	0	ms	Real-time
607Ah	607Ah	Target position	-2147483648 to 2147483647	0	reference unit	Real-time
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time
6081h	6081h	Profile velocity	0 to 4294967295	111848106	Reference unit/s	Real-time
6083h	6083h	Profile acceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time
6084h	6084h	Profile deceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time

12.5.5Related Functions

Positioning completed

Positioning completed: When position deviation fulfills the set condition, the positioning process is done. In this case, the servo drive sets bit10 of the status word, and the host controller, once receives the signal, acknowledges that positioning is done.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6067h	6067h	Position window	0 to 4294967295	46976	Reference unit	Real-time
6068h	6068h	Position window time	0 ms–65535 ms	0	ms	Real-time

Note

6067h only reflects the threshold of absolute position deviation when positioning is done. It is not related to the positioning accuracy.

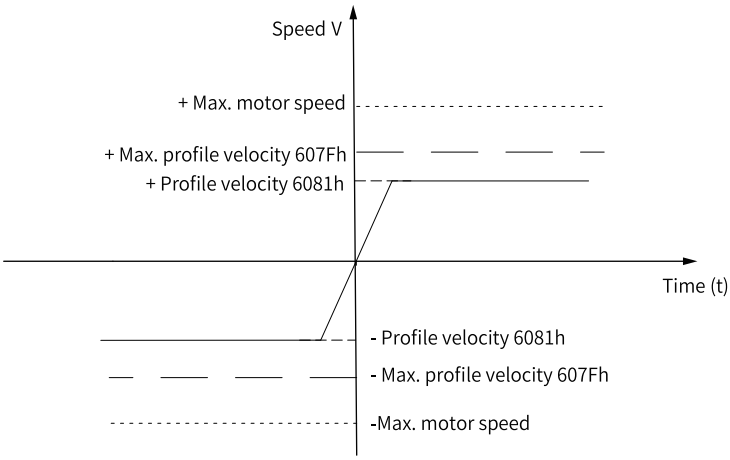
Position deviation monitoring function

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6065h	6065h	Following error window	0 to 4294967295	219895614	Reference unit	Real-time
6066h	6066h	Defines the time lapse to trigger excessive position deviation (EB00.0).	0 ms–65535 ms	0	ms	Real-time

Speed limit

In PP mode, 607Fh can be used to limit the maximum speed in forward/reverse operation. Note that the maximum speed cannot exceed the maximum running speed allowed by the motor.



☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time

Acceleration and deceleration limits

In PP mode, the change rate of position references can be limited through the acceleration and deceleration limits.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6083h	6083h	Profile acceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time
6084h	6084h	Profile deceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time

Reference polarity

You can change the position reference direction through setting the position reference polarity.

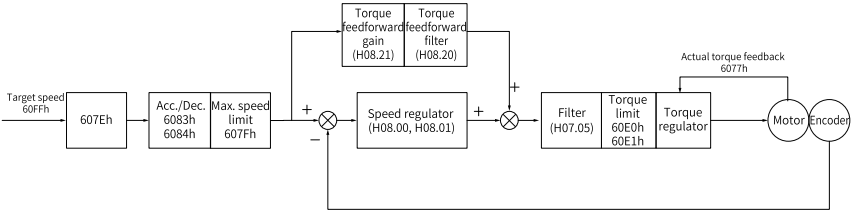
☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time

12.6 Profile Velocity Mode (PV)

In PV mode, the host controller sends the target speed, acceleration rate, and deceleration rate to the servo drive. The servo drive generates speed reference profiles and executes speed control and torque control.

12.6.1Function Block Diagram



12.6.2Configuration Block Diagram

Profile velocity mode (6060h=3)

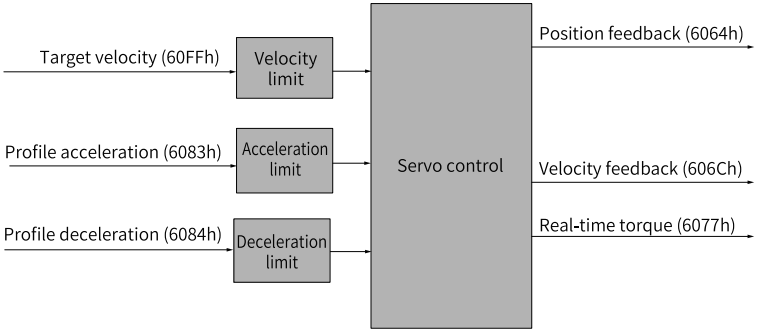


Figure 12-15 PV mode

12.6.3Recommended Configuration

The basic configuration for the PV mode is described in the following table.

RPDO	TPDO	Remarks
6040h: control word	6041h: status word	Mandatory
60FFh: target velocity	-	Mandatory
-	6064h: position actual value	Optional

RPDO	TPDO	Remarks
-	606Ch: velocity actual value	Optional
6083h: profile acceleration	-	Optional
6084h: profile deceleration	-	Optional
6060h: modes of operation	6061h: modes of operation display	Optional

12.6.4Related Parameters

6040h Control word

Address: 6040h
Min.: 0x0
Max.: 0xFFFF
Default: 0x0
Access: RW
Unit: -
Data Type: UInt16
Change: Real-time
Mapping: RPDO

Value Range:
0x0 to 0xFFFF
Description:
Defines the control command.

bit	Name		Description
0	Switch on	Switch on	1: Active, 0: Inactive
1	Enable voltage	Enable voltage	1: Active, 0: Inactive
2	Quick stop	Quick stop	0: Active, 1: Inactive
3	Enable operation	Enable operation	1: Active, 0: Inactive
8	Halt	Halt	0: Keep present operating state, 1: Halt

6041h Status word

Address: 6041h
Min.: 0x0
Max.: 0xFFFF
Default: 0x0
Access: RO
Unit: -
Data Type: UInt16
Change: Unchangeable
Mapping: TPDO

Value Range:
0x0 to 0xFFFF
Description:
Indicates the servo drive status.

bit	Name		Description
0	Ready to switch on	Ready to switch on	1: Active, 0: Inactive
1	Switch on	Switch on	1: Active, 0: Inactive
2	Enable operation	Operation enabled	1: Active, 0: Inactive
3	Fault	Fault	1: Active, 0: Inactive
4	Voltage enabled	Voltage enabled	1: Active, 0: Inactive
5	Quick stop	Quick stop	0: Active, 1: Inactive
6	Switch on disabled	Switch on disabled	1: Active, 0: Inactive
7	Alarm	Alarm	1: Active, 0: Inactive
8	Manufacturer-specific	Manufacturer-specific	Undefined
9	Remote	Remote	1: Active, control word effective 0: Inactive
10	Target reach	Target reach	0: The target velocity is not reached. 1: The target velocity is reached.
11	Internal limit active	Internal limit active	0: Position feedback within the limit 1: Position feedback beyond the limit
12	Speed	Speed	0: Speed is not 0 1: Speed is 0
13	-	N/A	N/A
14	Manufacturer-specific	Manufacturer-specific	Undefined
15	-	N/A	N/A

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
606Ch	606Ch	Actual speed	–2147483648 to +2147483647	0	Reference unit/s	Unchangeable
606Dh	606Dh	Velocity window	0[mm/s]/[rpm]–65535[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time
606Eh	606Eh	Velocity window time	0 ms–65535 ms	0	ms	Real-time
606Fh	606Fh	Zero speed signal threshold	0[mm/s]/[rpm]–65535[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time
6070h	6070h	Velocity threshold time	0 ms–65535 ms	0	ms	Real-time
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time
6083h	6083h	Profile acceleration	0 to 4294967295	4294967295	Reference unit/s²	Real-time
6084h	6084h	Profile deceleration	0 to 4294967295	4294967295	Reference unit/s²	Real-time
60FFh	60FFh	PV, CSV mode speed reference	–2147483648 to +2147483647	0	Reference unit/s	Real-time

12.6.5Related Functions

Monitoring on speed reach status

This function serves to check whether the speed reference of the servo drive is consistent with the motor speed feedback.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
606Dh	606Dh	Velocity window	0[mm/s]/[rpm]–65535[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time
606Eh	606Eh	Velocity window time	0 ms–65535 ms	0	ms	Real-time

Monitoring on zero speed

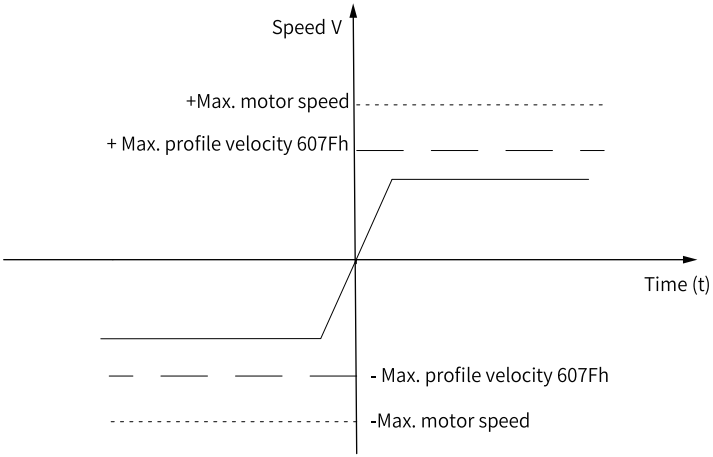
It is used to check whether the absolute value of motor speed feedback is lower than the set threshold. If yes, the motor is considered to be close to standstill (zero speed). Bit12 of 6041h is set to 1.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
606Fh	606Fh	Zero speed signal threshold	0[mm/s]/[rpm]–65535[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time
6070h	6070h	Velocity threshold time	0 ms–65535 ms	0	ms	Real-time

Speed limit

In PV mode, 607Fh can be used to limit the maximum speed in forward/reverse running, but its value must not exceed the max. allowable speed of the motor.



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time

Acceleration and deceleration limits

In PV mode, the change rate of speed references can be limited through acceleration and deceleration limits.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
60C5h	60C5h	Max. acceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time
60C6h	60C6h	Max. deceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time

Reference polarity

You can change the speed reference direction through setting the speed reference polarity.

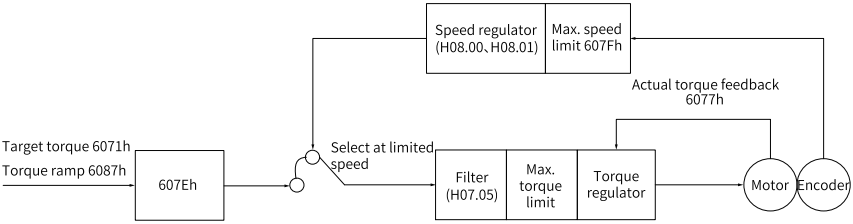
☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time

12.7 Profile Torque Mode (PT)

In PT mode, the host controller sends the target torque (6071h) and the torque slope (6087h) to the servo drive. The servo drive generates torque reference profiles and executes torque control.

12.7.1Function Block Diagram



12.7.2Configuration Block Diagram

Profile torque mode (6060h=4)

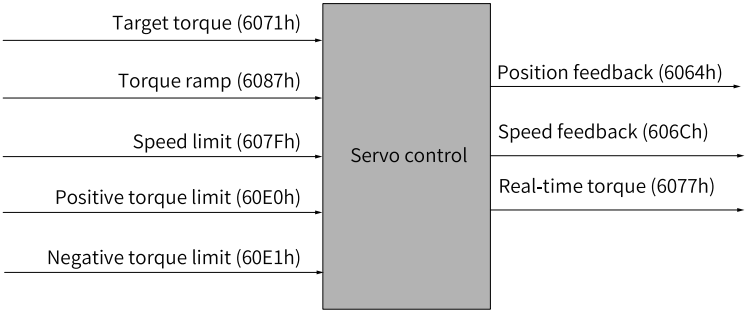


Figure 12-16 PT mode

12.7.3Recommended Configuration

The basic configuration for the profile torque mode is described in the following table.

RPDO	TPDO	Remarks
6040h: control word	6041h: status word	Mandatory
6071h: target torque	-	Mandatory
6087h: torque slope	-	Optional
-	6064h: position actual value	Optional
-	606Ch: velocity actual value	Optional
-	6077h: torque actual value	Optional
6060h: modes of operation	6061h: modes of operation display	Optional

12.7.4Related Parameters

6040h Control word

Address: 6040h
Min.: 0x0 Unit: -
Max.: 0xFFFF Data Type: UInt16
Default: 0x0 Change: Real-time
Access: RW Mapping: RPDO

Value Range:

0x0 to 0xFFFF

Description:

Defines the control command.

bit	Name		Description
0	Switch on	Switch on	1: Active, 0: Inactive
1	Enable voltage	Enable voltage	1: Active, 0: Inactive
2	Quick stop	Quick stop	0: Active, 1: Inactive
3	Enable operation	Enable operation	1: Active, 0: Inactive
8	Halt	Halt	0: Keep present operating state, 1: Halt

6041h Status word

Address: 6041h
Min.: 0x0 Unit: -
Max.: 0xFFFF Data Type: UInt16
Default: 0x0 Change: Unchangeable
Access: RO Mapping: TPDO

Value Range:
0x0 to 0xFFFF
Description:
Indicates the servo drive status.

bit	Name		Description
0	Ready to switch on	Ready to switch on	1: Active, 0: Inactive
1	Switch on	Switch on	1: Active, 0: Inactive
2	Enable operation	Operation enabled	1: Active, 0: Inactive
3	Fault	Fault	1: Active, 0: Inactive
4	Voltage enabled	Voltage enabled	1: Active, 0: Inactive
5	Quick stop	Quick stop	0: Active, 1: Inactive
6	Switch on disabled	Switch on disabled	1: Active, 0: Inactive
7	Alarm	Alarm	1: Active, 0: Inactive
8	Manufacturer-specific	Manufacturer-specific	Undefined
9	Remote	Remote	1: Active, control word effective 0: Inactive
10	Target reach	Target reach	0: Target torque not reached 1: Target torque reached
11	Internal limit active	Internal limit active	0: Position feedback within the limit 1: Position feedback beyond the limit
12 to 14	No assignment	N/A	No assignment, always being 0
15	-	N/A	N/A

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.17	2007-12h	Speed limit source	0: Internal speed limit 1: V-LMT 2: H07.19 or H07.20 as defined by DI Note: For SV680P-INT, the parameter takes effect when H02.00 is not 8. For SV680N-INT, the parameter takes effect when H02.00 is not 9.	0	-	Real-time
6060h	6060h	Servo drive mode	SV680P-INT 1: Profile position mode (pp)	0	-	Real-time

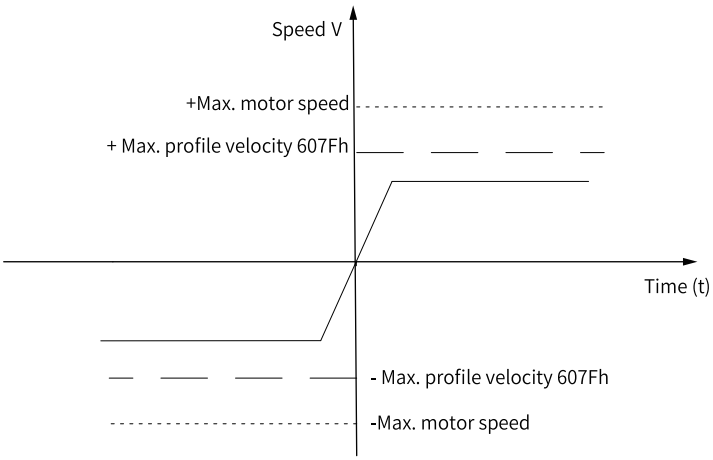
Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			3: Profile velocity mode (PV) 4: Profile torque mode (PT) 6: Homing mode (HM) 7: Interpolation mode (IP) SV680N-INT 1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode			
6061h	6061h	Operation mode display	SV680P-INT 1: Profile position mode (pp) 3: Profile velocity mode (PV) 4: Profile torque mode (PT) 6: Homing mode (HM) 7: Interpolation mode (IP) SV680N-INT 1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Unchangeable
6071h	6071h	Target torque	Setpoint range: -4000 to 4000 Actual value range: -400.0% to 400.0% Note: Actual value = Setpoint x Unit	0	0.10%	Real-time
6072h	6072h	Max. torque reference	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0% Note: Actual value = Setpoint x Unit	3500	0.10%	Real-time
6074h	6074h	torque reference	Setpoint range: -4000 to 4000 Actual value range: -400.0% to 400.0% Note: Actual value = Setpoint x Unit	0	0.10%	Unchangeable
6077h	6077h	Actual torque	Setpoint range: -4000 to 4000 Actual value range: -400.0% to 400.0% Note: Actual value = Setpoint x Unit	0	0.10%	Unchangeable
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time
6087h	6087h	Torque slope	Setpoint range: 0 to 4294967295	4294967295	0.1%/s	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			Actual value range: 0.0%/s to 429496729.5%/s Note: Actual value = Setpoint x Unit			
60E0h	60E0h	Positive torque limit	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0% Note: Actual value = Setpoint x Unit	3500 Note: For model N, the default value is 3000.	0.10%	Real-time
60E1h	60E1h	Negative torque limit	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0% Note: Actual value = Setpoint x Unit	3500 Note: For model N, the default value is 3000.	0.10%	Real-time

12.7.5Related Functions

Speed limit in the torque control mode

In the torque mode, 607Fh can be used to limit the maximum speed in forward/ reverse running. Note that the maximum speed cannot exceed the maximum running speed allowed by the motor.

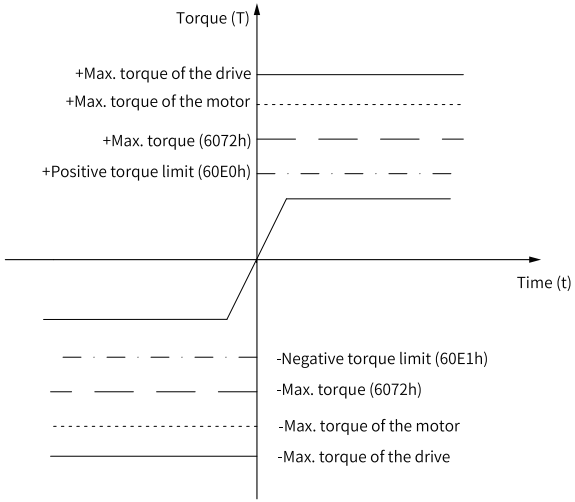


☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time

Torque limit

To protect the mechanical devices, you can limit the torque references of the servo drive in the position, speed, and torque control modes by setting 6072h (Max torque), 60E0h (Positive torque limit value), and 60E1h (Negative torque limit value). Note that the maximum torque allowed by the servo drive cannot be exceeded.



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6072h	6072h	Max. torque reference	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0% Note: Actual value = Setpoint x Unit	3500	0.10%	Real-time
60E0h	60E0h	Positive torque limit	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0% Note: Actual value = Setpoint x Unit	3500 Note: For model N, the default value is 3000.	0.10%	Real-time
60E1h	60E1h	Negative torque limit	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0% Note: Actual value = Setpoint x Unit	3500 Note: For model N, the default value is 3000.	0.10%	Real-time

Torque reference polarity

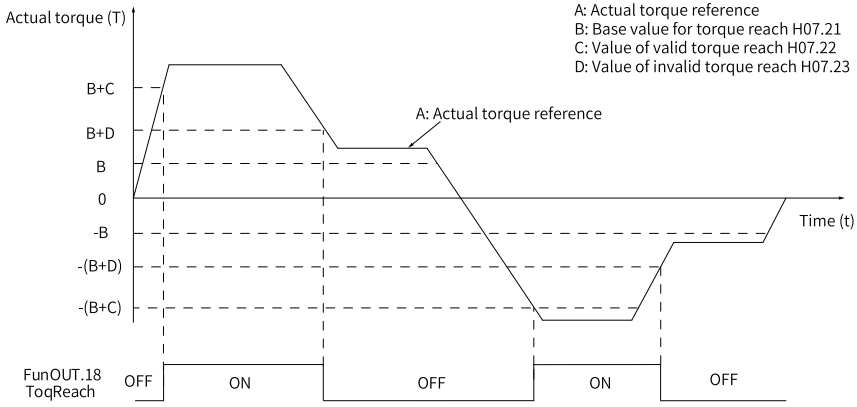
You can change the torque reference direction through setting the torque reference polarity.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time

Torque reach monitoring

It is used to determine whether the torque reference value reaches the set torque base value. If yes, a corresponding torque reach signal will be output to the host controller.



- Actual torque reference (viewed in H0b.02): A
- Base value for torque reach (H07.21): B
- Threshold of valid torque arrival (H07.22): C
- Threshold of invalid torque reach (H07.23): D

C and D are the offset based on B.

The torque reach DO signal can be activated only when the actual torque reference meets the following condition: $|A| \geqslant B + C$. Otherwise, the torque reach DO signal remains inactive.

The torque reach signal is deactivated only when the actual torque reference meets the following condition: $|A| < B + D$. Otherwise, the torque reach signal remains active.

12.8 Homing Mode (HM)

The homing mode is used to search for the mechanical home and determine the position relation between the mechanical home and mechanical zero.

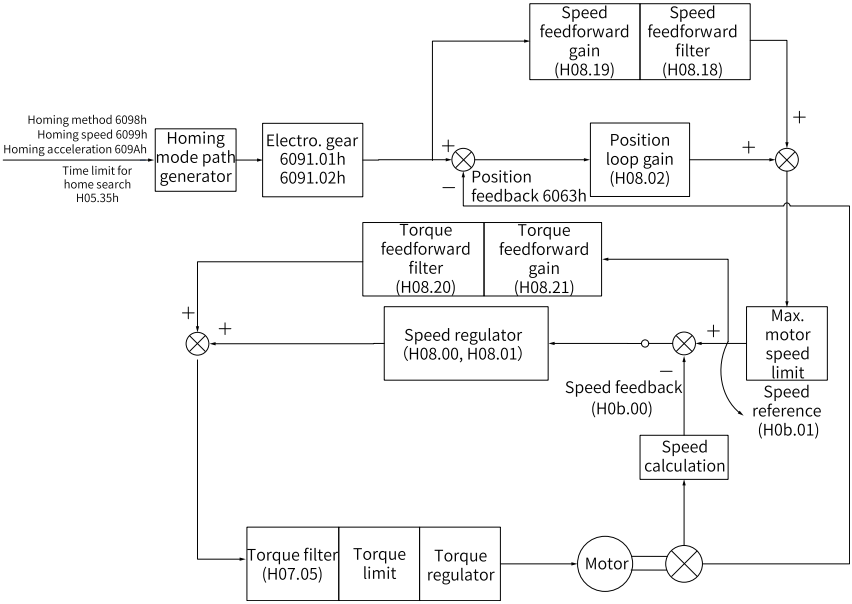
- Mechanical home: a fixed position on the machine, which corresponds to a certain home switch or the motor Z signal.
- Mechanical zero: absolute zero point on the machine

After homing is done, the motor stops at the mechanical home. The relation between the mechanical home and mechanical zero can be set in 607Ch.

Mechanical home = Mechanical zero + 607Ch (Home offset)

When 607C is 0, the mechanical home overlaps with the mechanical zero.

12.8.1Function Block Diagram



12.8.2Configuration Block Diagram

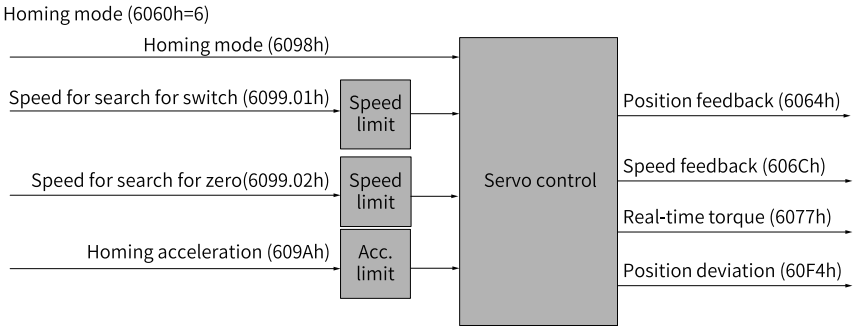


Figure 12-17 HM mode

12.8.3Recommended Configuration

The basic configuration for the homing mode is shown in the following table.

RPDO	TPDO	Remarks
6040h: control word	6041h: status word	Mandatory
6098h: homing method	-	Optional

RPDO	TPDO	Remarks
6099.01h: speed during search for switch	-	Optional
6099.02h: speed during search for zero	-	Optional
609Ah: homing acceleration	-	Optional
-	6064h: position actual value	Optional
6060h: modes of operation	6061h: modes of operation display	Optional

12.8.4Related Parameters

6040h Control word

Address: 6040h
Min.: 0x0 Unit: -
Max.: 0xFFFF Data Type: UInt16
Default: 0x0 Change: Real-time
Access: RW Mapping: RPDO

Value Range:

0x0 to 0xFFFF

Description:

Defines the control command.

bit	Name		Description
0	Switch on	Switch on	1: Active, 0: Inactive
1	Enable voltage	Enable voltage	1: Active, 0: Inactive
2	Quick stop	Quick stop	0: Active, 1: Inactive
3	Enable operation	Enable operation	1: Active, 0: Inactive
4[1]	Enable homing	Enable homing	0→1: Start, 1→0: Stop
8	Halt	Halt	0: Keep present operating state, 1: Halt

Note

[1]: Model P has no bit 4.

6041h Status word

Address: 6041h
Min.: 0x0 Unit: -
Max.: 0xFFFF Data Type: UInt16

Default: 0x0 Change: Unchangeable
Access: RO Mapping: TPDO

Value Range:
0x0 to
0xFFFF

Description:
Indicates the servo drive status.

bit	Name		Description
0	Ready to switch on	Ready to switch on	1: Active, 0: Inactive
1	Switch on	Switch on	1: Active, 0: Inactive
2	Enable operation	Operation enabled	1: Active, 0: Inactive
3	Fault	Fault	1: Active, 0: Inactive
4	Voltage enabled	Voltage enabled	1: Active, 0: Inactive
5	Quick stop	Quick stop	0: Active, 1: Inactive
6	Switch on disabled	Switch on disabled	1: Active, 0: Inactive
7	Alarm	Alarm	1: Active, 0: Inactive
8	Manufacturer-specific	Manufacturer-specific	Undefined
9	Remote	Remote	1: Active, control word effective 0: Inactive
10	Target reach	Target reach	1: Origin is found or homing is interrupted or failed 0: Disabled or home is not found[1]
11	Internal limit active	Internal limit active	0: Position reference within the limit 1: Position reference beyond the limit
12	Homing attained	Homing attained	0: Homing not attained 1: Homing attained
13	Homing error	Homing error	0: No error 1: Error is present
15	Home find	Home find	0: Homing completed 1: Homing done

Note

[1]: The value of bit 10 of model N is always 1.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6060h	6060h	Servo drive mode	SV680P-INT 1: Profile position mode (pp) 3: Profile velocity mode (PV) 4: Profile torque mode (PT) 6: Homing mode (HM) 7: Interpolation mode (IP) SV680N-INT 1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Real-time
6061h	6061h	Operation mode display	SV680P-INT 1: Profile position mode (pp) 3: Profile velocity mode (PV) 4: Profile torque mode (PT) 6: Homing mode (HM) 7: Interpolation mode (IP) SV680N-INT 1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Unchangeable
6065h	6065h	Following error window	0 to 4294967295	219895608	reference unit	Real-time
6066h	6066h	Defines the time lapse to trigger excessive position deviation (EB00.0).	0 ms–65535 ms	0	ms	Real-time
607Ch	607Ch	Home offset	-2147483648 to 2147483647	0	reference unit	Real-time
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time
6098h	6098h	Homing method	-3 to +35	1	-	Real-time
6099.01h	6099-01h	Speed during search for switch	0 to 4294967295	111848106	Reference unit/s	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6099.02h	6099-02h	Speed during search for zero	0 to 4294967295	11184810	Reference unit/s	At stop
609Ah	609Ah	Homing acceleration	0 to 4294967295	4294967295	Reference unit/s²	Real-time
60C5h	60C5h	Max. acceleration	0 to 4294967295	4294967295	Reference unit/s²	Real-time

12.8.5Related Functions

Homing timeout

When the homing duration exceeds the value defined by H05.35 (Homing time limit), the servo drive reports E601.0 (Homing timeout).

E601.0 can be used to determine whether the homing speed, the acceleration setpoint are proper and whether the deceleration point signal and home signal are connected properly.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
H05.35	2005-24h	Home search time limit	0 ms–65535 ms	10000	ms	Real-time

Actual position calculation method

After homing, the calculation method for the present mechanical position can be defined by 607Ch.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
607Ch	607Ch	Home offset	-2147483648 to 2147483647	0	reference unit	Real-time

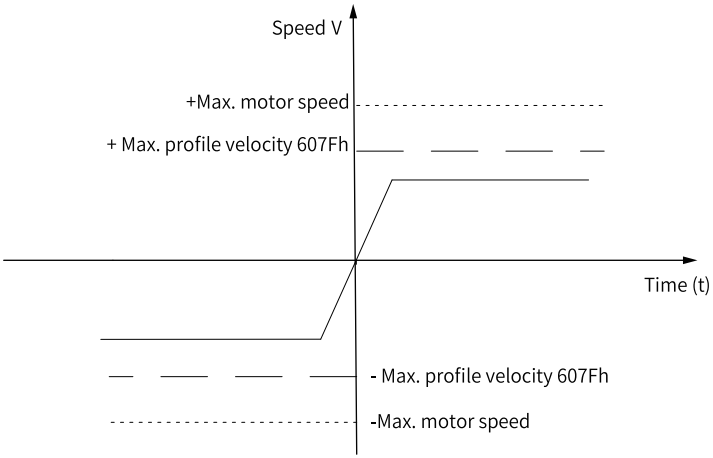
Position deviation monitoring function

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6065h	6065h	Following error window	0 to 4294967295	219895608	reference unit	Real-time
6066h	6066h	Defines the time lapse to trigger excessive position deviation (EB00.0).	0 ms–65535 ms	0	ms	Real-time

Speed limit

In HM mode, 607Fh can be used to limit the maximum speed in forward/reverse running, but its value must not exceed the max. allowable speed of the motor.



☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time

Acceleration limit

In the homing mode, the change rate of position references can be limited through the acceleration limit.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
60C5h	60C5h	Max. acceleration	0 to 4294967295	4294967295	Reference unit/s²	Real-time

12.8.6Homing Operation

Note

Evaluation conditions for torque homing:

- When 6098h=-3, after the motor reaches the hard limit, and the torque feedback reaches the limit value defined in H05.58 (mechanical limit homing torque evaluation value), the first Z signal in the reverse direction is searched for and regarded as the home after the motor stops.
- When 6098h = -2/-1, the limit value is the minimum of H05.58 (mechanical limit homing torque evaluation value), 6072h (maximum torque command), 60E0h (forward torque limit) and 60E1h (reverse torque limit).

In the following figure, "H" represents high speed 6099.01h, and "L" represents low speed 6099.02h, and “-” indicates reverse run.

6098h = 1

Mechanical home: motor Z signal

Deceleration point: negative limit switch

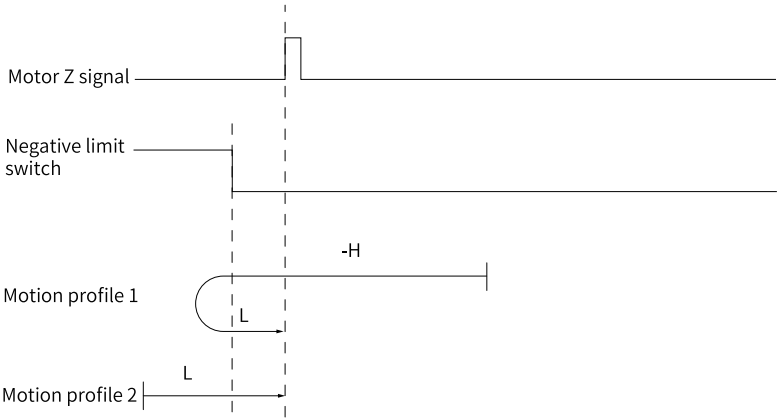


Figure 12-18 Motor running curve and speed in mode 1

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

6098h = 2

Home: Z signal

Deceleration point: positive limit switch

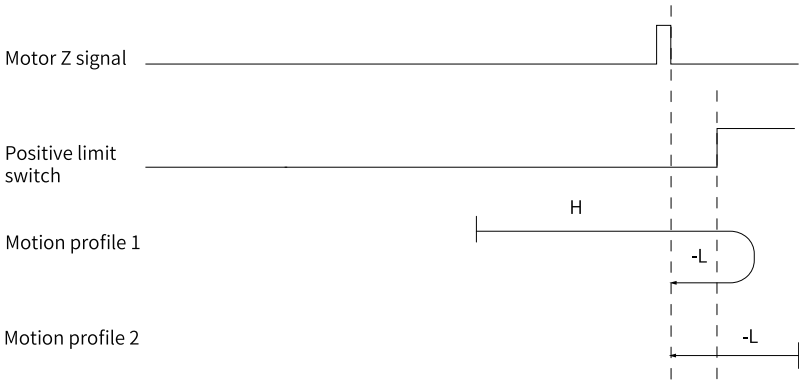


Figure 12-19 Motor running curve and speed in mode 2

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

6098h = 3

Home: Z signal

Deceleration point: home switch (HW)

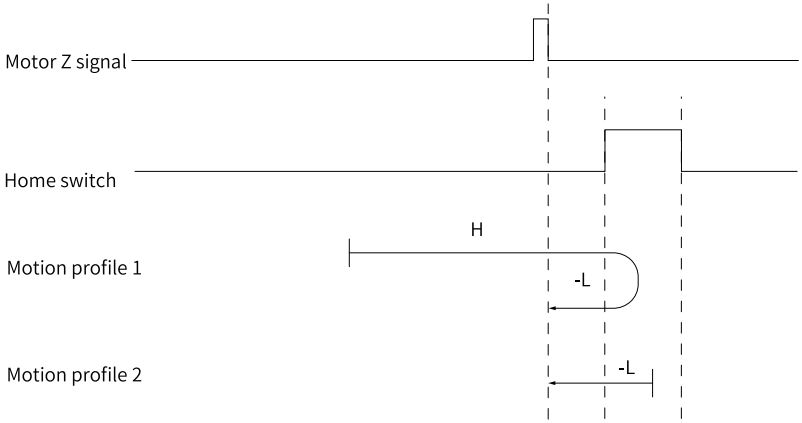


Figure 12-20 Motor running curve and speed in mode 3

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

6098h = 4

Home: Z signal

Deceleration point: home switch (HW)

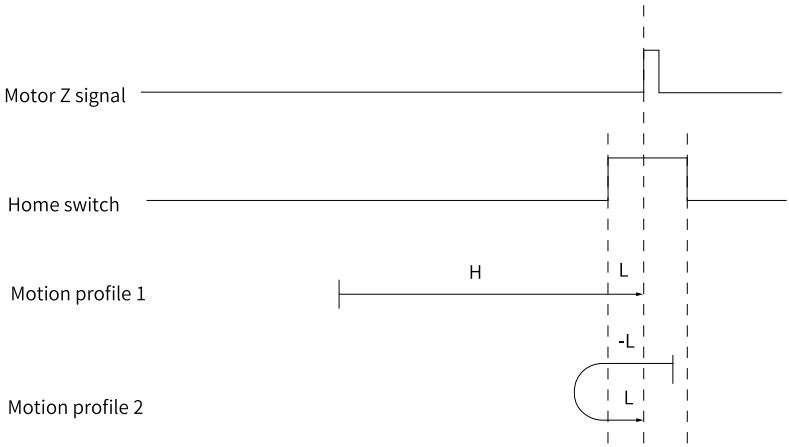


Figure 12-21 Motor running curve and speed in mode 4

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

6098h = 5

Home: Z signal

Deceleration point: home switch (HW)

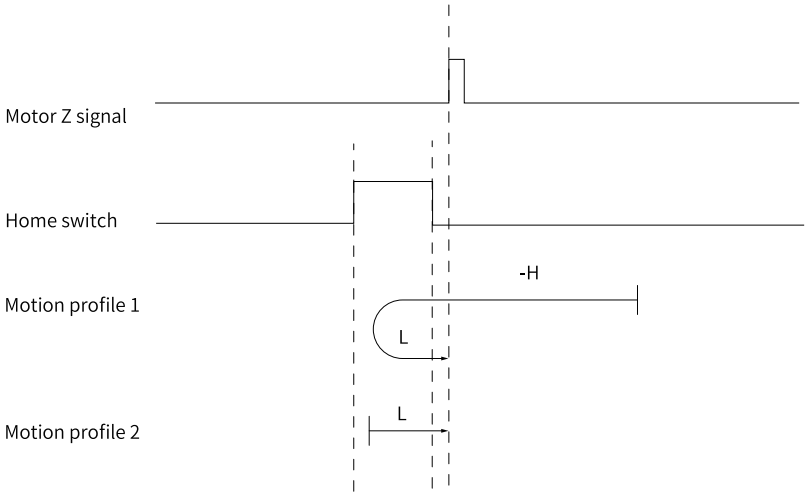


Figure 12-22 Motor running curve and speed in mode 5

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

6098h = 6

Home: Z signal

Deceleration point: home switch (HW)

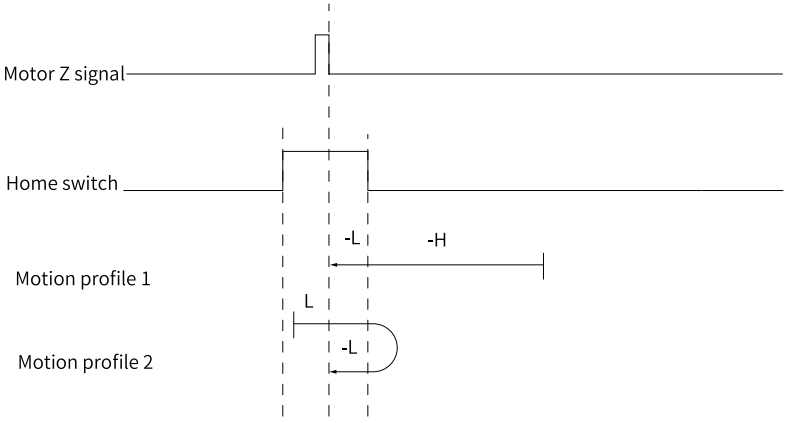


Figure 12-23 Motor running curve and speed in mode 6

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

6098h = 7

Home: Z signal

Deceleration point: home switch (HW)

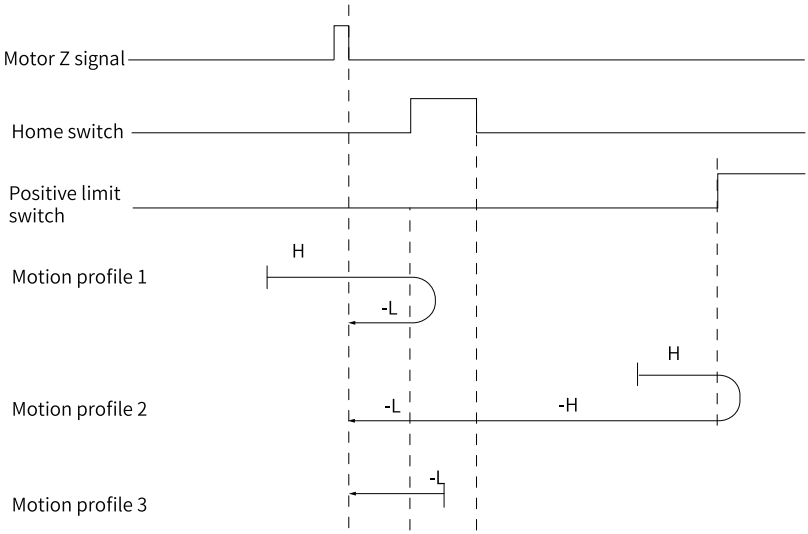


Figure 12-24 Motor running curve and speed in mode 7

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 8

Home: Z signal

Deceleration point: home switch (HW)

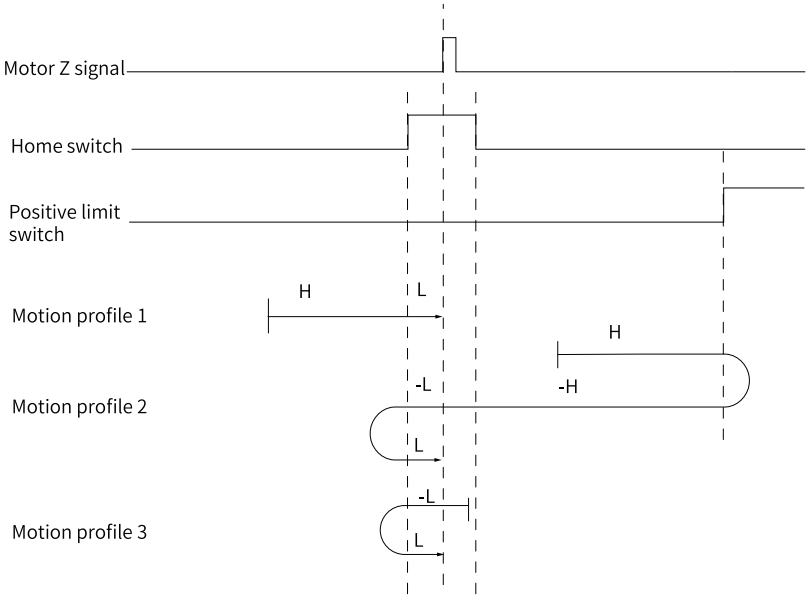


Figure 12-25 Motor running curve and speed in mode 8

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 9

Home: Z signal

Deceleration point: home switch (HW)

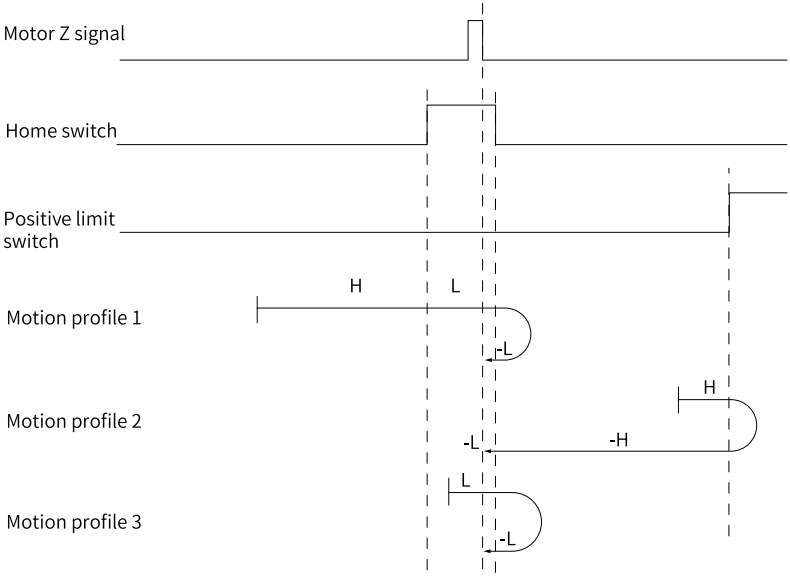


Figure 12-26 Motor running curve and speed in mode 9

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 10

Home: Z signal

Deceleration point: home switch (HW)

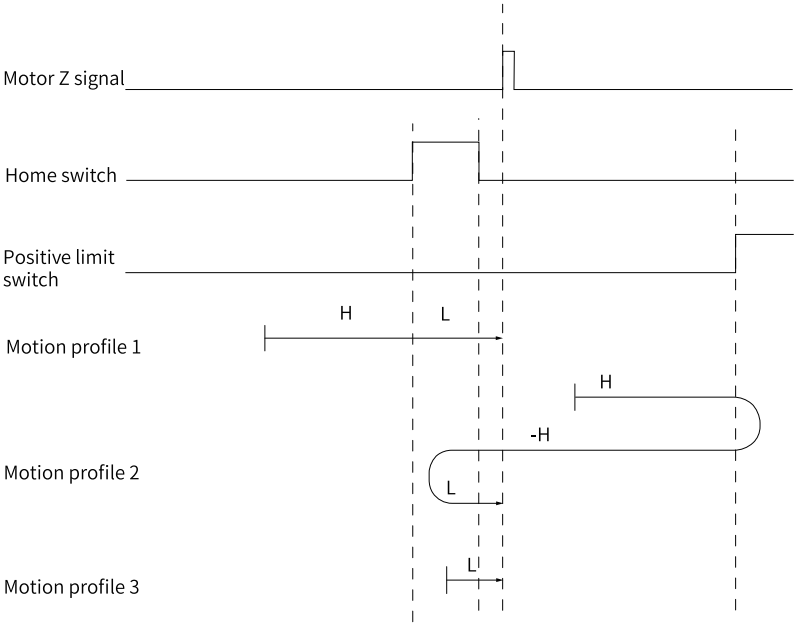


Figure 12-27 Motor running curve and speed in mode 10

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 11

Home: Z signal

Deceleration point: home switch (HW)

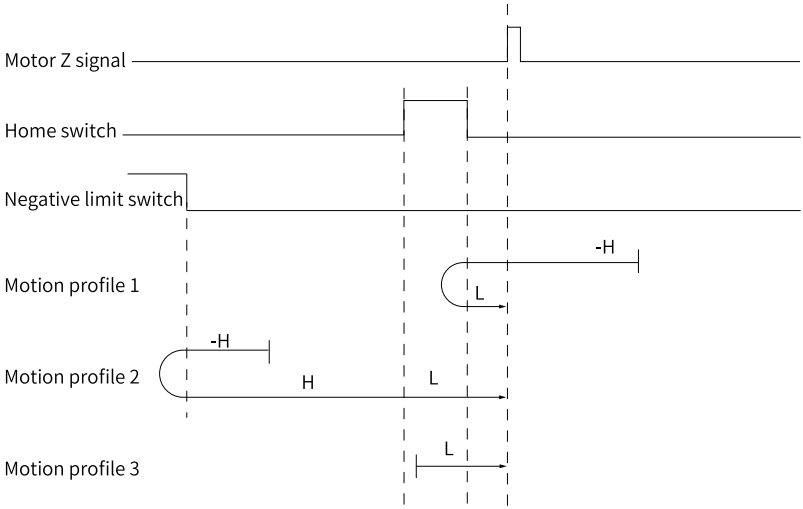


Figure 12-28 Motor running curve and speed in mode 11

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 12

Home: Z signal

Deceleration point: home switch (HW)

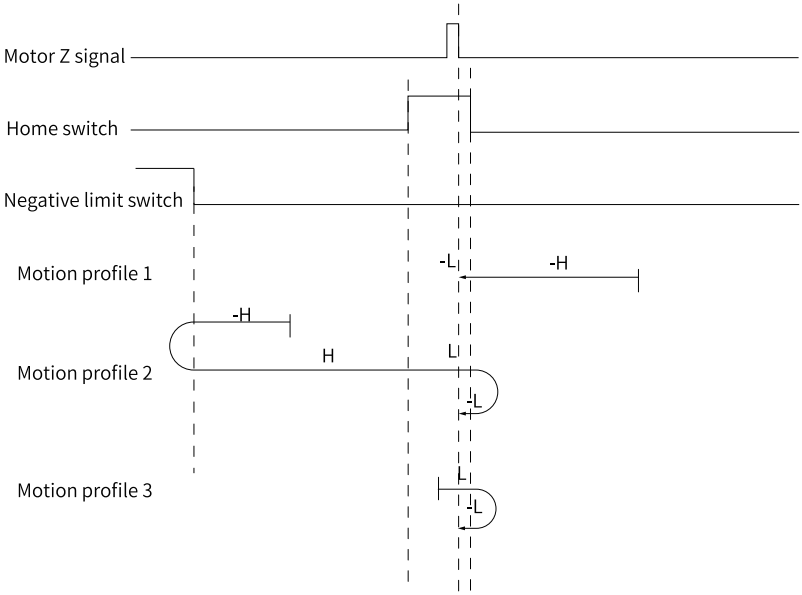


Figure 12-29 Motor running curve and speed in mode 12

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 13

Home: Z signal

Deceleration point: home switch (HW)

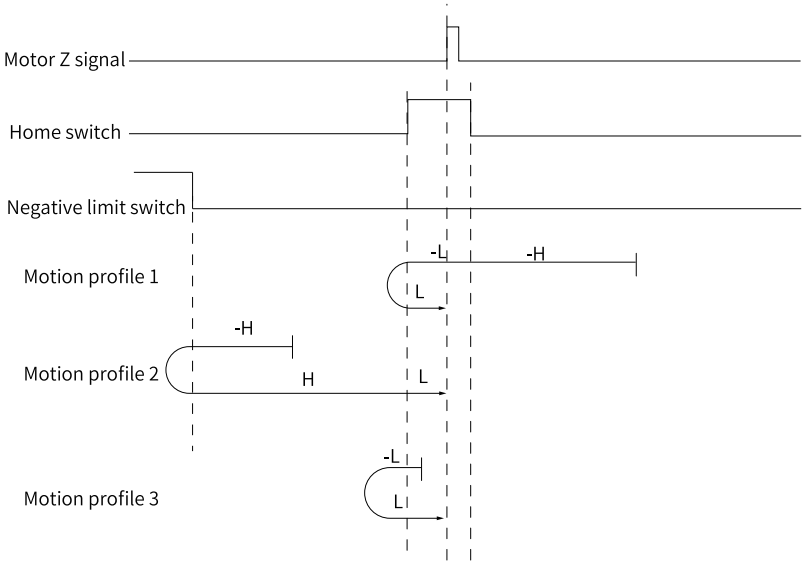


Figure 12-30 Motor running curve and speed in mode 13

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 14

Home: Z signal

Deceleration point: home switch (HW)

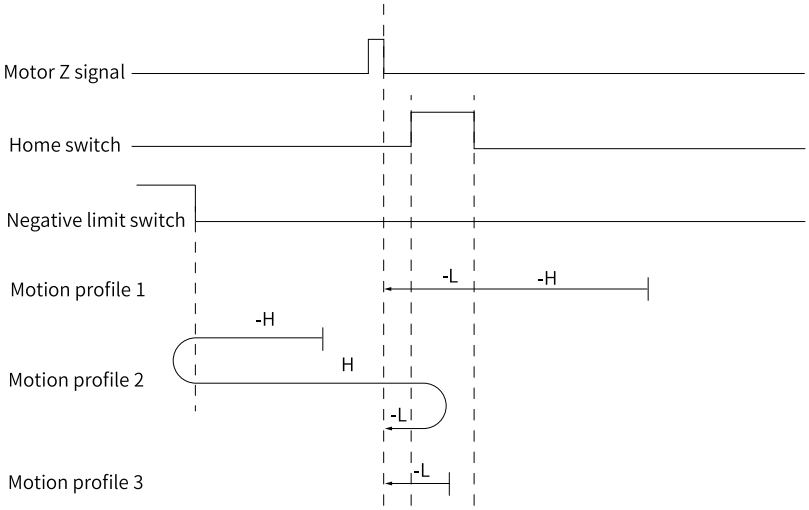


Figure 12-31 Motor running curve and speed in mode 14

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 17

Home: negative limit switch

Deceleration point: negative limit switch

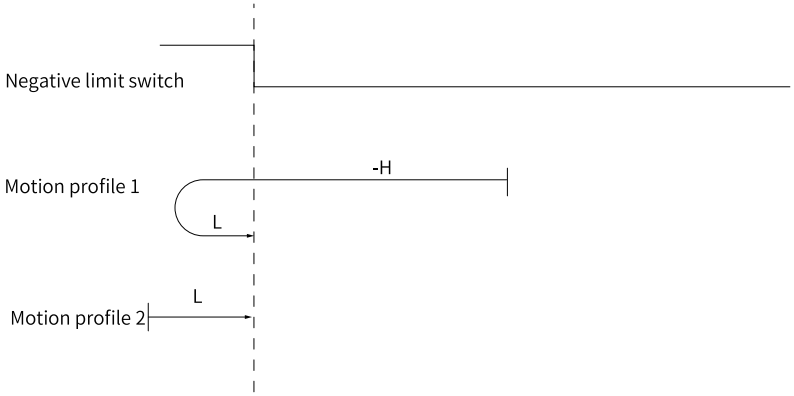


Figure 12-32 Motor running curve and speed in mode 17

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

6098h = 18

Home: positive limit switch

Deceleration point: positive limit switch

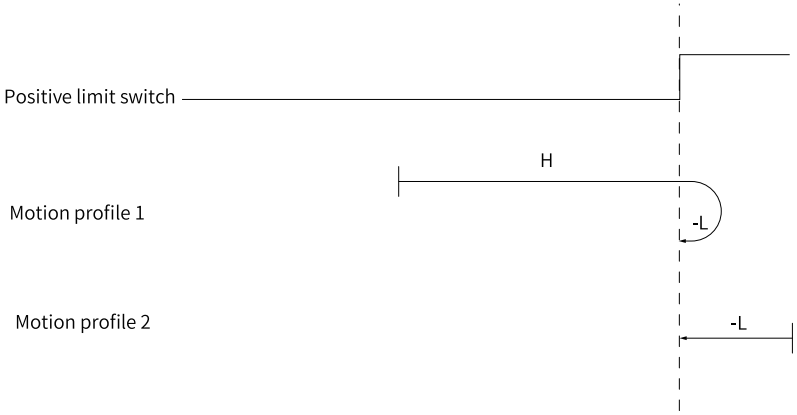


Figure 12-33 Motor running curve and speed in mode 18

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

6098h = 19

Home: home switch (HW)

Deceleration point: home switch (HW)

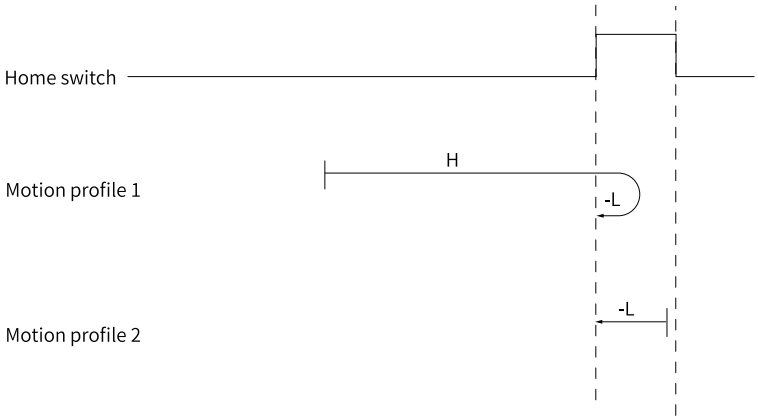


Figure 12-34 Motor running curve and speed in mode 19

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

6098h = 20

Home: home switch (HW)

Deceleration point: home switch (HW)

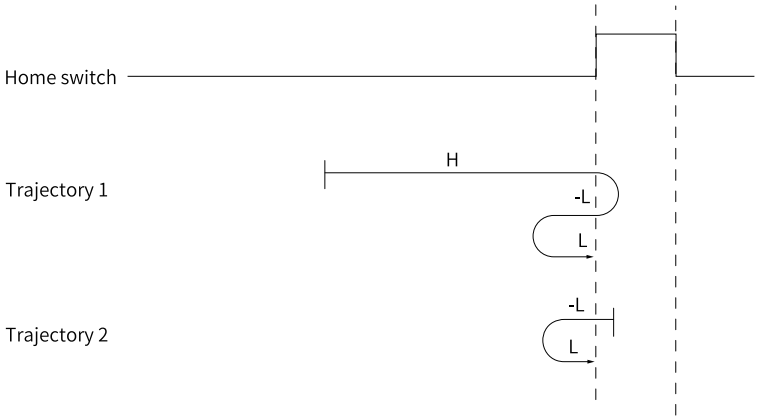


Figure 12-35 Motor running curve and speed in mode 20

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

6098h = 21

Home: home switch (HW)

Deceleration point: home switch (HW)

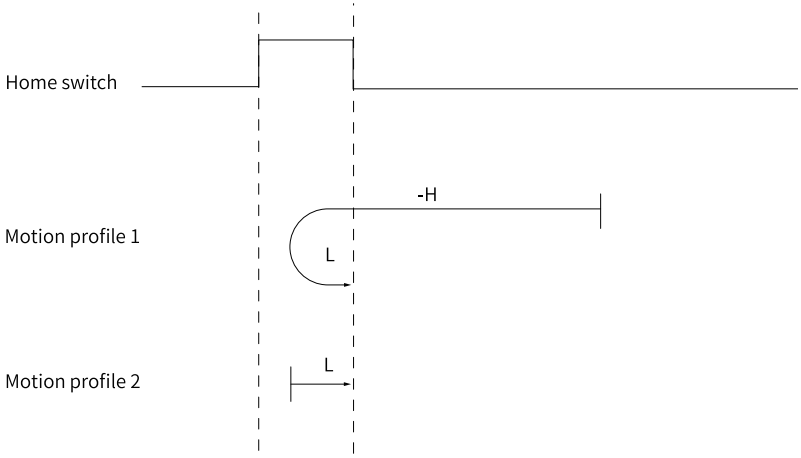


Figure 12-36 Motor running curve and speed in mode 21

- Motion profile 1: Deceleration point signal inactive at start.

- Motion profile 2: Deceleration point signal active at start.

6098h = 22

Home: home switch (HW)

Deceleration point: home switch (HW)

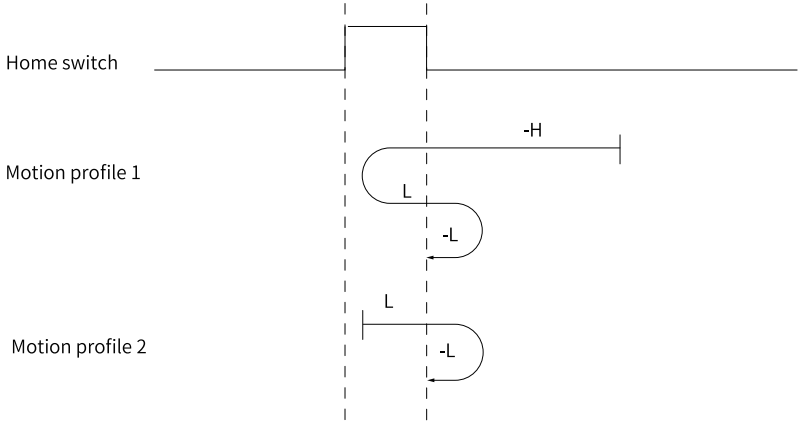


Figure 12-37 Motor running curve and speed in mode 22

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

6098h = 23

Home: home switch (HW)

Deceleration point: home switch (HW)

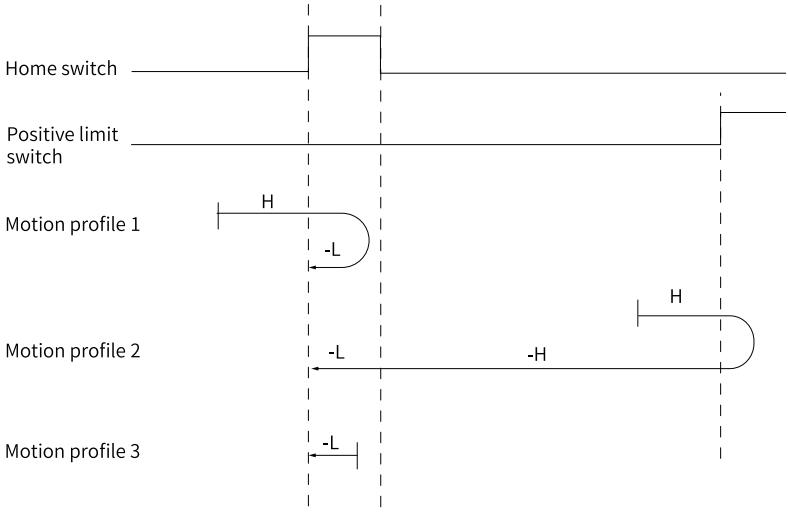


Figure 12-38 Motor running curve and speed in mode 23

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 24

Home: home switch (HW)

Deceleration point: home switch (HW)

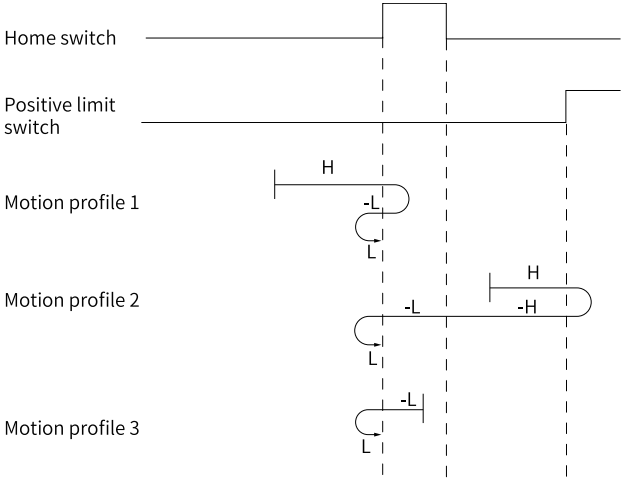


Figure 12-39 Motor running curve and speed in mode 24

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 25

Home: home switch (HW)

Deceleration point: home switch (HW)

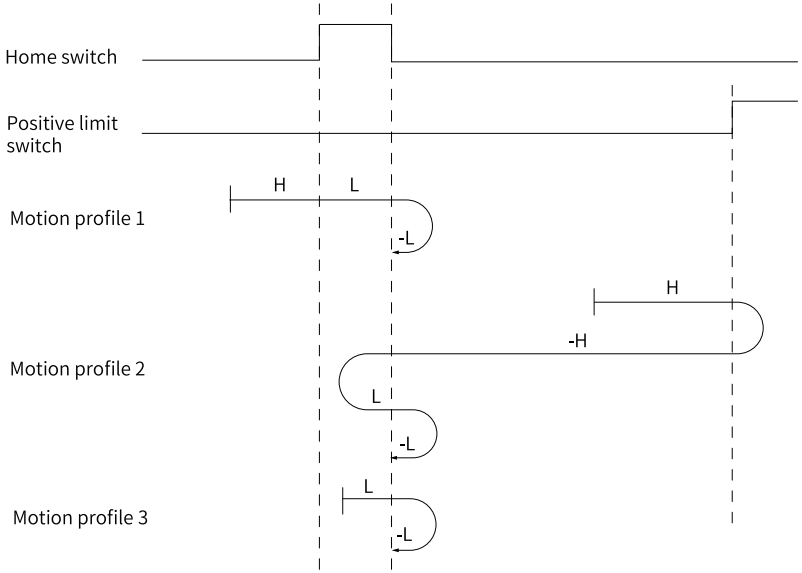


Figure 12-40 Motor running curve and speed in mode 25

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 26

Home: home switch (HW)

Deceleration point: home switch (HW)

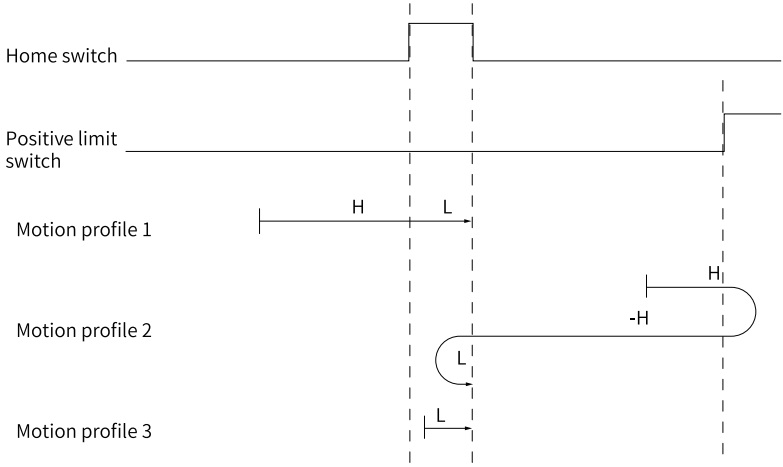


Figure 12-41 Motor running curve and speed in mode 26

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 27

Home: home switch (HW)

Deceleration point: home switch (HW)

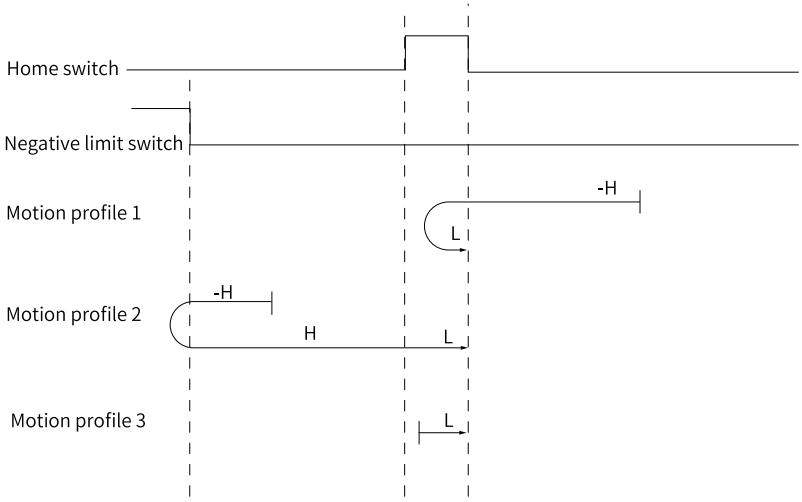


Figure 12-42 Motor running curve and speed in mode 27

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 28

Home: home switch (HW)

Deceleration point: home switch (HW)

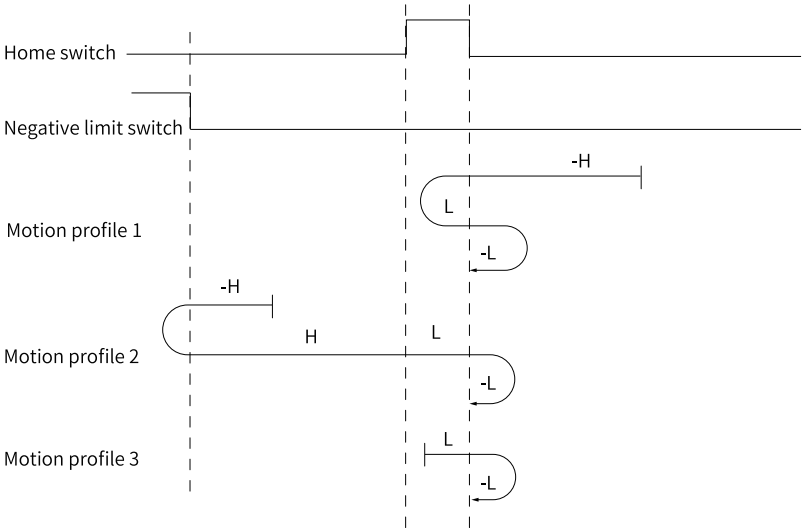


Figure 12-43 Motor running curve and speed in mode 28

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 29

Home: home switch (HW)

Deceleration point: home switch (HW)

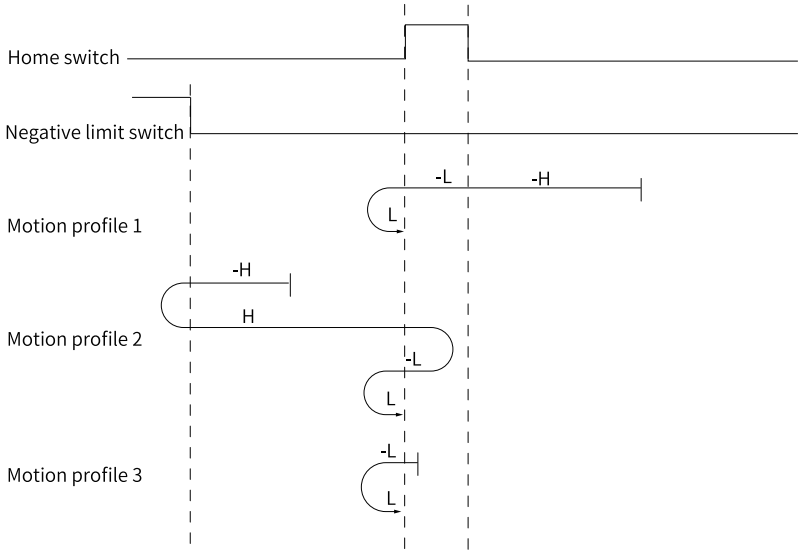


Figure 12-44 Motor running curve and speed in mode 29

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 30

Home: home switch (HW)

Deceleration point: home switch (HW)

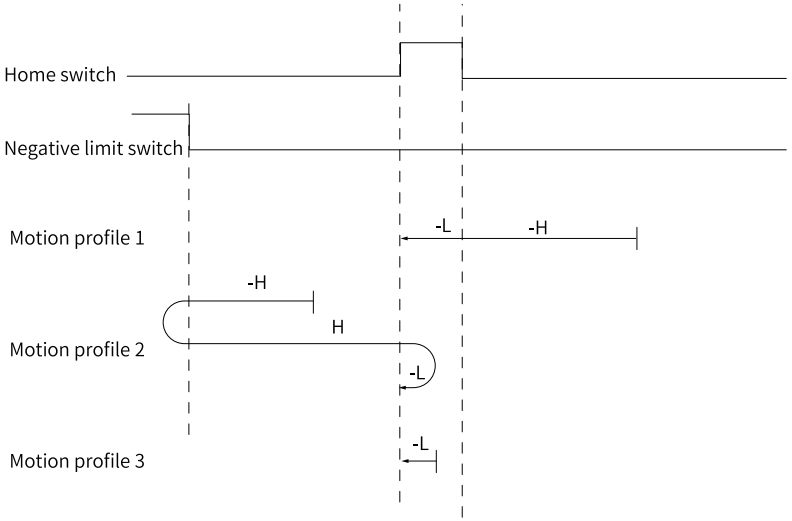


Figure 12-45 Motor running curve and speed in mode 30

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

6098h = 31 and 32

This mode is not defined in the CiA402 protocol. It can be used for extension purpose.

6098h = 33/34

Home: Z signal

Deceleration point: None

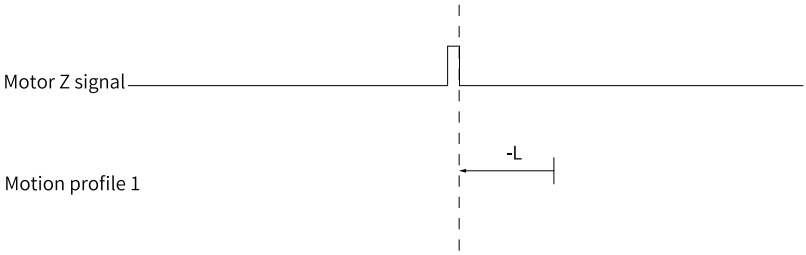


Figure 12-46 Motor running curve and speed in mode 33

- Motion profile 1: The motor runs in the reverse direction at low speed and stops at the first Z signal..

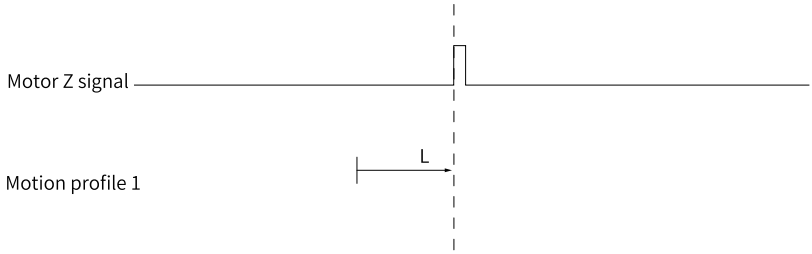


Figure 12-47 Motor running curve and speed in mode 34

- Motion profile 1: The motor runs in the forward direction at low speed and stops at the first Z signal..

6098h = 35

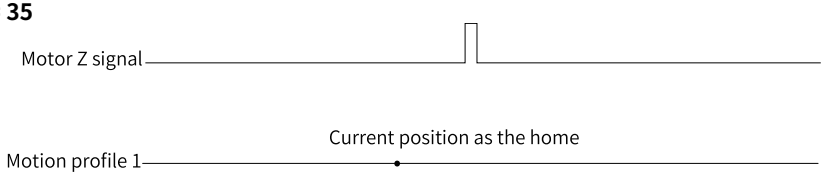


Figure 12-48 Motor running curve and speed in mode 35

Homing mode 35: The present position is taken as the mechanical home. After homing is triggered (control word 6040h: 0x0F → 0x1F).

6098h = -1

The motor runs in the reverse direction at high speed first. If the status where the torque reaches the limit and the speed is near zero after the axis hits the mechanical limit persists, it indicates the axis has reached the mechanical limit position. In this case, the motor runs in the forward direction at low speed and stops after reaching the rising edge of the Z signal for the first time.

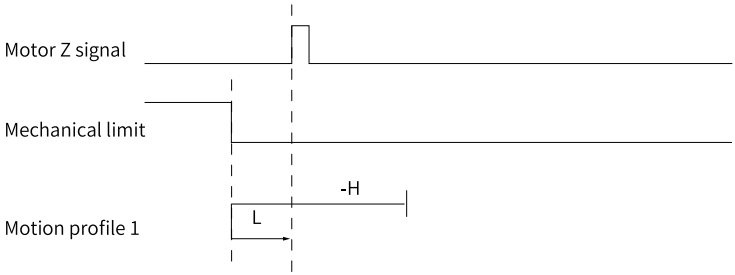


Figure 12-49 Motor running curve and speed in mode -1

6098h = -2

The servo motor runs in the forward direction at a high speed first. If the torque reaches the limit and the speed is near zero when the motor hits the mechanical limit, and such status persists, it indicates the motor reaches the mechanical limit position. In this case, the motor runs in the reverse direction at a low speed and stops at the first Z signal after reaching the rising edge.

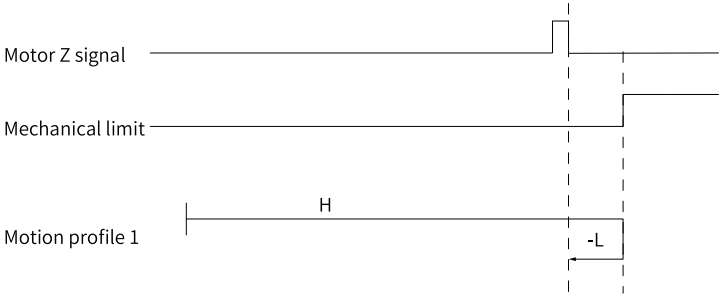


Figure 12-50 Motor running curve and speed in mode -2

6098h = -3

Home: Z signal

Deceleration point: None

- If the single-turn position is close to the reverse home, the homing profile is motion profile 1.
- If the single-turn position is close to the forward home, the homing profile is motion profile 2.

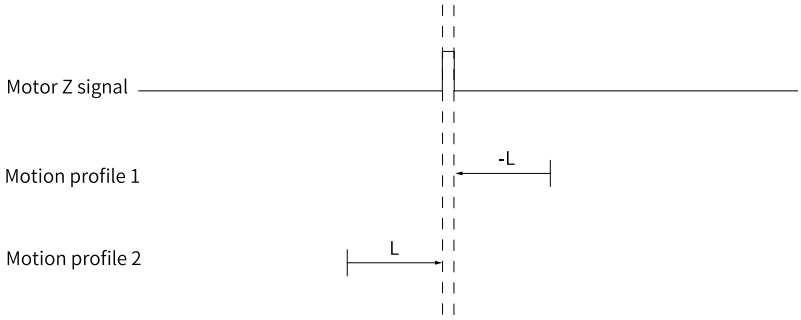


Figure 12-51 Motor running curve and speed in mode -3

- Motion profile 1: The motor runs in the reverse direction at low speed and stops at the first Z signal.
- Motion profile 2: The motor runs in the forward direction at low speed and stops at the first Z signal.

12.9 Position Control Mode

Note

In position control mode, model N only supports multi-position.

★ Definition of terms:

- "Reference unit": Refers to the minimum identifiable value input from the host controller to the drive.
- Encoder unit: Refers to the value of the input reference multiplied/divided by the electronic gear ratio.

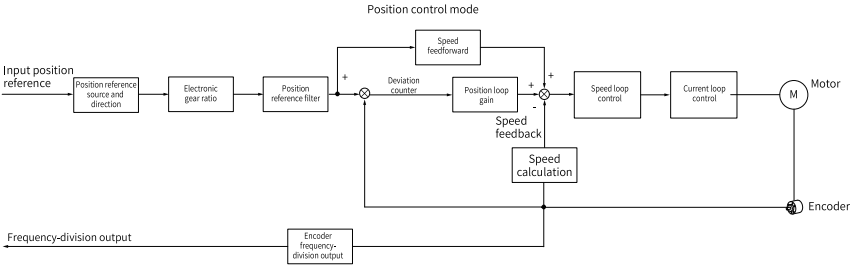


Figure 12-52 Position control diagram

Set H02.00 (Control mode) to 1 (Position control mode) through the keypad or Inovance software tool to make the drive operate in the position control mode. Set the drive parameters based on the mechanical structure and technical indicators.

The following describes basic parameter settings for the position control mode.

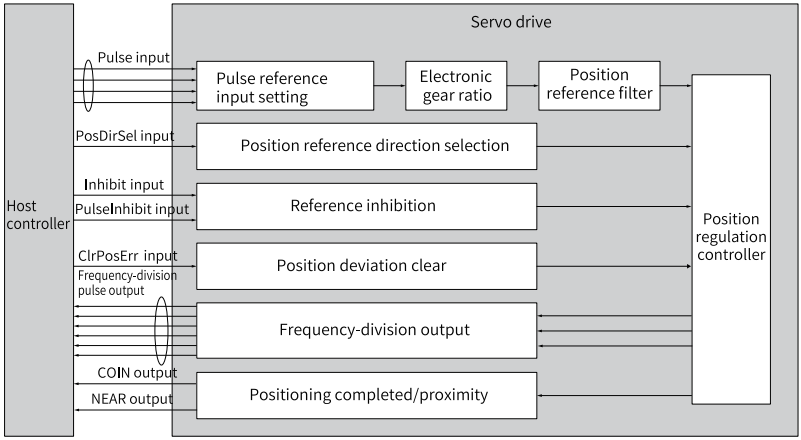


Figure 12-53 Signal exchange between the drive and the host controller

12.9.1Function Block Diagram

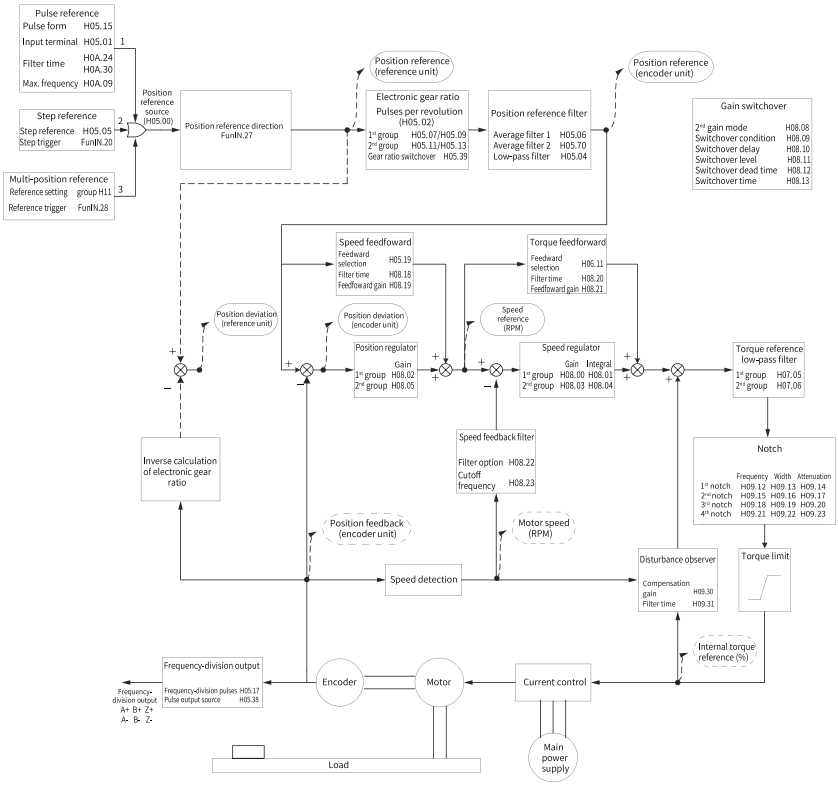


Figure 12-54 Block diagram of position control

12.9.2Position Reference Input

The position reference input setting includes the position reference source, position reference direction, and FunIN.13 (Position reference inhibited).

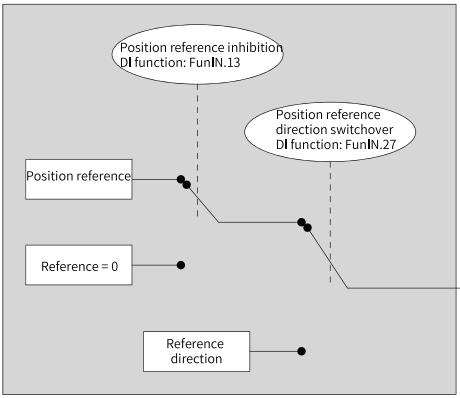


Figure 12-55 Position reference input setting

Position reference source

In the position control mode, set the position reference source in H05.00 first.

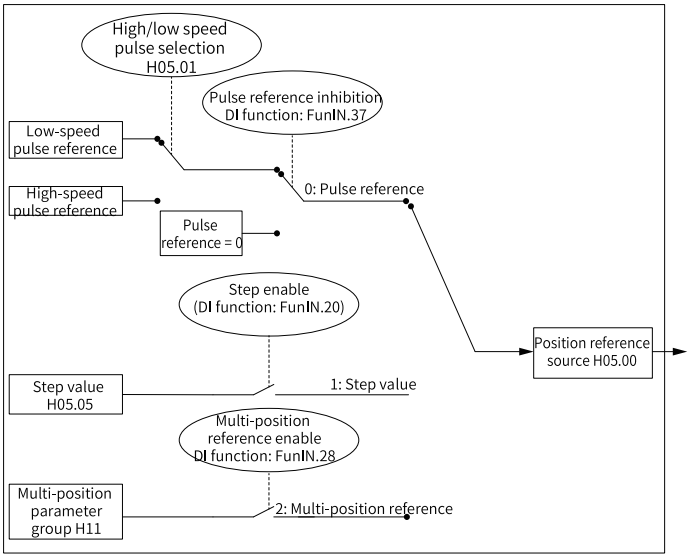


Figure 12-56 Setting the position reference source

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.00	2005-01h	Primary position reference source	0: Pulse reference 1: Step reference 2: Multi-position reference **Note: For model N, only "2: Multi-position reference" is available.**	0 Note: For model N, the default value is 2.	-	Real-time

- **Pulse reference as the source (H05.00 = 0)**
  Perform the following operations to obtain the correct pulse reference form.

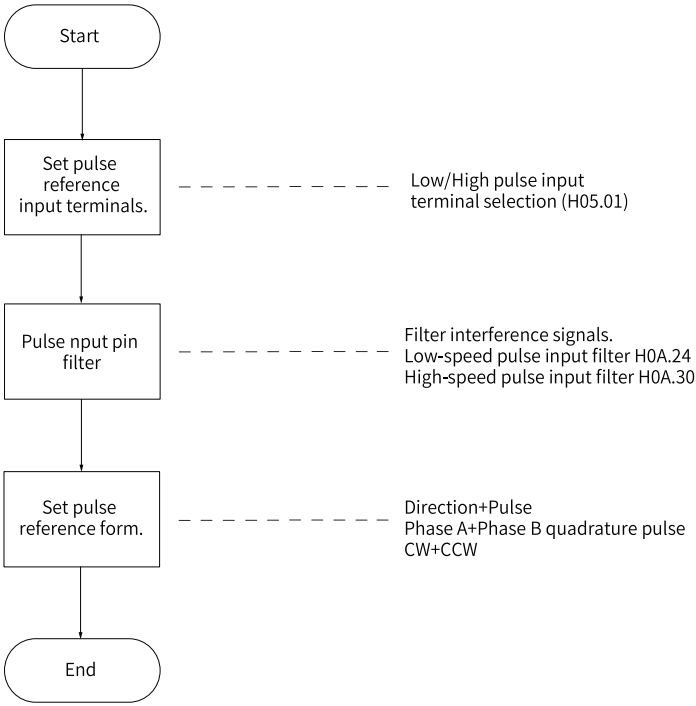
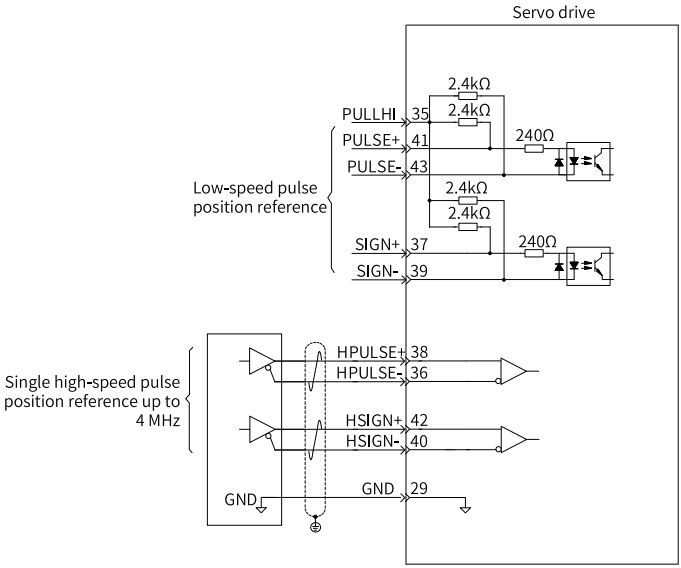


Figure 12-57 Flowchart for setting the pulse reference as the source

  - Pulse reference input terminals
    The drive provides two groups of pulse input terminals.



The low-speed pulse input terminals (PULSE+, PULSE-, SIGN+, SIGN-) receive open-collector input (maximum single input frequency is 200 kpps).

The high-speed pulse input terminals (HPULSE+, HPULSE-, HSIGN+, HSIGN-) only receive differential input (maximum single input frequency is 4 Mpps).

Note

Low-speed pulses and high-speed pulses are not allowed to be connected simultaneously.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.01	2005-02h	Position pulse reference input terminal	0: Low speed 1: High speed	0	-	At stop

For details on the interface circuit, see *SV680-INT Series Servo Drive Hardware Guide*.

Table 12–5 Specifications of pulse input

Pulse Type		Maximum Input Frequency	Voltage	Forward Current
High-speed pulse	Differential signal	4M	5 V	< 15 mA
Low-speed pulse	Differential signal	200k	5 V	< 15 mA
	Open-collector signal	200k	24 V	< 15 mA

- Pulse input pin filter
  Set the pin filter time for input terminals of low-speed and high-seed pulses. This is to prevent motor malfunction caused by interference signals.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0A.24	200A-19h	Filter time constant of low-speed pulse input terminal	0 ns–255 ns	30	25ns	At stop
H0A.30	200A-1Fh	Filter time constant of high-speed pulse input terminal	0 ns–255 ns	2	ns	At stop

If the filter time constant for pulse input pins is t_F, the minimum width of input signals is t_{min}, then the input signals before and after filtering are as follows. The filtered input signals will be delayed for t_F over the unfiltered ones.

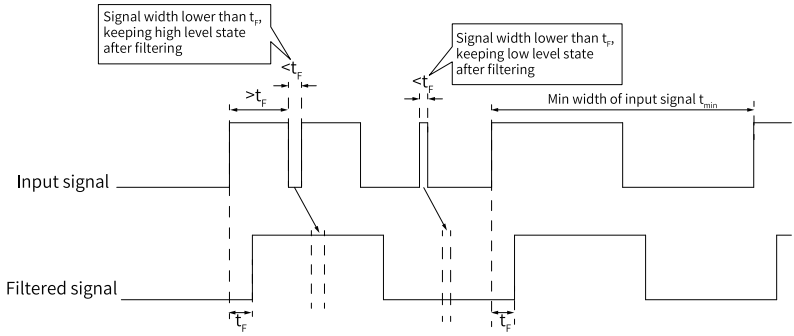


Figure 12-58 Example of filtered signal waveform

The pulse input pin filter time tF must meet the following requirement: $t_F \leqslant$ (20% to 25%) t_{min}

The recommended filter parameter setting based on the maximum frequency (minimum width) of input pulses is described in the following table.

Table 12–6 Recommended filter time constant

Pulse Input Terminal	Related Parameters	Maximum Frequency of Input Pulses	Recommended Filter Time Constant (25 ns)
Low-speed pulse input terminal	H0A.24	< 167 kbps	30
		167 kbps to 200 kbps	20
High-speed pulse input terminal	H0A.30	200 kpps to 1 M	5
		> 1 Mpps	3

For example, if the filter time constant is set to 30, the actual filter time is 30 x 25 = 750 ns.

- Pulse reference form

  The drive supports the following three types of pulse references:

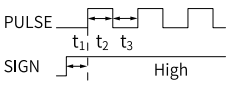
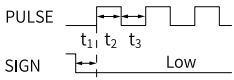
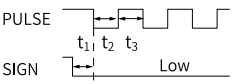
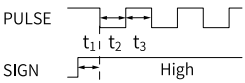
  - Direction + Pulse (positive or negative logic)
  - Phase A + Phase B quadrature pulse, quadrupled frequency
  - CW + CCW

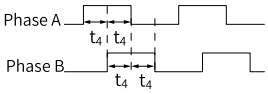
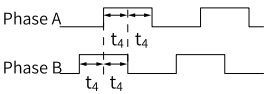
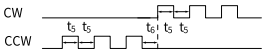
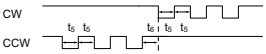
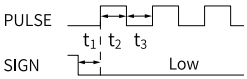
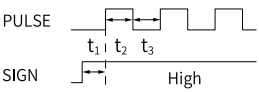
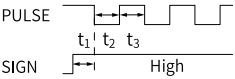
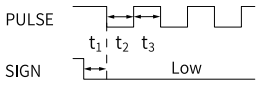
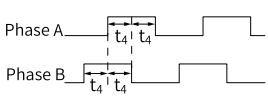
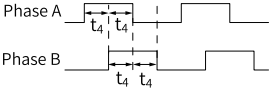
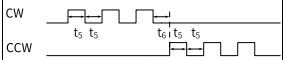
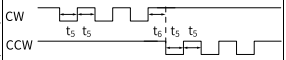
  Set the pulse reference form appropriate for the host controller or other pulse generators.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.15	2005-10h	Pulse reference form	0: Direction + Pulse, positive logic 1: Direction + Pulse, negative logic 2: Phase A + phase B quadrature pulse, quadrupled frequency 3: CW + CCW	0	-	At stop

Table 12–7 Descriptions of the pulse form

H02.02	H05.15	Pulse input form	Signal	Diagram of forward pulses	Diagram of reverse pulses
0	0	Pulse + Direction Positive Logic	PULSE SIGN		
	1	Pulse + Direction Negative Logic	PULSE SIGN		

H02.02	H05.15	Pulse input form	Signal	Diagram of forward pulses	Diagram of reverse pulses
	2	Phase A + Phase B Quadrature pulse Quadrupled frequency	PULSE (phase A) SIGN (phase B)	Phase A leads phase B by 90°. 	Phase B leads phase A by 90°. 
	3	CW+CCW	PULSE (CW) SIGN (CCW)		
1	0	Pulse + Direction Positive Logic	PULSE SIGN		
	1	Pulse + Direction Negative Logic	PULSE SIGN		
	2	Phase A + Phase B Quadrature pulse Quadrupled frequency	PULSE (phase A) SIGN (phase B)	Phase B leads phase A by 90°. 	Phase A leads phase B by 90°. 
	3	CW+CCW	PULSE (CW) SIGN (CCW)		

The following table describes the maximum frequencies and minimum time widths of position pulse references corresponding to different input terminals.

Table 12–8 Specifications of pulse references

Input terminal	Single-channel max. input frequency (pps)	Min. Time Width (μs)	
High-speed pulse input terminal	4M	t1	0.125
		t2	0.125
		t3	0.125
		t4	0.0625
		t5	0.125
		t6	0.125
Low-speed pulse input terminal	200k	t1	2.5
		t2	2.5
		t3	2.5
		t4	1.25
		t5	2.5

Input terminal	Single-channel max. input frequency (pps)	Min. Time Width (μs)	
		t6	2.5

The rising time and falling time of position pulse references must be shorter than 0.1 μs.

- Pulse reference frequency
  Set the maximum position pulse frequency in H0A.09.
- EB01.0 (Pulse input error) occurs when the actual input pulse frequency exceeds H0A.09.
  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0A.09	200A-0Ah	Max. pulse input frequency in position control	100 kHz–16000 kHz	16000	kHz	At stop

- **Step reference as position reference source (H05.00 = 1)**



When the S-ON (Servo ON) signal is active, the motor is in the locked state when the step reference is disabled or in the rotational state when the step reference is enabled. After H05.05 (Step reference) is done executing, the motor stays in the locked state when no step reference is triggered again.

The drive supports step operation, which means the drive can operate at a fixed speed until the set displacement is reached. The setting flowchart is as follows.

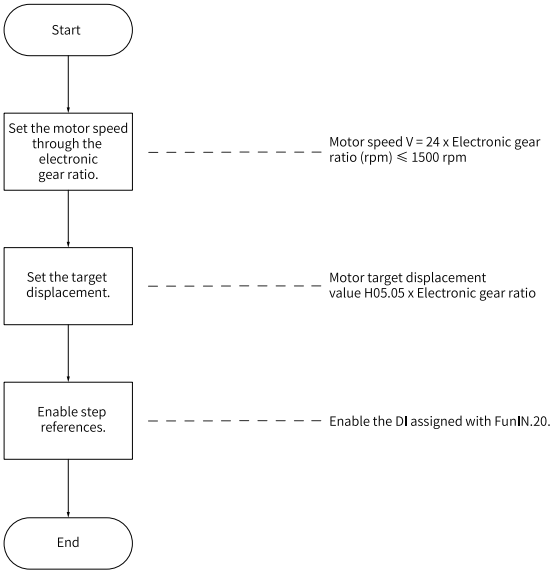


Figure 12-59 Flowchart for setting step reference as the position reference source

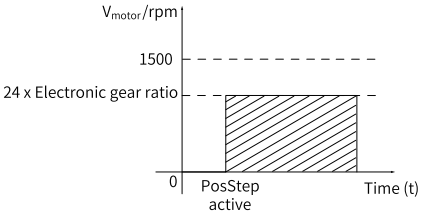


Figure 12-60 Motor operating curve (H05.00 = 1)

The hatched area in the preceding figure indicates the motor displacement: H05.05 x Electronic gear ratio (encoder unit).

- Relationship between the motor speed and electronic gear ratio
  When the step reference is used as the position reference source, the set motor speed will be converted based on the following formula. The motor speed in this case cannot exceed 1500 rpm.

$$V_{motor} = 24 \times \text{Electronic gear ratio (rpm)}$$

- Motor displacement
  When the step reference is used as the position reference source, the sum of position references (reference unit) is set in H05.05. The sign of the setpoint of H05.05 determines the motor direction of rotation.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.05	2005-06h	Step amount	-9999 to +9999	50	reference unit	At stop

- Step reference

  To use the step reference as the position reference source, assign FunIN.20 (PosStep, step reference enable) to a certain DI of the drive, and set the active logic of this DI.

  ☆ Related parameters:

Code	Name	Function Name	Function
FunIN.20	PosStep	Step reference	S-ON: Active: The position reference defined by H05.05 is input to the servo drive, driving the motor to run. Invalid: Servo motor in locked state

  FunIN.20 (Step reference enable) is edge-triggered. The motor is locked after the step reference is done executing. When FunIN.20 is triggered again, the motor executes the step reference defined by H05.05 again.

- **Multi-position reference as the position reference source (H05.00 = 2)**

  The servo drive supports multi-position operation. It stores 16 position references; the displacement, maximum running speed, and acceleration/deceleration time of each can be set. The interval time and switchover mode between positions can also be set according to actual requirements. The setting flowchart is as follows.

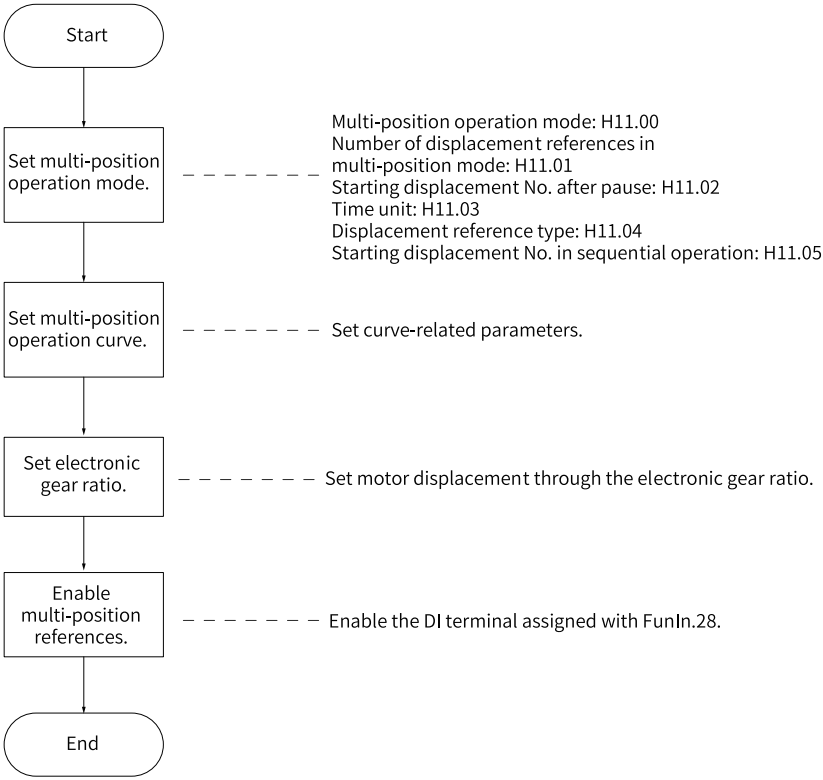


Figure 12-61 Flowchart for setting the multi-position reference as the source

- Setting the multi-position operation mode

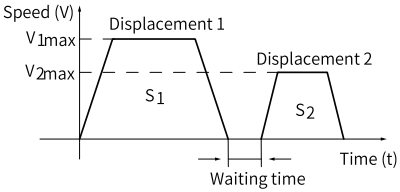
  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H11.00	2011-01h	Multi-position running mode	0: Single run (number of displacements selected in H11.01) 1: Cyclic operation (number of displacement selected in H11.01) 2: DI-based operation (selected by DI) 3: Sequential operation 5: Axis-controlled continuous operation	1	-	At stop
H11.01	2011-02h	Number of displacement references in multi-position mode	1 to 16	1	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H11.02	2011-03h	Starting displacement No. after pause	0: Continue to execute the unexecuted displacements 1: Start from displacement 1	0	-	At stop
H11.03	2011-04h	Interval time unit	0: ms 1: s	0	-	At stop
H11.04	2011-05h	Displacement reference type	0: Relative displacement reference 1: Absolute displacement reference	0	-	Real-time
H11.05	2011-06h	Starting displacement No. in sequential operation	0 to 16	0	-	At stop

1. **Individual operation (H11.00 = 0)**

Table 12–9 Description of individual operation

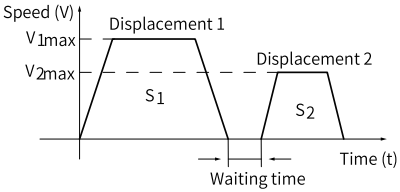
Description	Operating Curve
• The drive stops after one cycle of operation. • The drive switches to the next displacement automatically. • The interval time between displacements can be set as needed. • The PoslnSen (multi-position reference enable) signal is level-triggered.	 V_{1max} , V_{2max} : maximum operating speeds in displacement 1 and displacement 2 S_1 , S_2 : displacement 1 and displacement 2 • The positioning completed signal is active after each displacement is reached. • If the PosInsen signal is switched off during operation, the drive abandons the unfinished displacement and stops. The COIN (positioning completed) signal is activated after the drive stops. • After the PoslnSen signal is enabled again, the drive executes the displacement defined by H11.02. • If the S-ON signal is switched off during operation, the motor stops as defined by H02.05 (Stop mode at S-ON OFF). The COIN (positioning completed) signal is deactivated after the motor stops. • When a certain displacement is in progress, the logic change of the DI assigned with FunIN.27 (PosDirSel) does not affect the operating direction in this displacement.

★ Definition of terms:

A complete operation cycle covers all the position references defined by H11.01.

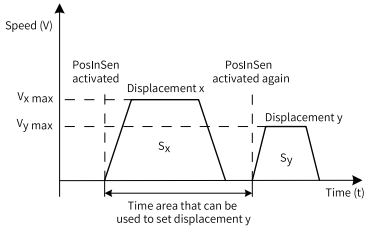
2. **Cyclic running (H11.00 = 1)**

Table 12–10 Descriptions of cyclic operation

Description	Operating Curve
• The drive starts from displacement 1 again after each cycle of operation. • The drive switches to the next displacement automatically. • The interval time between displacements can be set as needed. • The cyclic operation mode is kept when the FunIN.28 (Multi-position reference enable) is active. • The PoslnSen (multi-position reference enable) signal is level-triggered.	 V_{1max} , V_{2max} : maximum operating speeds in displacement 1 and displacement 2 S_1 , S_2 : displacement 1 and displacement 2 • The positioning completed signal is active after each displacement is reached. • If the PosInsen signal is switched off during operation, the drive abandons the unfinished displacement and stops. The COIN (positioning completed) signal is activated after the drive stops. • After the PoslnSen signal is enabled again, the drive executes the displacement defined by H11.02. • If the S-ON signal is switched off during operation, the motor stops as defined by H02.05 (Stop mode at S-ON OFF). The COIN (positioning completed) signal is deactivated after the motor stops. • When a certain displacement is in progress, the logic change of the DI assigned with FunIN.27 (PosDirSel) does not affect the operating direction in this displacement.

3. **DI-based operation (H11.00 = 2)**

Table 12–11 Descriptions of DI-based operation

Description	Operating Curve
• The displacement to be executed next can be set when the current displacement is in progress. The motor stops after current displacement is done executing. After the PoslnSen (position reference enable) signal is enabled again, the present displacement will be executed. • The speed No. is determined by the DI logic. • The interval time between displacements is determined by the command delay of the host controller. • The PoslnSen (multi-position reference enable) signal is edge-triggered.	 V_{xmax} , V_{ymax} : maximum operating speeds in displacement x and displacement y S_x , S_y : displacement x and displacement y • The positioning completed signal is active after each displacement is reached. • If the PosInsen (multi-position reference enable) signal is switched off during operation, the drive continues to execute the unfinished displacement and outputs the COIN (positioning completed) signal. • The displacements must be switched in the following sequence: a. Wait until displacement x is done executing before switching the displacement no.. b. When displacement x is in progress or done, switch off the PoslnSen (multi-position reference enable) signal first, and then change the displacement No. from x to y (if x = y, the drive executes displacement x again). c. After displacement x is done executing, switch on the PoslnSen (multi-position reference enable) signal again to make the drive execute displacement y. • If the S-ON signal is switched off during operation, the motor stops as defined by H02.05 (Stop mode at S-ON OFF). The COIN (positioning completed) signal is deactivated after the motor stops. • When a certain displacement is in progress, the logic change of the DI assigned with FunIN.27 (PosDirSel) does

Description	Operating Curve
	not affect the operating direction in this displacement.

In the multi-position operation mode, assign four DIs with FunIN.6 to FunIN.9 respectively, and set the active logic of these DIs.

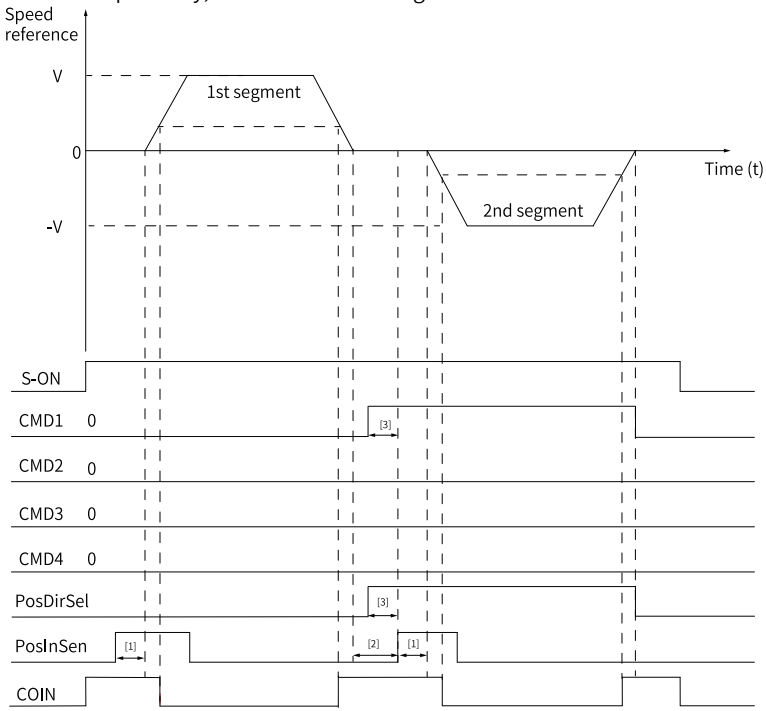


Figure 12-62 Multi-position sequence diagram

Note

- [1] The PosInSen signal is edge-triggered. The minimum signal widths required by the normal DI and high-speed DI are 3 ms and 0.25 ms respectively.
- [2] Area for switching the displacement No.: Refers to the interval that start from the moment the last position reference is done transmitting to the moment the next PosInSen (multi-position reference enable) signal is activated again.
- [3] When a normal DI is used, an effective signal width of 0.125 ms must be kept.

☆ Related parameters:

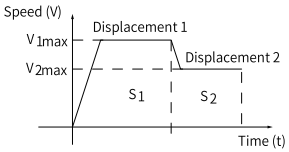
Code	Name	Function Name	Function
FunIN.6	CMD1	Multi-reference switchover 1	The displacement No. is a 4-bit binary. The relationship between the displacement No. and CMD1 to CMD4 is shown in *"Table 12–12 " on page 525*. The DI logic is level-triggered. The CMD value is 1 upon active level input or 0 upon inactive level input.
FunIN.7	CMD2	Multi-reference switchover 2	
FunIN.8	CMD3	Multi-reference switchover 3	
FunIN.9	CMD4	Multi-reference switchover 4	

Table 12–12 Relationship between the displacement No. and CMD1 to CMD4

CMD4	CMD3	CMD2	CMD1	Segment No.
0	0	0	0	1
0	0	0	1	2
…				
1	1	1	1	16

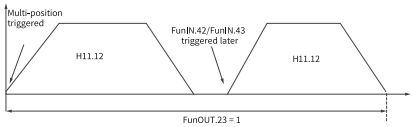
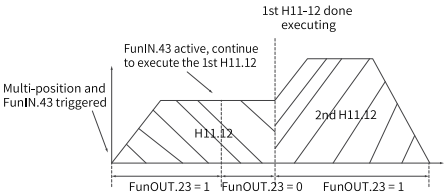
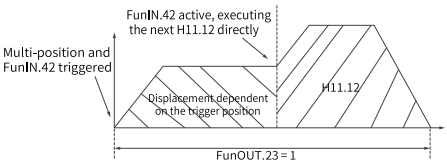
4. **Sequential running (H11.00 = 3)**

Table 12–13 Descriptions of sequential operation

Description	Operating Curve
• The drive stops after one cycle of operation. • (H11.05 = 0 or H11.05 > H11.01). • The starting displacement after the first cycle of operation is defined by H11.05. • The drive switches to the next displacement automatically. • There is no interval time between displacements. • The PoslnSen (multi-position reference enable) signal is level-triggered.	 V_{1max} , V_{2max} : maximum operating speeds in displacement 1 and displacement 2 S_1 , S_2 : displacement 1 and displacement 2 • The positioning completed signal is active after each displacement is reached. • If the PosInsen signal is switched off during operation, the drive abandons the unfinished displacement and stops. The COIN (positioning completed) signal is activated after the drive stops. • After the PoslnSen signal is enabled again, the drive executes the displacement defined by H11.02. • If the S-ON signal is switched off during operation, the motor stops as defined by H02.05 (Stop mode at S-ON OFF). The COIN (positioning completed) signal is deactivated after the motor stops. • When a certain displacement is in progress, the logic change of the DI assigned with FunIN.27 (PosDirSel) does not affect the operating direction in this displacement.

5. **Axis-controlled continuous operation (H11.00 = 5)**

Table 12–14 Description of axis-controlled continuous operation

Description	Operating Curve
• The drives executes one displacement only. • The individual operation mode, sequential operation mode, and interrupted operation mode are included. • The PoslnSen (multi-position reference enable) signal is level-triggered.	• Individual operation  The PoslnSen (multi-position reference enable) signal is triggered only once (FunIN.43/42 triggered later). The drive stops after executing the distance defined by H11.12. • Sequential operation  The PoslnSen (multi-position reference enable) signal is triggered only once. Write H11.12 again and activate FunIN.43 when the distance defined by the first H11.12 is still in progress.After receiving the new distance (or speed), which is the second H11.12, the drive continues executing the first H11.12 until the distance defined by the first H11.12 is done. Then it starts to execute the second H11.12 directly. The travel distance therefore is the sum of the first H11.12 and the second H11.12. • Interrupted operation  The PoslnSen (Multi-position reference enable) signal is triggered only once. Write H11.12 (such as 1000000) again and activate FunIN.42 when the first H11.12 (such as 9000000) is still in progress. After receiving the new distance (or speed), which is the second H11.12, the drive stops executing the first H11.12 and turns to executing the second H11.12.

☆ Related parameters:

Code	Name	Function Name	Function
FunIN.42	MultiBlockTrig	Axis control command executed immediately	Active: Newly written command activated immediately Inactive: Newly written command not activated
FunIN.43	MultiBlockWr	Axis control command not executed immediately	Active: Newly written command activated after current displacement is done executing Inactive: Newly written command not activated
FunOUT.23	WrNextBlockEn	Command input	Active: Next command input allowed Inactive: Next command input inhibited

- Setting multi-position operating curve
  A total of 16 position references can be set during multi-position operation. The displacement, maximum operating speed, acceleration/deceleration time, and interval time between displacements can be set separately. The following takes displacement 1 as an example.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H11.12	2011-0Dh	Displacement 1	-1073741824 to 1073741824	10000	reference unit	Real-time
H11.14	2011-0Fh	Max. speed of displacement 1	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time
H11.15	2011-10h	Acc/Dec time of displacement 1	0 ms–65535 ms	10	ms	Real-time
H11.16	2011-11h	Interval time after displacement 1	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time

The actual operating curve of the motor based on preceding settings is shown in the following figure.

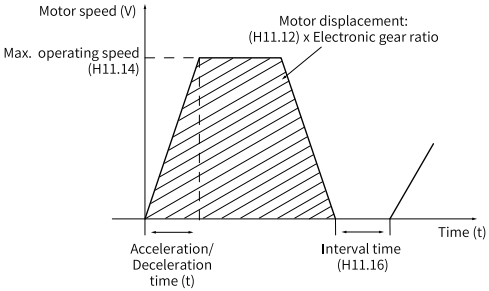


Figure 12-63 Motor operating curve in displacement 1

Actual time (t) taken to accelerate to H11.14:

$$t = \frac{(H11.14)}{1000} \times (H11.15)$$

For settings of other 15 parameters, see *SV680-INT Series Servo Drive Parameter Guide*.

- Setting multi-position reference enable mode
  To use the multi-position reference as the position reference source, assign FunIN.28 (PosInSen, multi-position reference enable) to a certain DI of the drive, and set the active logic of this DI.

  ☆Related function No.:

Code	Name	Function Name	Function
FunIN.28	PosInSen	Multi-position reference enable	Active: The motor executes the multi-position reference. Invalid: Servo motor in locked state Note: • When H11.00 is set to 0, 1, or 3, the logic of the DI assigned with the PosInSen signal is level-triggered. • When H11.00 is set to 2, the logic of the DI assigned with the PosInSen signal is edge-triggered.

Position reference direction

A DI can be used to change the position reference direction, so as to change the motor direction of rotation. Assign FunIN.27 (PosDirSel, position reference direction) to a DI of the drive, and set the active logic of this DI.

☆ Related parameters:

Code	Name	Function Name	Function
FunIN.27	PosDirSel	Position reference direction	Inactive: Actual position reference direction same as the set direction Active: Actual position reference direction opposite to the set direction

The actual motor direction is related to the rotating direction in H02.02, positive/ negative of position reference, position reference direction (FunIN.27).

Table 12–15 Motor direction of rotation

H02.02	Sign of Position Reference	FunIN.27	Direction of Rotation
0	+	Inactive	CCW
0	+	Active	CW
0	-	Inactive	CW
0	-	Active	CCW
1	+	Inactive	CW
1	+	Active	CCW
1	-	Inactive	CCW
1	-	Active	CW

Position reference inhibited

FunIN.13 (Inhibit) and FunIN.37 (PulseInhibit) are used to inhibit position references and pulse references.

- Position reference inhibited
  The drive sets all the position references to 0, which means it does not respond to any internal or external position references, and the motor is in the locked state in the position control mode. In this case, the drive can switch to other control modes to continue operating.

  To use FunIN.13 (Inhibit, position reference inhibited), assign FunIN.13 to a certain DI and set the active logic of this DI. It is recommended to use the high-speed DI (DI7 or DI8) terminal.

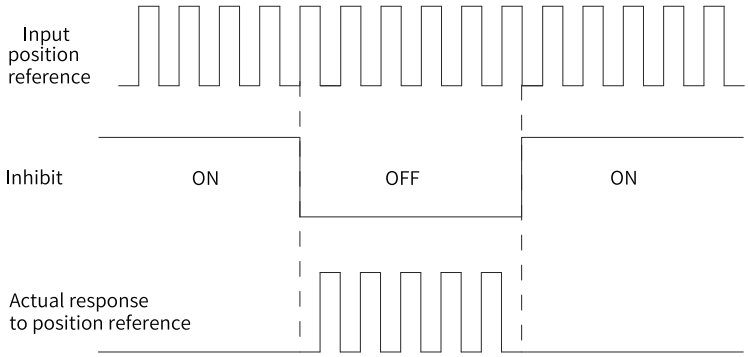


Figure 12-64 Waveform example for position reference inhibited

☆Related function No.:

Code	Name	Function Name	Function
FunIN.13	Inhibit	Position reference inhibited	Inactive: The drive responds to position references in the position control mode. Active: The drive does not respond to any internal or external position references in the position control modes.

- Pulse reference inhibited

  The drive sets all the pulse references to 0, which means it does not respond to any pulse references inputted from the pulse input terminal but it can respond to position references in other forms in the position control mode. In this case, the drive can be switched to other control modes to continue operating.

  When pulse reference inhibition is activated in the position control mode, no other forms of position references are used and pulse signals are input in the pulse input terminal, the input position reference counter (H0b.13) stops counting.

  If position references in other forms are used in the position control mode, the input position reference counter (H0b.13) continues counting the these position references, and these references will be executed.

  To use FunIN.37 (PulseInhibit, pulse reference inhibit), assign FunIN.37 to a certain DI and set the active logic of this DI. It is recommended to use the high-speed DI (DI7 or DI8) terminal.

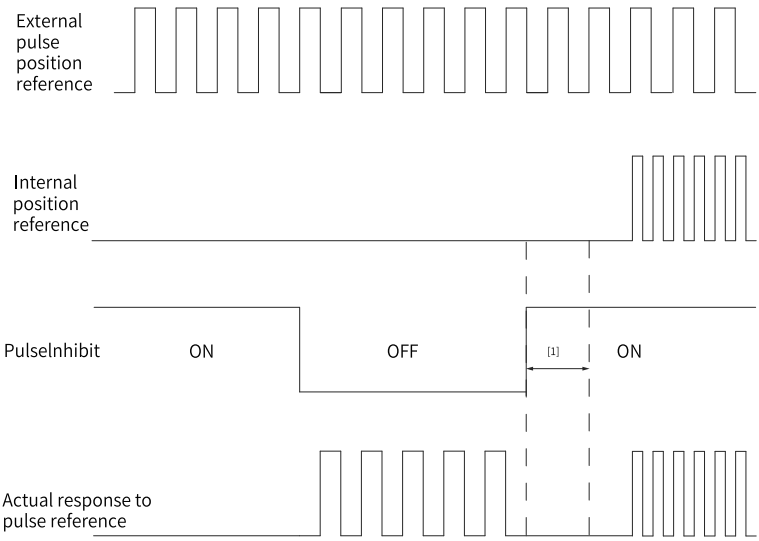


Figure 12-65 Waveform example for pulse reference inhibited

Note

[1] When DI is used, keep an interval of at least 0.5 ms from the moment the DI logic is deactivated to the moment the internal position reference is inputted.

☆Related function No.:

Code	Name	Function Name	Function
FunIN.37	PulseInhibit	Pulse reference inhibited	When the position reference source is pulse reference (H05.00 = 0) in the position control mode: Inactive: The drive responds to pulse references. Active: The drive does not respond to pulse references.

12.9.3Reference Frequency Division/Multiplication (Electronic Gear Ratio)

Definition of the electronic gear ratio

In the position control mode, the input position reference (reference unit) defines the load displacement; the motor position reference (encoder unit) defines the motor displacement. The electronic gear ratio is used to establish a proportional relationship between the input position reference and motor position reference.

The electronic gear ratio, which allows frequency division (electronic gear ratio < 1) or frequency multiplication (electronic gear ratio > 1), can be used to set the actual displacement corresponding to the input position reference per reference unit, or used to increase the position reference frequency when the motor speed needed cannot be fulfilled due to limited pulse output frequency of the host controller or limited parameter value range.

★ Definition of terms:

- Reference unit: Refers to the minimum identifiable value input from the host controller to the drive.
- Encoder unit: Refers to the value of the input reference multiplied/divided by the electronic gear ratio.

Procedure for setting the electronic gear ratio

The electronic gear ratio varies with the mechanical structure. Set the electronic gear ratio according to the following flowchart.

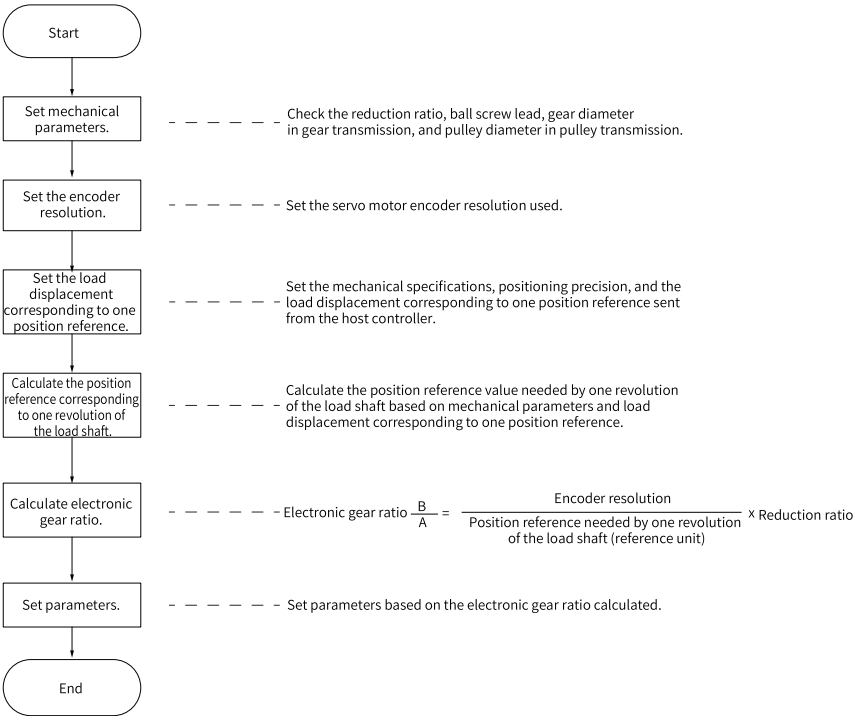


Figure 12-66 Procedure for setting the electronic gear ratio

See the following figure for how to set parameters.

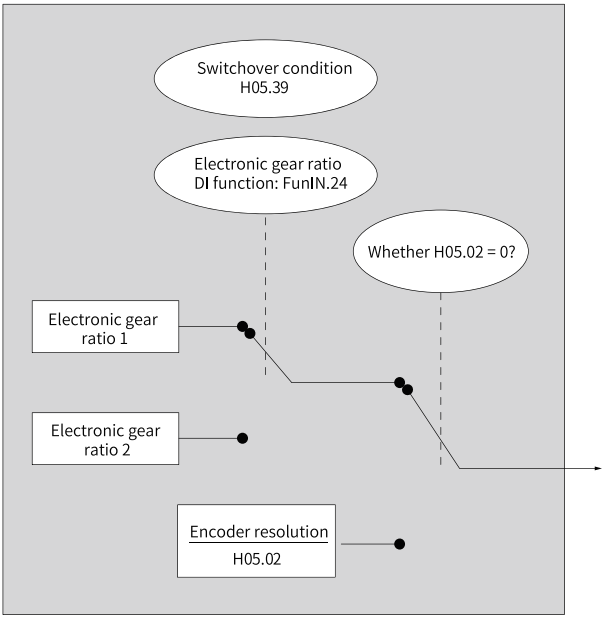


Figure 12-67 Procedure for setting the electronic gear ratio

Note

When the setpoint of H05.02 (Pulses per revolution) is not 0, the following formula applies:

Electronic gear ratio $\frac{B}{A} = \frac{\text{Encoder resolution}}{\text{H05.02}}$. When H05-02 is set to 0, electronic gear ratios 1 and 2 are invalid.

Related parameters

- Setting the electronic gear ratio parameters
  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.02	2005-03h	Pulses per revolution	0 to 4294967295	0	[P/N-N]/ [P/Rev]	At stop
H05.07	2005-08h	Electronic gear ratio 1 (numerator)	1 to 1073741824	67108864 Note: For model N, the default value is 1.	-	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.09	2005-0Ah	Electronic gear ratio 1 (denominator)	1 to 1073741824	10000 Note: For model N, the default value is 1.	-	Real-time
H05.11	2005-0Ch	Electronic gear ratio 2 (numerator)	1 to 1073741824	67108864 Note: For model N, the default value is 1.	-	Real-time
H05.13	2005-0Eh	Electronic gear ratio 2 (denominator)	1 to 1073741824	10000 Note: For model N, the default value is 1.	-	Real-time

- Switching the electronic gear ratio

Caution

The motor speed may fluctuate significantly if the electronic gear ratio changes sharply in real time or electronic gear ratio 1 differs greatly from electronic gear ratio 2. In this case, set H05.04 (First-order low-pass filter time constant) properly to allow smooth switchover of the position reference.

- The electronic gear ratio can be switched when H05.02 (Pulses per revolution) is set to 0. Determine whether to switch between electronic gear ratios 1 and 2 based on mechanical conditions and set the condition for switching the electronic gear ratio.
- Only one electronic gear ratio is effective at any moment.
- The effective time of real-time change in the electronic gear ratio is also restricted by the switchover condition.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.39	2005-28h	Electronic gear ratio switchover condition	0: Switchover after position reference is kept 0 for 2.5 ms 1: Switched in real time	0	-	At stop

Assign FunIN.24 (GEAR-SEL, electronic gear ratio selection) to a certain DI and set the active logic of this DI.

☆ Related parameters:

Code	Name	Function Name	Function
FunIN.24	GEAR_SEL	Electronic gear ratio selection	Inactive: Electronic gear ratio 1 used in the position control mode Active: Electronic gear ratio 2 used in the position control mode

See the following table for the electronic gear ratio used by the servo drive.

H05.02	H05.39	Level of the DI Assigned with FunIN.24	Electronic gear ratio
0	0	Inactive	$\frac{H05.07}{H05.09}$
		Active	$\frac{H05.11}{H05.13}$
	1	Inactive	$\frac{H05.07}{H05.09}$
		Active	$\frac{H05.11}{H05.13}$
1 to 1048576	-		-

The resolution of the serial encoder is 2^n(P/r), where "n" is the number of bits of the serial encoder.

For example, the resolution of a 26-bit serial encoder is 2^{26}(P/r), which is 67108864 (P/r).

- Calculating the electronic gear ratio
  The following figure shows the relationship among the position reference (reference unit), load displacement, and electronic gear ratio.

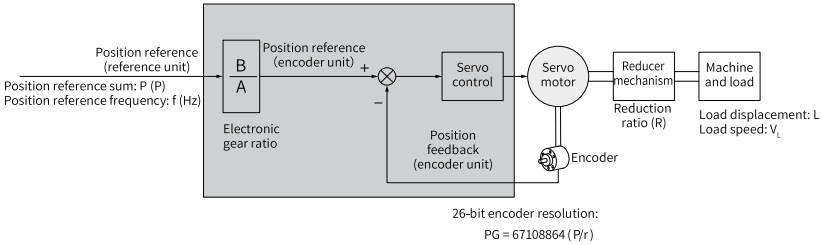


Figure 12-68 Relationship among the position reference (reference unit), load displacement, and electronic gear ratio

Take the ball screw in linear motion as an example, with P_B (mm) as the screw lead, P_G as the encoder resolution, and R as the reduction ratio of the reducer.

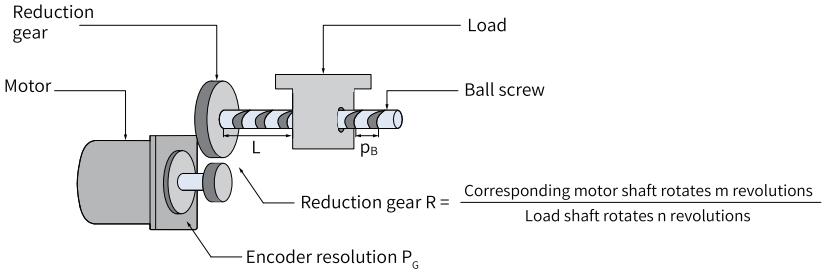


Figure 12-69 Ball screw

- When the load displacement per pulse ΔL (mm) is known:

  The load shaft rotates $\frac{\Delta L}{p_B}$ circles and the motor shaft rotates $\frac{\Delta L}{p_B} \times R$ circles when the mechanical displacement is ΔL. Then the following formula applies:

  $$1 \times \frac{B}{A} = \frac{\Delta L}{p_B} \times R \times P_G$$

  Therefore, the electronic gear ratio is as follows.

  $$\frac{B}{A} = \frac{\Delta L}{p_B} \times R \times P_G$$

- When the load displacement L (mm) and position reference sum P (P) are known:

  The load shaft rotates $\frac{L}{p_B}$ circles, and the motor shaft rotates $\frac{L}{p_B} \times R$ circles when the mechanical displacement is L. Then the following formula applies:

  $$P \times \frac{B}{A} = \frac{L}{p_B} \times R \times P_G$$

  Therefore, the electronic gear ratio is as follows.

  $$\frac{B}{A} = \frac{L}{p_B} \times R \times P_G \times \frac{1}{P}$$

- When the load moving speed VL (mm/s) and position reference frequency f (Hz) are known:

  Load shaft speed: $\frac{v_L}{p_B}$ (r/s)

  Motor speed: $v_M = \frac{v_L}{p_B} \times R$ (r/s)

  The relationship among the position reference frequency, electronic gear ratio, and motor speed is as follows:

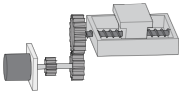
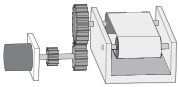
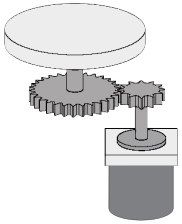
$$f \times \frac{B}{A} = v_M \times P_G$$

Therefore, the electronic gear ratio is as follows.

$$\frac{B}{A} = \frac{v_M \times P_G}{f}$$

- Example for setting the electronic gear ratio

Table 12–16 Example for setting electronic gear ratio

Item	Name	Mechanical Structure		
		Transmission With Ball Screw	Transmission With Belt Pulley	Rotary Load
	-			
1	Mechanical parameters	Reduction ratio (R): 1/1 Screw lead: 0.01 m	Reduction ratio (R): 5/1 Diameter of belt pulley: 0.2 m (Circumference of belt pulley): 0.628 m	Reduction ratio (R): 10/1 Load angle of rotation per revolution of the load shaft: 360°
2	Resolution	26-bit = 67108864 PPR	26-bit = 67108864 PPR	26-bit = 67108864 PPR
3	Load displacement per position reference (reference unit)	0.0001 m	0.000005 m	0.01°
4	Position references per revolution of the load shaft (reference unit)	$\frac{0.01}{0.0001} = 100$	$\frac{0.628}{0.000005} = 125600$	$\frac{360}{0.01} = 36000$
5	Calculation	$\frac{B}{A} = \frac{67108864}{100} \times \frac{1}{1}$	$\frac{B}{A} = \frac{67108864}{125600} \times \frac{5}{1}$	$\frac{B}{A} = \frac{67108864}{36000} \times \frac{10}{1}$
6	Setting	H05.07 = 67108864 H05.09 = 100	H05.07 = 335544320 H05.09 = 125600	H05.07 = 671088640 H05.09 = 36000

12.9.4Position reference filter

Position reference filter serves to filter the position references (in encoder unit) multiplied or divided by the electronic gear ratio, which includes first-order low-pass filtering and moving average filtering. It involves the first-order filter and moving average filter.

It is applicable to the following conditions:

- The acceleration/deceleration process is not performed on the position references sent from the host controller.
- The pulse reference frequency is low.
- The electronic gear ratio is larger than 10.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.04	2005-05h	First-order low-pass filter time constant	0.0 ms–6553.5 ms	0.0	ms	At stop
H05.06	2005-07h	Moving average filter time constant 1	0.0 ms–128.0 ms	0.0	ms	At stop

Note

This function does not affect the displacement value (position reference sum).

An excessively high setpoint delays the responsiveness, so set a proper filter time constant based on actual conditions.

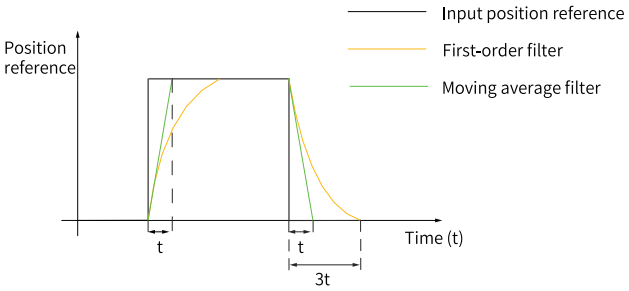


Figure 12-70 First-order filter and moving average filter for rectangular position references

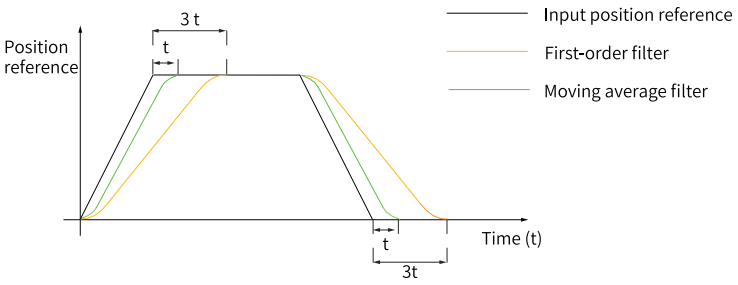


Figure 12-71 First-order filter and moving average filter for trapezoid position references

12.9.5Position Deviation Clearance

Position deviation = Position reference sum – Position feedback sum

This function serves to clear the position deviation when the condition defined by H05.16 (Clear action selection) is met.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.16	2005-11h	Clear action	0: Position deviation cleared upon S-ON OFF or fault 1: Position deviation cleared upon S-ON OFF or fault 2: Position deviation cleared upon active DI function 35 or non-operational state	0	-	At stop

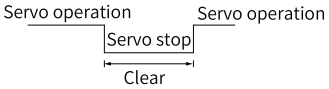
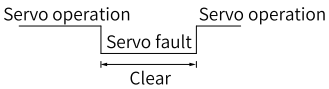
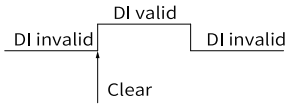
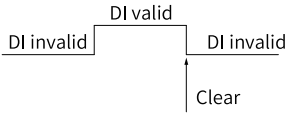
When H05.16 is set to 2, assign FunIN.35 (ClrPosErr, clear position deviation) to a certain DI and set the active logic of this DI. It is recommended to use the high-speed DI (DI7 or DI8) terminal.

☆ Related parameters:

Code	Name	Function Name	Function
FunIN.35	ClrPosErr	Position deviation cleared	Active: Position deviation cleared Inactive: Position deviation not cleared

The setting method is shown as follows.

Table 12–17 Position deviation clear

Value	Clear Condition	Clear Time
H05.16 = 0	Position deviation is cleared upon S-OFF or in the non-operational state.	
H05.16 = 1	Position deviation is cleared upon S-OFF or a fault.	
H05.16 = 2	Position deviation is cleared upon S-OFF or active DI function 35 (ClrPosErr, clear position deviation).	 (Rising edge-triggered)  (Falling edge-triggered)

12.9.6Frequency-division Output

Caution

It is recommended to use the active edge output by the Z signal in cases where a high precision frequency-division output of Z signal is required.

Parameter	bit	Description
H05.41	Bit 0: Frequency-division Z signal output polarity	0: Positive (falling edge-triggered) 1: Negative (rising edge-triggered)
	Bit 1: OCZ signal output polarity	0: Positive (falling edge-triggered) 1: Negative (rising edge-triggered)

The frequency-division output function outputs the position reference pulses or encoder feedback position references as A/B phase quadrature pulses.

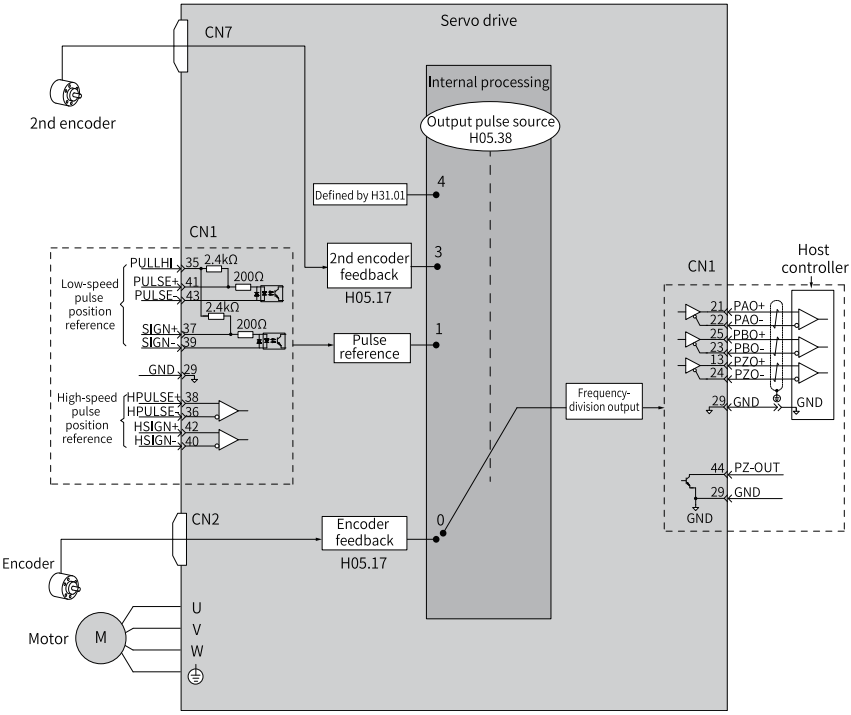


Figure 12-72 Schematic diagram of frequency-division output

- It is recommended to use synchronous output (H05.38 = 1) of pulse references in case of synchronous tracing of multi-axis servo pulses. When the host controller is used for closed-loop feedback, it is recommended to use encoder frequency-division output (H05.38 = 0).
- when the host controller provides full closed-loop feedback, encoder frequency-division output (H05.38 = 3) is recommended. When the output frequency setpoint is used, it is recommended to use H31.01 frequency division output setting mode , that is, H05.38=4.

The drive offers one group of frequency-division terminals, as described below:

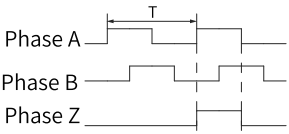
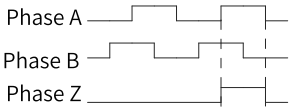
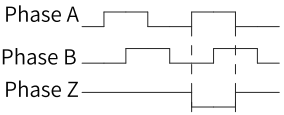
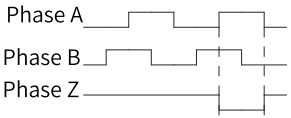
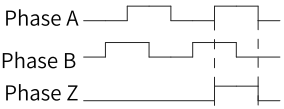
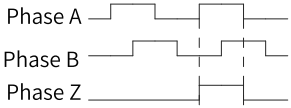
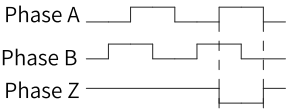
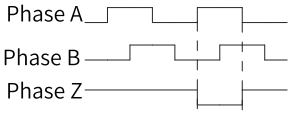
- Phase A pulses: PAO+ and PAO-, differential output, maximum output pulse frequency: 4 Mpps
- Phase B pulses: PBO+ and PBO-, differential output, maximum output pulse frequency: 4 Mpps
- Phase Z pulses: PZO+ and PZO-, differential output, maximum output pulse frequency: 4 Mpps
- PZ-OUT, GND, open-collector output, maximum output pulse frequency: 100 kpps

When using the frequency-division output function, set the output pulse source (H05.38), phase (H02.03), resolution (H05.17), and phase Z pulse polarity (H05.41) according to requirements.

When the output source is encoder frequency-division pulse (H05.38 = 0), the motor rotates one revolution and the phase A/B output pulses per motor revolution are determined by H05.17 (Encoder frequency-division pulses). The pulse width (T) of phase A/B is determined by the motor speed. The phase Z, whose width is also T, is synchronized with phase A. For communication motors, Z signal is output once per motor revolution.

When the output source is H31.01 (H05.38 = 4), the A/B phase output pulse frequency (quadruple) is determined by H31.01, and there is no Z phase pulse output.

Table 12–18 Pulse diagrams of encoder frequency-division output (H05.38 = 0)

H02.03 (Output pulse phase)	H05.41 (Z pulse output polarity)	Pulse Output Diagram of Forward RUN	Pulse Output Diagram of Reverse RUN
0	0	 Phase A leads phase B by 90°.	 Phase B leads phase A by 90°.
	1	 Phase A leads phase B by 90°.	 Phase B leads phase A by 90°.
1	0	 Phase B leads phase A by 90°.	 Phase A leads phase B by 90°.
	1	 Phase B leads phase A by 90°.	 Phase A leads phase B by 90°.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.03	2002-04h	Output pulse phase	0: Phase A leads phase B 1: Phase A lags behind phase B	0	-	At stop
H05.17	2005-12h	Number of encoder frequency-division pulses	0–4194303	2500	[P/N-N]/[P/Rev]	At stop
H05.38	2005-27h	Frequency-division output source	0: Encoder frequency-division output 1: Pulse reference synchronous output 2: Frequency-division output inhibited 3: Second encoder frequency-division output 4: H31.01 reference frequency output Note: For model N, only 0, 2, 3 and 4 are available.	0	-	Real-time
H05.41	2005-2Ah	Z pulse output polarity	bit0: Frequency-division Z output polarity 0: Positive (high level upon active Z pulse) 1: Negative (low level upon active Z pulse) bit1: OCZ output polarity 0: Positive (high level upon active Z pulse) 1: Negative (low level upon active Z pulse) bit2: Inner loop probe Z signal source 0: Motor Z signal 1: Frequency-division output Z signal	0x1	-	At stop

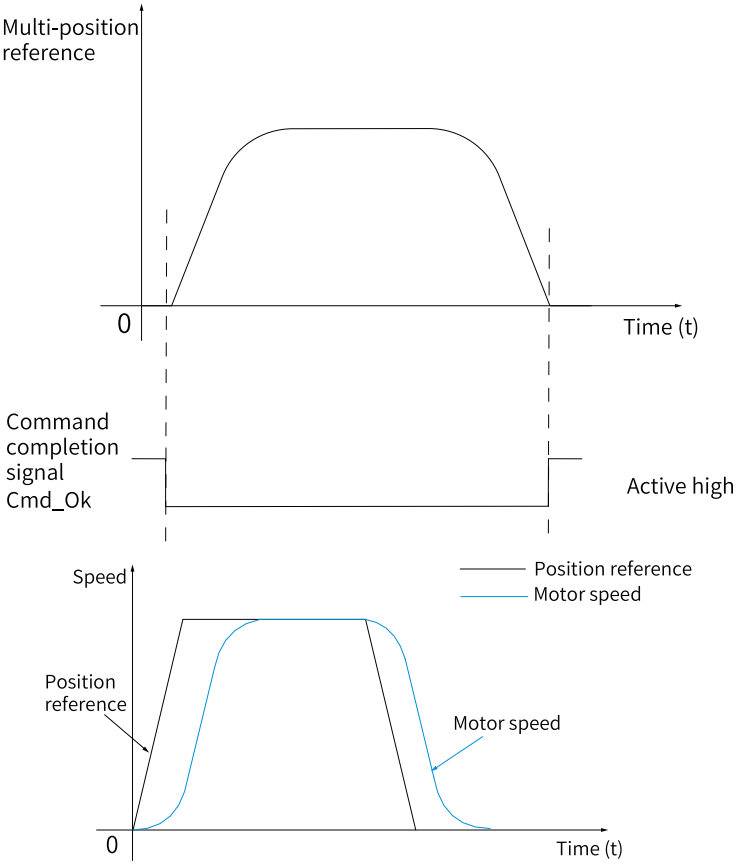
12.9.7 Motion Control Completed, Internal Command Completed, Positioning Completed, Proximity

- "Motion control completed" refers to the completion of command transmission and positioning in the position control mode. In this case, the servo drive outputs a McOK (motion control completed) signal, and the host controller, upon receiving the signal, acknowledges the motion control is done.
- "Internal command completed" refers to the completion of command transmission. In this case, the internal multi-position reference is zero. The servo drive therefore outputs a CmdOk (Internal command completed) signal, and the host controller, upon receiving the signal, acknowledges the internal command

transmission is done. Internal instruction completion is not used to evaluate whether homing is completed.

- Positioning completed: When the position deviation fulfills the condition set by users (H05.20), it indicates the positioning in position control mode is completed. Meanwhile, the servo drive outputs positioning completed (COIN) signal, and the host controller, after receiving this signal, confirms the positioning is completed.

The following figure shows the schematic diagram.



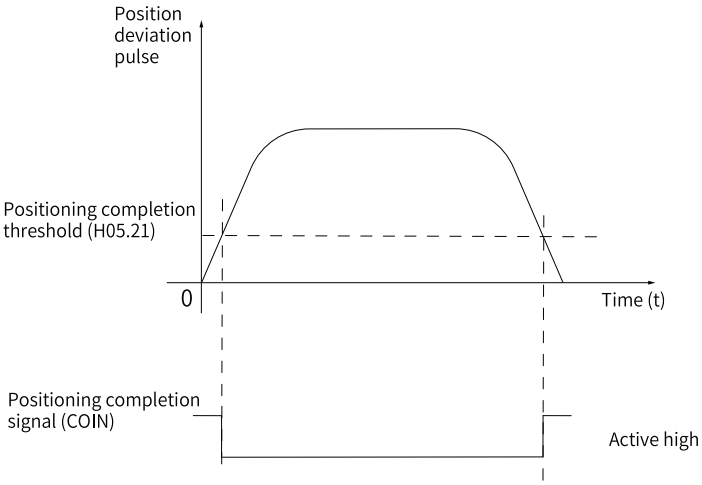


Figure 12-73 Description of positioning completed/proximity functions

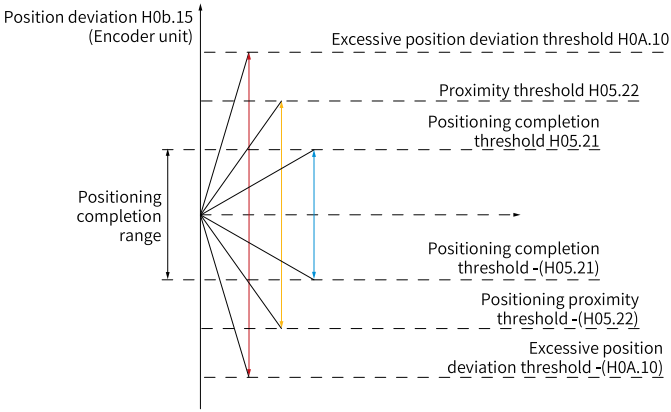


Figure 12-74 Signals related to position deviation

You can set the unit for positioning completed, proximity, and excessive position deviation in H0A.17. When position deviation meets the condition defined by H05.20, the servo drive outputs a NEAR signal to prepare for positioning completed.

Before applying the positioning completed/proximity function, set H05.20, H05.21, H05.22, H05.59, and H05.60 first. The schematic diagram for the window time (H05.59) and hold time (H05.60) of positioning completed signal is as follows.

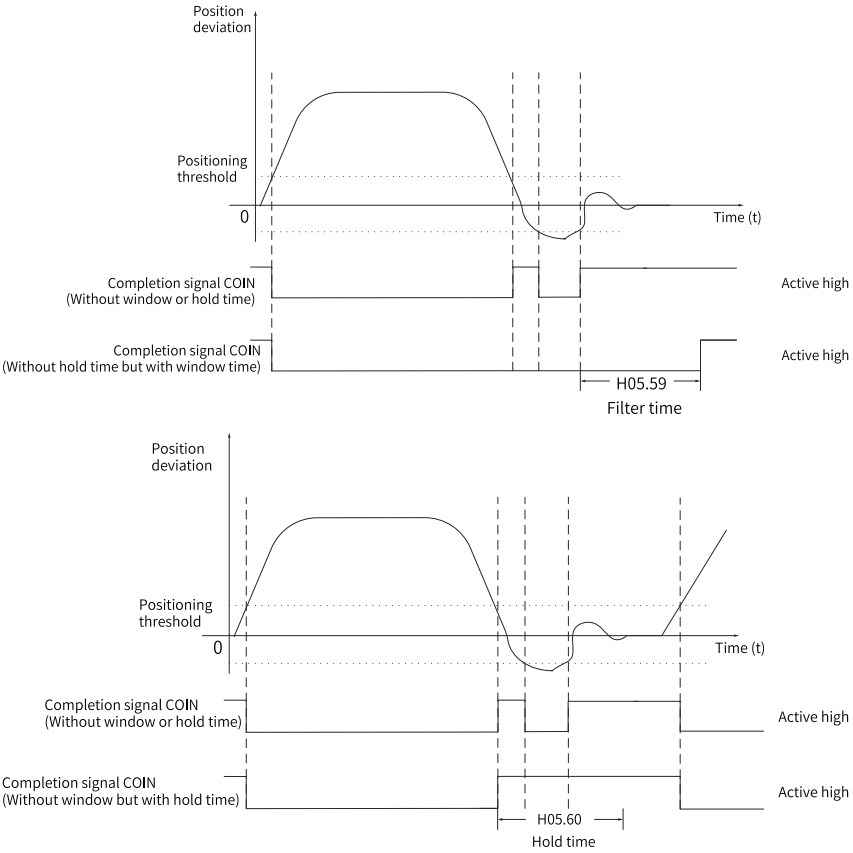


Figure 12-75 Schematic diagram for the window time (H05.59) and hold time (H05.60) of positioning completed signal

When the COIN (positioning completed) signal has a hold time of 0, it remains active until the next position reference is received.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.20	2005-15h	Condition for positioning completed signal output	0: When absolute value of position deviation is smaller than the value of H05.21, a positioning completion ON signal is output. 1: When filtered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 2: When unfiltered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 3: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the unfiltered position command and the absolute value of the position deviation. 4: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the filtered position command and the absolute value of the position deviation. 5: When the unfiltered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 6: When the filtered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is	0	-	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			less than H05.21, a positioning completion ON signal is output. 7: When the unfiltered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 8: When the filtered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 9: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 10: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Note: For SV680P-INT, the parameter takes effect when H02.00 is not 8. For SV680N-INT, the parameter takes effect when H02.00 is not 9.			
H05.21	2005-16h	Positioning completed threshold	1 to 65535 Note: For SV680P-INT, the parameter takes effect when H02.00 is not 8. For SV680N-INT, the parameter takes effect when H02.00 is not 9.	46976	encoder unit	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.22	2005-17h	Proximity threshold	1 to 65535 Note: For SV680P-INT, the parameter takes effect when H02.00 is not 8. For SV680N-INT, the parameter takes effect when H02.00 is not 9.	65535	encoder unit	Real-time
H05.59	2005-3Ch	Positioning window time	0 ms–30000 ms	0	ms	Real-time
H05.60	2005-3Dh	Hold time of positioning completed	0 ms–30000 ms	0	ms	Real-time
H0A.17	200A-12h	Reference pulse selection	0: Pulse unit 1: Reference unit	0 Note: For model N, the default value is 1.	-	At stop

Caution

- Set H05.22 to a value higher than H05.21 in general cases.
- H05.21 only reflects the absolute threshold when the positioning completed signal is active. It is not related to the positioning precision.
- An excessively high speed feedforward gain (H08.19) or low-speed operation reduces the absolute position deviation. In this case, the COIN (positioning completed) signal may keep active if H05.21 is set to an excessively high value. To improve the positioning accuracy, decrease the value of H05.21.
- When H05.21 is set to a low value along with small position deviation, you can change the condition for outputting the COIN (positioning completed) signal in H05.20.
- An inactive S-ON signal deactivates the COIN (positioning completed) signal and NEAR (proximity) signal output.
- The output of position proximity DO is not affected by H05.60 (positioning completion holding time) or H05.59 (positioning window time) and you need not to evaluate the change of the positioning command.

To use the motion control/internal command/positioning completion/proximity functions, assign FunOUT.24 (McOk, motion control completed), FunOUT.22 (CmdOk, internal command completed), FunOUT.5 (COIN, positioning completed), and FunOUT.6 (NEAR) to DOs respectively, and set the active logic of these DOs.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.60	2005-3Dh	Hold time of positioning completed	0 ms–30000 ms	0	ms	Real-time

☆ Related parameters:

Code	Name	Function Name	Function
FunOUT.5	COIN	Positioning completed	Active: The absolute position deviation meets the threshold defined by H05.21 in the position control mode, indicating positioning is done. Inactive: The servo drive is in the process of completion in the position control mode.
FunOUT.6	NEAR	Proximity	Active: The absolute position deviation meets the condition defined by H05.22, indicating the servo drive is close to the target position. Inactive: The servo drive is in the process of proximity in the position control mode.
FunOUT.22	CmdOk	Internal command completed	Active: The transmission of the multi-position reference or interrupt positioning reference is done in the position control mode. Inactive: The transmission of the multi-position reference or interrupt positioning reference is in progress in the position control mode.
FunOUT.24	McOk	Motion control completed	Active: The transmission of the multi-position reference or interrupt positioning reference and the positioning process are done in the position control mode. Inactive: The transmission of the multi-position reference or interrupt positioning reference or positioning is in progress in the position control mode.

12.10 Speed Control Mode

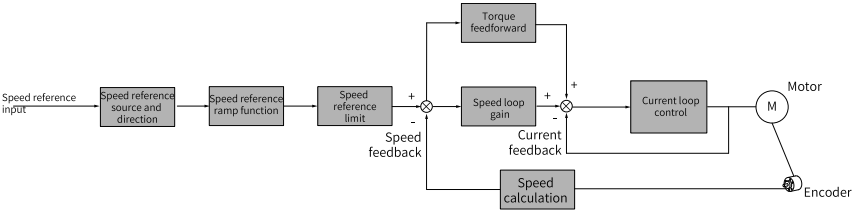


Figure 12-76 Block diagram of speed control

Set H02.00 (Control mode selection) to 0 (Speed control mode) through the keypad or Inovance software tool to make the servo drive operate in the speed control mode. Set the drive parameters based on the mechanical structure and technical indicators. The following part uses the basic parameter setting to describe the speed control mode.

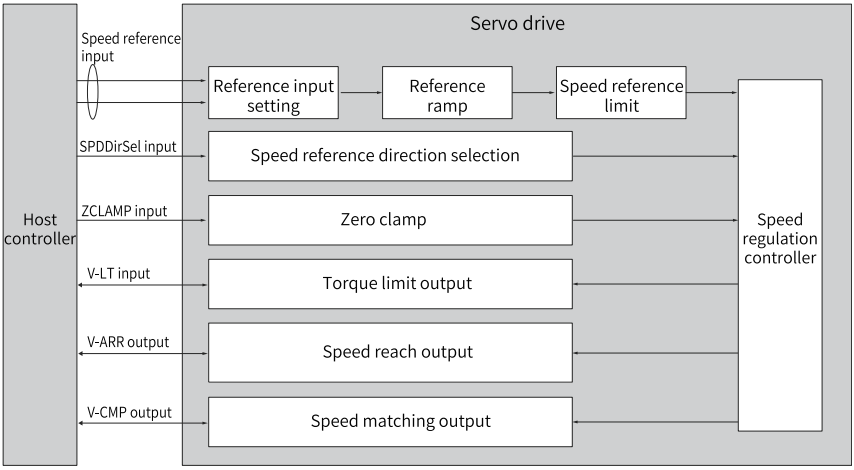


Figure 12-77 Signal exchange between the drive and the host controller

12.10.1Function Block Diagram

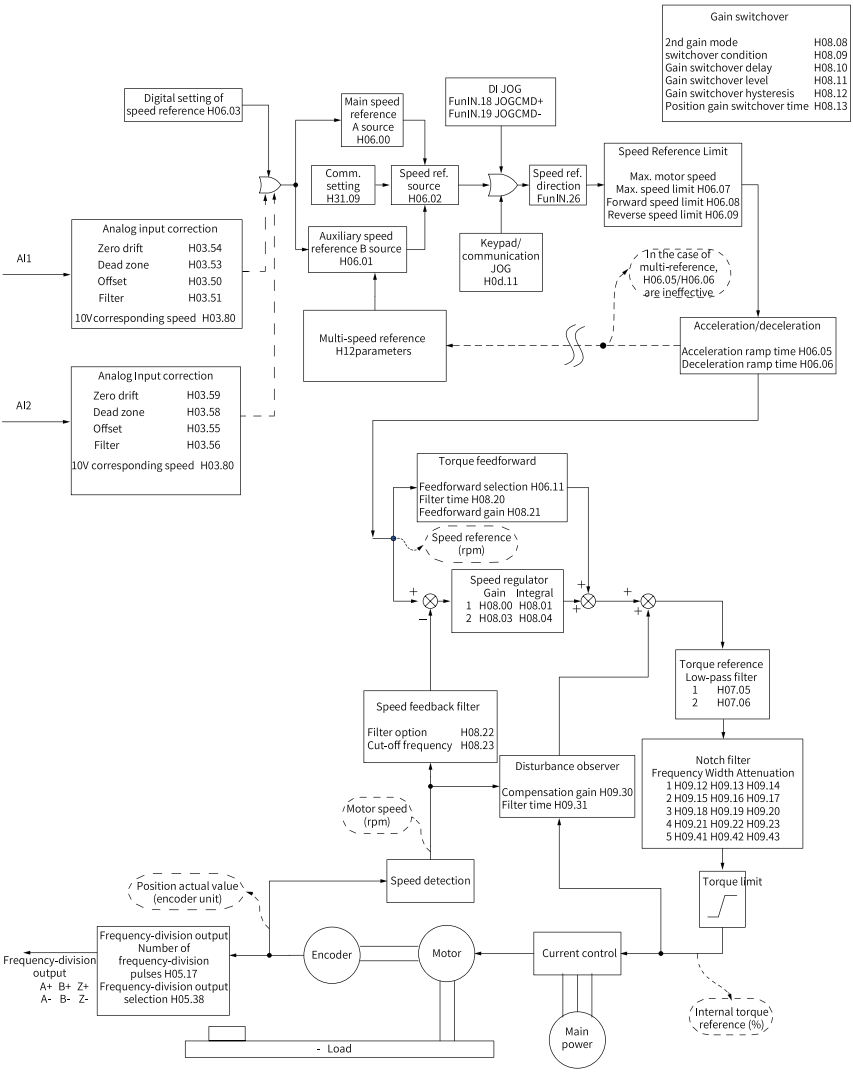


Figure 12-78 Block diagram of speed control parameters

12.10.2Speed Reference Input

Speed reference source

Five speed reference sources are available in the speed control mode, which can be set in H06.02.

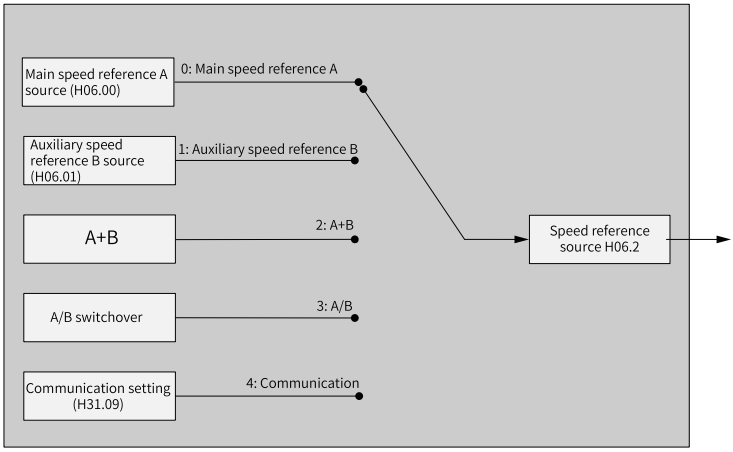


Figure 12-79 Speed reference source

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.02	2006-03h	Speed reference source	0: Source of main speed reference A 1: Source of auxiliary speed reference B 2: A+B 3: Switched between A and B 4: Communication	0	-	At stop

- **Source of main speed reference A**
  The sources of main speed reference A include digital setting and analog voltage setting. Digital setting refers to the internal speed reference. Analog voltage setting refers to the external speed reference.

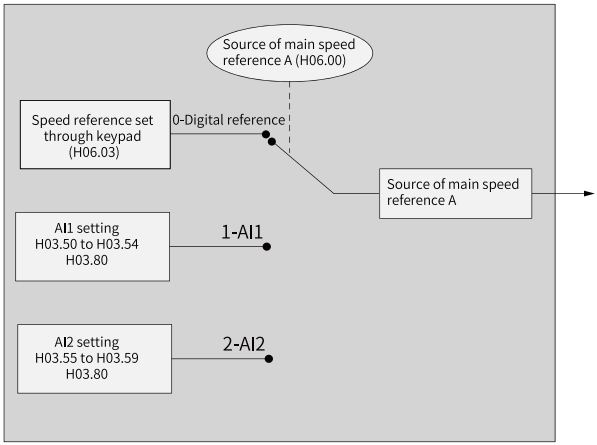


Figure 12-80 Source of main speed reference A

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.00	2006-01h	Source of main speed reference A	0: Digital setting (H06.03) 1: AI1 2: AI2	0	-	At stop

■ **Digital setting**

The speed reference is set in H06.03.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.03	2006-04h	Speed reference set through keypad	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time

■ **Analog voltage setting**

The analog voltage signal output by the host controller or other devices is used as the speed reference after being processed.

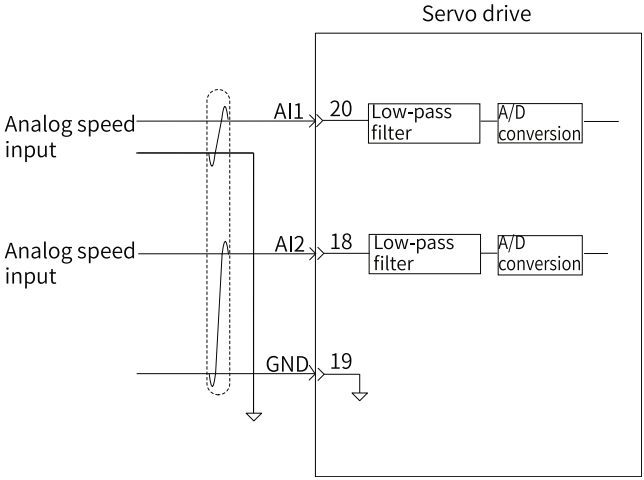
Analog voltage input terminal:

The servo drive comes with 2 AI channels for control: AI1 and AI2.

AI1 voltage input: 16-bit, -10 V to +10 V; max. allowable voltage: ±12 VDC; input impedance: approx. 74 kΩ.

AI2 voltage input: 12-bit, -10 V to +10 V; max. allowable voltage: ±12 VDC; input impedance: approx. 74 kΩ.

Analog input circuit:



Note

[P] Analog input/output terminal: AI1 corresponds to pin No. 20, AI2 corresponds to pin No. is 18, and GND corresponds to pin No. 19.

[N] Analog input/output terminal: AI1 corresponds to pin No. 25, AI2 corresponds to pin No. is 17, and GND corresponds to pin No. 8.

Steps:

The following figure takes AI1 as an example to show how to set speed references through analog voltage.

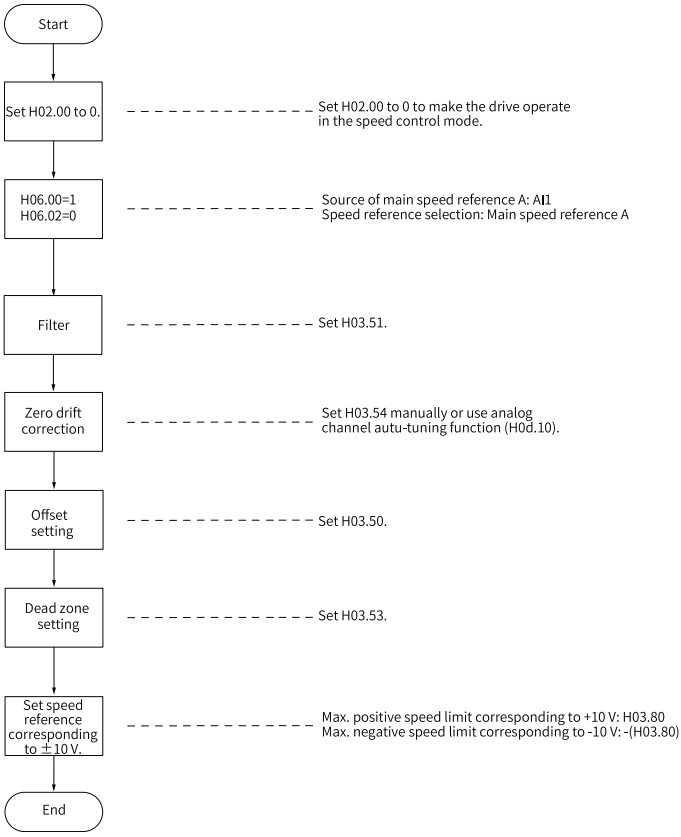


Figure 12-81 Flowchart for setting speed references through analog voltage

Definition of terms:

- Zero drift: Refers to the value of the drive sampling voltage relative to GND upon zero AI voltage.
- Offset: Refers to the AI voltage upon zero sampling voltage after zero drift correction.
- Dead zone: Refers to the AI voltage range upon zero sampling voltage.

In the following figure, y_1 represents the unprocessed AO voltage, y_6 represents the final speed reference after being processed by the servo drive.

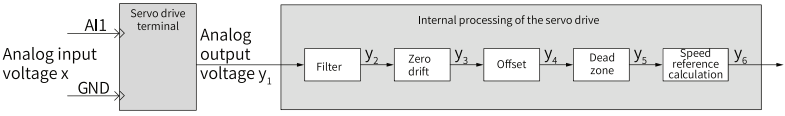


Figure 12-82 AI processing of the servo drive

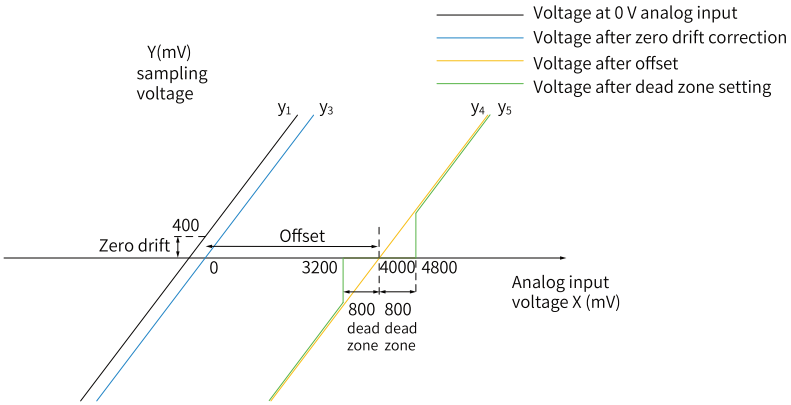


Figure 12-83 Example of the sampling voltage processed by AI

- **Filter:**
  The servo drive provides the analog channel filter function. Setting the filter time constant in H03.56 prevents motor reference fluctuation due to unstable AI voltage and eliminates motor malfunction caused by signal interference. The filter function cannot eliminate or suppress zero drift or dead zone.

- **Zero drift correction**
  Zero drift is used to correct the AO voltage value that deviates from 0 V upon 0 V voltage input.

  In the preceding figure, y_1 represents the AO voltage not processed by the servo drive. If H03.51 is set to 0.00 ms, the filtered sampling voltage y_2 is the same as y_1.

  Therefore, when the actual input voltage x is 0 and the output voltage y_1 is 400 mV, the zero drift is 400 mV.

  Set H03.54 to 400.0 (mV) manually. The sampling voltage after zero drift correction is shown by y_3. $y_3 = y_1 - 400.0$

  Zero drift can also be corrected automatically through H0d.10.

- **Offset setting**
  Offset setting is used to define the actual input voltage corresponding to zero sampling voltage.

  As shown in the preceding figure, when the preset sampling voltage y_4 is 0, the actual input voltage x is 4000 mV, therefore, the offset value is 4000 mV.

Set H03.50 to 4000 (mV) manually. The sampling voltage y_4 after offset = x - 4000 = y_3 - 4000.

- **Dead zone correction**

  Dead zone correction is used to define the effective voltage input range when the sampling voltage is not 0.

  After the offset is set, if the sampling voltage is always 0 when the input voltage x is within 3200 mV to 4800 mV, the dead zone is 800 mV.

  Set H03.53 to 800.0. The sampling voltage after dead zone correction is shown by y_5.

$$y_5 = \begin{cases} 0 & 3200 \leqslant x \leqslant 4800 \\ y_4 & 4800 < x \leqslant 10000 \text{ or } -10000 \leqslant x < 3200 \end{cases}$$

- **Speed reference calculation**

  After setting the zero drift, offset, and dead zone, set the speed reference corresponding to 10 V (10000 mV) in H03.80 (Speed corresponding to 10 V) to obtain the actual speed reference y_6:

$$y_6 = \frac{y_5}{10000} \times (\text{H03.80})$$

  This value is used as the analog speed reference value in the speed control mode.

  The left figure below applies when no offset exists. The right figure below applies when offset exists. After proper settings, you can view the AI1 sampling voltage value through H0b.21 in real time or view the speed reference value corresponding to the input analog value through H0b.01.

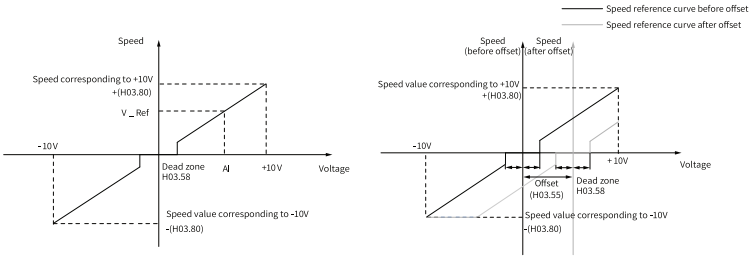


Figure 12-84 AI1 without offset (left) & AI1 after offset (right)

The relationship between the final speed reference y_6 and the input voltage x is as follows:

$$y_6 = \begin{cases} 0 & B\text{-}C \leqslant x \leqslant B+C \\ x\text{-}B & B+C < x \leqslant 10000 \text{ or } -10000 \leqslant x < B\text{-}C \end{cases}$$

in which, B represents the offset and C represents the dead zone.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H03.50	2003-33h	Voltage-type AI1 offset	-5000 mV to 5000 mV	0	mV	Real-time
H03.51	2003-34h	Voltage-type AI1 input filter time constant	0.00 ms–655.35 ms	2.00	ms	Real-time
H03.53	2003-36h	Voltage-type AI1 dead zone	0.0 mV to 1000.0 mV	10.0	mV	Real-time
H03.54	2003-37h	Voltage-type AI1 zero drift	-500.0 mV–500.0 mV	0.0	mV	Real-time
H03.55	2003-38h	Voltage-type AI2 offset	-5000 mV to 5000 mV	0	mV	Real-time
H03.56	2003-39h	Voltage-type AI2 input filter time constant	0.00 ms–655.35 ms	2.00	ms	Real-time
H03.58	2003-3Bh	Voltage-type AI2 dead zone	0.0 mV to 1000.0 mV	10.0	mV	Real-time
H03.59	2003-3Ch	Voltage-type AI2 zero drift	-500.0 mV–500.0 mV	0.0	mV	Real-time
H03.80	2003-51h	Speed corresponding to analog 10 V	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	At stop
H0d.10	200d-0Bh	Analog channel auto adjusting	0: No operation 1: Adjusted through AI1 2: Adjusted through AI2	0	-	At stop

- **Source of auxiliary speed reference B**
  The sources of auxiliary speed reference B include digital setting, analog voltage setting, and multi-speed references. Digital setting and multi-speed references produce the internal speed reference, and analog setting produces the external speed reference.

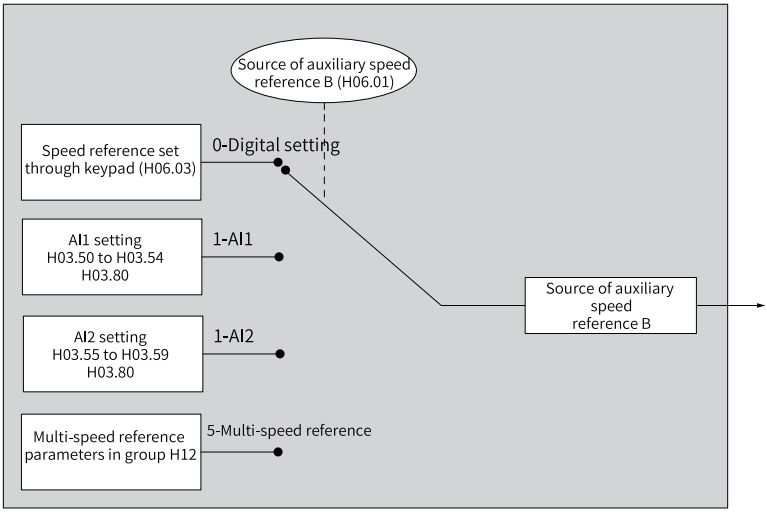


Figure 12-85 Source of auxiliary speed reference B

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.01	2006-02h	Source of auxiliary speed reference B	0: Digital setting (H06.03) 1: AI1 2: AI2 5: Multi-speed reference	1	-	At stop

The digital setting mode is the same as H06.00. The following describes multi-speed references.

The servo drive supports multi-speed operation. The servo drive stores 16 speed references, and the maximum running speed and running time of each can be set. Four groups of acceleration/deceleration time are optional. The setting flowchart is as follows.

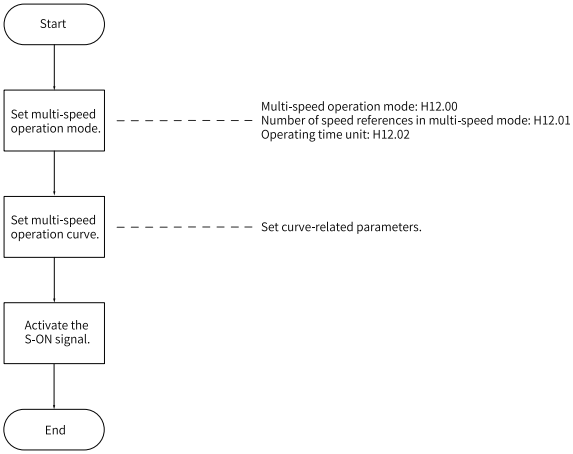


Figure 12-86 Flowchart for setting multi-speed operation

1. Set the multi-speed operation mode.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H12.00	2012-01h	Multi-speed operation mode	0: Individual operation (number of speeds selected in H12.01) 1: Cyclic operation (number of speeds selected in H12.01) 2: DI-based operation	1	-	At stop
H12.01	2012-02h	Number of speed references in multi-speed mode	1 to 16	16	-	At stop
H12.02	2012-03h	Operating time unit	0: s 1: min	0	-	At stop

You can assign FunIN.5 (DIR- SEL) to an external DI to select the multi-speed reference direction.

☆ Related parameters:

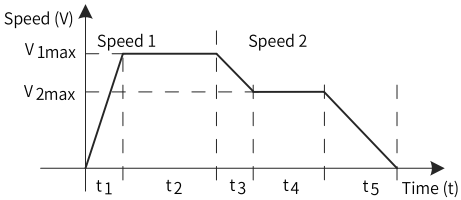
Code	Name	Function Name	Function
FunIN.5	DIR-SEL	Multi-reference direction	Inactive: Reference direction by default Active: Opposite to the reference direction

The following takes "H12.01 = 2" as an example to describe each mode.

- Individual operation (H12.00 = 0)
  Set H12.00 to 0 to select the individual operation mode.

  Set H12.01 and H12.02 as needed. Then set the reference value, operating time, and acceleration/deceleration time of each speed. The drive executes multi-speed references in a sequence from speed 1 to speed N. After all the speeds are executed, the drive stops.

Table 12–19 Description of individual operation

Description	Operating Curve
• The drive stops after one cycle of operation. • The drive switches to the next displacement automatically.	 • V_{1max} , V_{2max} : reference values of speed 1 and speed 2 • t_1 : actual acceleration/deceleration time of speed 1 • t_3 , t_5 : acceleration/deceleration time of speed 2 • Operating time = Time taken in switching from the last speed to current speed + Duration of constant-speed operation at current speed (For example, the operating time of speed 1 is the sum of t_1 and t_2 ; the operating time of speed 2 is the sum of t_3 and t_4 .) • Do not set the operating time of a certain speed to 0. Otherwise, the drive skips this speed and switches to the next speed directly. • The speed reach signal is activated when the motor speed feedback reaches the maximum operating speed set for this speed. • If the S-ON signal is switched off during operation, the motor stops in the mode defined by H02.05 (Stop mode at S-ON OFF).

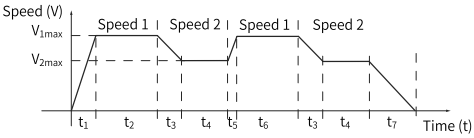
★ Definition of terms:

A complete operation cycle covers all the multi-speed references defined by H12.01.

- Cyclic running (H12.00 = 1)
  Set H12.00 to 1 to select the cyclic operation mode.

Set H12.01 and H12.02 based on the number of speeds and the operating time unit. Then set the reference value, operating time and acceleration/deceleration time for each speed. The drive executes the set speeds in a sequence from speed 1 to speed N (last speed). After all the speeds are executed, the drive jumps to speed 1 and repeats the preceding process.

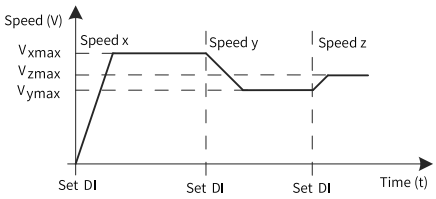
Table 12–20 Descriptions of cyclic operation

Description	Operating Curve
• The drive starts from displacement 1 again after each cycle of operation. • The drive switches to the next displacement automatically. • The cyclic operation state remains active as long as the S-ON signal is active.	 • V_{1max} , V_{2max} : maximum operating speeds in displacement 1 and displacement 2 • Operating time = Time taken in switching from the last speed to current speed + Duration of constant-speed operation at this speed (For example, the operating time of speed 1 is the sum of t_1 and t_2 ; the operating time of speed 2 is the sum of t_3 and t_4 .) • Do not set the operating time of a certain speed to 0. Otherwise, the drive skips this speed and switches to the next speed directly. • The speed reach signal is activated when the motor speed feedback reaches the maximum operating speed set for this speed. • If the S-ON signal is switched off during operation, the motor stops in the mode defined by H02.05 (Stop mode at S-ON OFF).

■ DI-based operation (H12.00 = 2)
Set H12.00 to 2 to select DI-based operation.

Set H12.01 and H12.02 based on the number of speeds to be executed and the operating time unit. Then set the reference value, operating time and acceleration/deceleration time for each speed. The drive executes the speed references according to ON/OFF combination of the external DIs (CMDx).

Table 12–21 Descriptions of DI-based operation

Description	Operating Curve
• The drive operates continuously as long as the S-ON signal is active. • The speed No. is determined by the DI logic. • The operating time of each speed is determined only by the interval time of speed switchover.	 • x, y: speed No. (The relationship between the speed No. and the DI logic is described below.) • The operating time is independent of the parameter setpoint. If the speed No. changes during operation, the drive switches to the new speed No. immediately. • The speed reach signal is activated when the motor speed feedback reaches the maximum operating speed set for this speed. • If the S-ON signal is switched off during operation, the motor stops in the mode defined by H02.05 (Stop mode at S-ON OFF).

When the multi-speed operation mode is DI-based operation, assign DI functions 6...9 (multi-reference switchover) to four DIs and set the active logic of these DIs. In addition, assign FunIN.5 (DIR-SEL, direction selection in DI-based multi-speed operation) to a certain DI to switch the speed reference direction.

☆ Related parameters:

Code	Name	Function Name	Function
FunIN.5	DIR-SEL	Direction switchover through DI in multi-speed mode	Defines the speed reference direction in the DI-based operation mode. Inactive: Reference direction Active: Opposite to the reference direction
FunIN.6	CMD1	Multi-reference switchover 1	The speed No. is a 4-bit binary value. The relationship between the speed no. and CMD1 to CMD4 is shown in *"Table 12–22 " on page 566*. The value of CMD is 1 upon active DI level and 0 upon inactive DI level.
FunIN.7	CMD2	Multi-reference switchover 2	
FunIN.8	CMD3	Multi-reference switchover 3	
FunIN.9	CMD4	Multi-reference switchover 4	

Table 12–22 Relationship between the segment No. and CMD1 to CMD4

CMD4	CMD3	CMD2	CMD1	Segment No.
0	0	0	0	1
0	0	0	1	2
…				
1	1	1	1	16

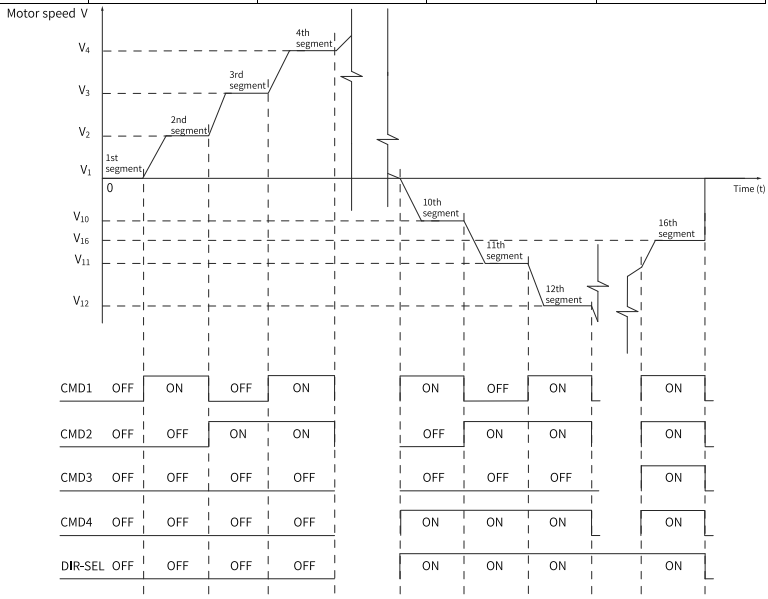


Figure 12-87 Example of multi-speed curve

2. Setting the multi-speed curve

The following takes speed 1 as an example.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H12.03	2012-04h	Acceleration time 1	0 ms–65535 ms	10	ms	Real-time
H12.04	2012-05h	Deceleration time 1	0 ms–65535 ms	10	ms	Real-time
H12.09	2012-0Ah	Acceleration time 4	0 ms–65535 ms	150	ms	Real-time
H12.10	2012-0Bh	Deceleration time 4	0 ms–65535 ms	150	ms	Real-time
H12.20	2012-15h	1st speed reference	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H12.21	2012-16h	Operating time of speed 1	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time
H12.22	2012-17h	1st speed rise/drop and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time

For speed references in the multi-speed operation mode, besides the reference value and operating time, four groups of acceleration/deceleration time options are also available. There is no acceleration/deceleration time by default.

The following describes the actual acceleration/deceleration time and the operating time in cases where H12.00 (Multi-speed operation mode) is set to 1 (Individual operation).

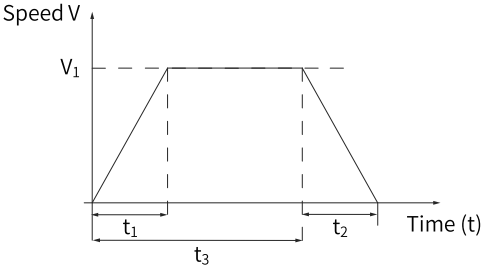


Figure 12-88 Example of multi-speed curve

As shown in the preceding figure, the speed reference is V_1 and the actual acceleration time t_1 is as follows.

$$t_1 = \frac{V_1}{1000} \times \text{Acceleration time set for this speed}$$

The actual deceleration time t_2 is:

$$t_2 = \frac{V_1}{1000} \times \text{Deceleration time set for this speed}$$

Operating time = Time taken in switching from the last speed to present speed + Duration of constant-speed operation at present speed (as shown by t_3 in the preceding figure)

- **Switched between A and B**
  When setting H06.02 (speed reference source) to 3 (Switched between A and B), you need to assign FunIN.4 (DI-SEL) to the corresponding DI. The input signal of this DI determines which source (A or B) is active.

  ☆ Related parameters:

Code	Name	Function Name	Description
FunIN.4	CMD-SEL	Main/Auxiliary reference switchover	Inactive: Current reference being A Active: Current reference being B

- **Communication setting**
  When H06.02 (Speed reference source) is set to 4 (Communication), the speed reference is the setpoint of H31.09. H31.09 is not displayed on the keypad, it can be set through communication only.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H31.09	2031-0Ah	Speed reference set through communication	-9999.000[mm/s]/[rpm]–9999.000[mm/s]/[rpm]	0.000	[mm/s]/[rpm]	Real-time

Speed reference direction setting

To switch the speed reference direction through DI, assign FunIN.26 to the corresponding DI. The input signal of this DI determines the speed reference direction.

☆ Related parameters:

Code	Name	Function Name	Description
FunIN.26	SPDDirSel	Speed reference direction	Inactive: Forward Active: Reverse

The actual direction of rotation is related to the setting of H02.02 (Direction of rotation), the sign (+/-) of the speed reference value, and the logic of FunIN.26.

Table 12–23 Actual direction of rotation in the speed control mode

H02.02	Sign of Speed Reference	FunIN.26	Direction of Rotation
0	+	Inactive	CCW
0	+	Active	CW
0	-	Inactive	CW
0	-	Active	CCW
1	+	Inactive	CW
1	+	Active	CCW
1	-	Inactive	CCW
1	-	Active	CW

12.10.3Ramp Function

The ramp function is used to smooth the acceleration rate of speed references through acceleration/deceleration time setting.

In the speed control mode, a high acceleration rate easily leads to motor jerk or intense vibration. In this case, increasing the acceleration/deceleration time smoothens the motor speed change, preventing mechanical damage caused by jerk or vibration.



- When the speed reference source is digital setting, analog voltage setting or jog speed, the acceleration time and deceleration time are set through parameters H06.05 and H06.06.
- When the speed reference source is multi-speed reference, the acceleration time and deceleration time are set in parameter group H12. For details, see *SV680-INT Series Servo Drive Parameter Guide*.

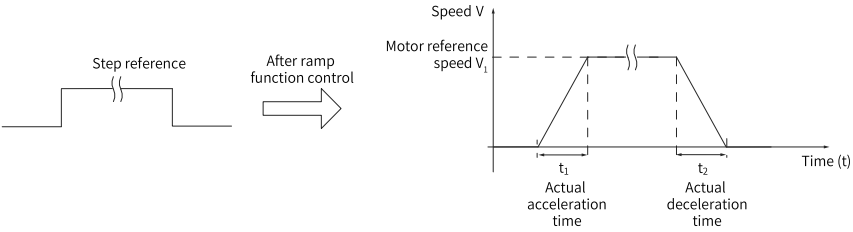


Figure 12-89 Ramp function definition

- H06.05 defines the time for the speed reference to change from 0 rpm to 1000 rpm.
- H06.06 defines the time for the speed reference to change from 1000 rpm to 0 rpm.

The formulas for calculating the actual acceleration/deceleration time are as follows:

$$\text{Actual acceleration time } t_1 = \frac{\text{Speed reference}}{1000} \times \text{Speed reference acceleration ramp time}$$

$$\text{Actual deceleration time } t_2 = \frac{\text{Speed reference}}{1000} \times \text{Speed reference deceleration ramp time}$$

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.05	2006-06h	Acc. ramp time of speed reference	0 ms–65535 ms	0	ms	Real-time
H06.06	2006-07h	Dec. ramp time of speed reference	0 ms–65535 ms	0	ms	Real-time

12.10.4Zero Clamp

Caution

- The zero speed clamp function is used in the system in which the host controller does not construct the position loop in speed control mode.
- If servo motor oscillation occurs in zero speed clamp state, adjust the position loop gain.

In the speed control mode, if FunIN.12 (ZCLAMP) is enabled, and the speed reference amplitude is smaller than or equal to the value of H06.15, the motor enters zero position clamp state. In this case, a position loop is built inside the drive and the speed reference is invalid.

The motor is clamped the minimum quantization error of the encoder. Even if it rotates due to external force, it will return to the zero position and be clamped.

When the speed reference amplitude exceeds the value of H06.15, the motor exits from the zero clamp state and continues running according to the speed reference received. Zero clamp is deactivated when the ZCLAMP (FunIN.12) signal is inactive.

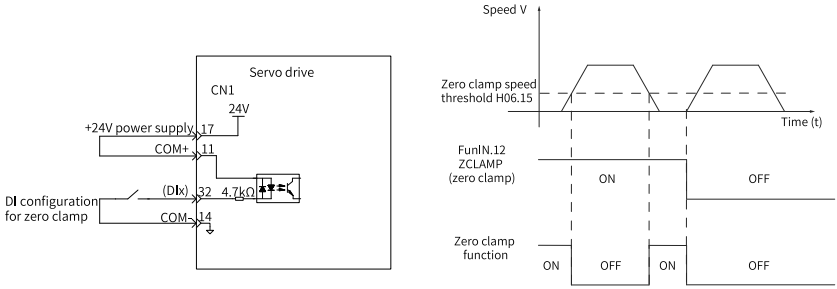


Figure 12-90 Wiring and waveform of zero clamp

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.15	2006-10h	Zero clamp speed threshold	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time

☆ Related parameters:

Code	Name	Function Name	Description
FunIN.12	ZCLAMP	Zero speed clamp	Inactive: Zero clamp disabled Active: Zero clamp enabled

12.10.5Speed Reference Limit

Caution

When the actual speed of the motor exceeds H0A.08 (Overspeed threshold), E500.0 (Motor overspeed) occurs. For details of H0A.08, see *SV680-INT Series Servo Drive Parameter Guide*. The speed reference limit must be lower than H0A.08.

In the speed control mode, the sources of speed reference limit include:

- H06.07 (Maximum speed limit): Defines the speed reference limit in both directions. The limit value applies when speed references exceed it.
- H06.08 (Forward speed limit): Defines the speed limit in the forward direction.The limit value applies when forward speed references exceed it.
- H06.09 (Reverse speed limit): Defines the speed limit in the reverse direction.The limit value applies when reverse speed references exceed it.
- Maximum speed of the motor (default threshold): Depends on the motor model.

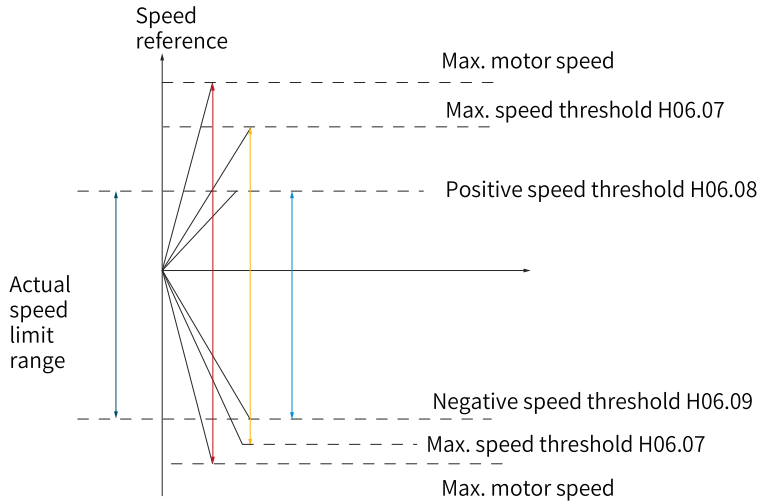


Figure 12-91 Example of speed reference limit

The actual motor speed limit meets the following requirements:

- |Forward speed limit| ⩽ min {maximum motor speed, H06.07, H06.08}
- |Reverse speed limit| ⩽ min {maximum speed of the motor, H06.07, H06.09}

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.07	2006-08h	Maximum speed limit	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	7000	[mm/s]/[rpm]	Real-time
H06.08	2006-09h	Forward speed threshold	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	7000	[mm/s]/[rpm]	Real-time
H06.09	2006-0Ah	Reverse speed threshold	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	7000	[mm/s]/[rpm]	Real-time

12.10.6Speed-Related DO

The filtered speed feedback can be compared with different thresholds, generating DO signals for use by the host controller. The filter time constant is set in H0A.27 (Speed DO filter time constant).

Motor rotation DO signal

When the absolute value of the filtered actual motor speed reaches the value of H06.16 (Threshold of TGON (motor rotation) signal), the motor is acknowledged to be rotating. In this case, the drive outputs the motor rotation signal (FunOUT.2: TGON) to acknowledge that the motor is rotating. When the absolute value of the filtered actual motor speed is lower than the value of H06.16, the motor is not rotating.

Judgment on the motor rotation signal (FunOUT.2, TGON) is not affected by the operating state or control mode of the drive.

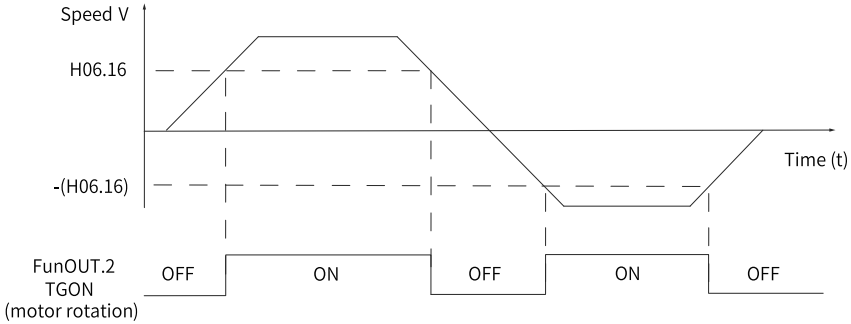


Figure 12-92 Waveform of motor rotation (TGON) signal

Note

In the preceding figure, ON indicates that the motor rotation DO signal is active. OFF indicates that the motor rotation DO signal is inactive.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.16	2006-11h	Threshold of TGON (motor rotation) signal	0[mm/s]/[rpm]–1000[mm/s]/[rpm]	20	[mm/s]/[rpm]	Real-time

To use the TGon signal, assign a DO with FunOUT.2 (TGon, motor rotation) and set the active logic of this DO.

☆ Related parameters:

Code	Name	Function Name	Description
FunOUT.2	TGon	Motor rotation	Inactive: The absolute value of filtered motor speed is lower than the setpoint of H06.16. Active. The absolute value of filtered motor speed reaches the setpoint of H06.16.

Speed matching DO signal [P]

A delay of 10 rpm is present in the speed matching signal.

When the absolute value of the difference between the motor speed after filter and the speed reference satisfies the setting of H06.17, the actual motor speed is considered to reach the speed reference. At this moment, the servo drive outputs the speed matching signal (FunOUT.4: V-CMP). When the absolute value of the difference between the motor speed after filter and the speed reference exceeds the setting of H06-17, the speed matching signal is inactive.

If the drive is not in the operational state or the speed control mode, the speed matching signal (FunOUT.4: V-Cmp) is always inactive.

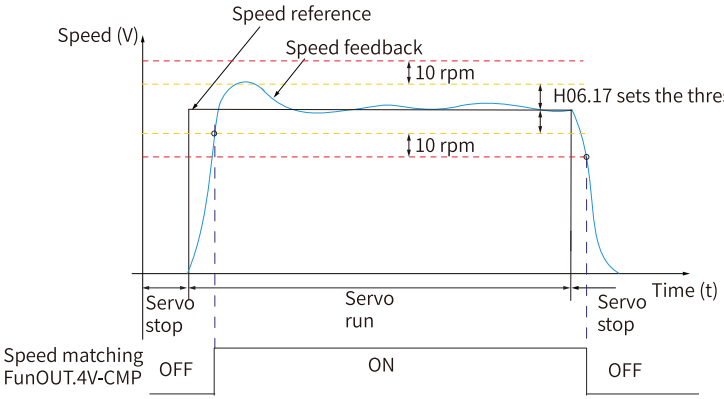


Figure 12-93 Waveform of speed matching (V-Cmp) signal

Note

In the preceding figure, "ON" indicates the the V-Cmp (speed matching) signal is active. "OFF" indicates the V-Cmp signal is inactive.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.17	2006-12h	Threshold of V-Cmp (speed matching) signal	0[mm/s]/[rpm]–100[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time

To use the V-Cmp (speed matching) signal, assign FunOUT.4 (V-Cmp, speed matching) to a certain DO and set the active logic of this DO.

☆ Related parameters:

Code	Name	Function Name	Description
FunOUT.4	V-Cmp	Speed matching	Inactive: The absolute difference between the filtered actual motor speed and the speed reference is higher than the value of H06.17. Active: The absolute difference between the filtered actual motor speed and the speed reference is lower than or equal to the value of H06.17.

Speed reach DO signal [P]

A delay of 10 rpm is present in the speed reach signal. When the absolute value of the motor speed after filter exceeds H06.18 + 10 rpm, the motor speed is considered to reach the desired value. At this moment, the servo drive outputs the speed arrival signal (FunOUT.19: V-Arr). On the contrary, when the absolute value of filtered motor speed is lower than H06.18 - 10 rpm, the speed reach signal is inactive.

Acknowledgment of the speed reach (FunOUT.19: V-Arr) signal is not affected by the operating state or control mode of the drive.

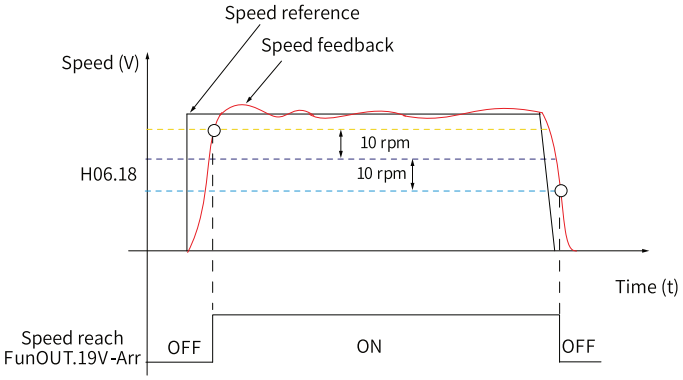


Figure 12-94 Waveform of the speed reach (V-Arr) signal

Note

In the preceding figure, "ON" indicates the V-Arr (speed reached) signal is active. "OFF" indicates the V-Arr (speed reached) signal is inactive.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.18	2006-13h	Threshold of speed reach signal	20[mm/s]/[rpm]–10000[mm/s]/[rpm]	1000	[mm/s]/[rpm]	Real-time

To use the V-Arr signal, assign FunOUT.19 (V-Arr, speed reach) to a DO and set the active logic of this DO.

☆ Related parameters:

Code	Name	Function Name	Description
FunOUT.19	V-Arr	Speed reach	Inactive: The absolute value of filtered motor speed feedback exceeds H06.18. Active: The absolute value of filtered motor speed feedback is lower than or equal to the value of H06.18.

Zero speed DO signal [P]

A delay of 10 rpm is present in the zero speed signal. The drive outputs zero speed (FunOUT.3: ZERO) signal only when the absolute value of actual motor speed is lower than the threshold defined by H06.19. On the contrary, when the absolute value of actual motor speed is higher than H06.19 + 10 rpm, the motor is in the rotational state and the V-Zero (zero speed) signal is inactive.

The zero speed signal is not influenced by the servo drive status and control mode.

The interference in the speed feedback can be filtered by the speed feedback DO filter. You can set the corresponding filter time constant in H0A.27.

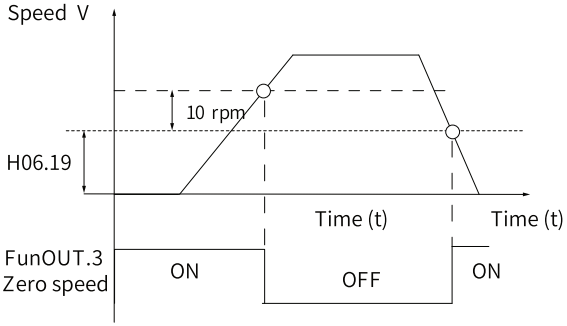


Figure 12-95 Waveform of the zero speed (V-Zero) signal

Note

In the preceding figure, "ON" indicates the V-Zero (zero speed) signal is active. "OFF" indicates the V-Zero (zero speed) signal is inactive.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H06.19	2006-14h	Threshold of zero speed output signal	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time

To use the zero speed signal, assign FunOUT.3: ZERO, zero speed to a DO and set the active logic of this DO.

☆ Related parameters:

Code	Name	Function Name	Description
FunOUT.3	ZERO	Zero speed signal	Inactive: The difference between motor speed feedback and the reference value is higher than the setpoint of H06.19. Active: The difference between motor speed feedback and the reference value is lower than or equal to the value of H06.19.

12.11 Torque Control Mode

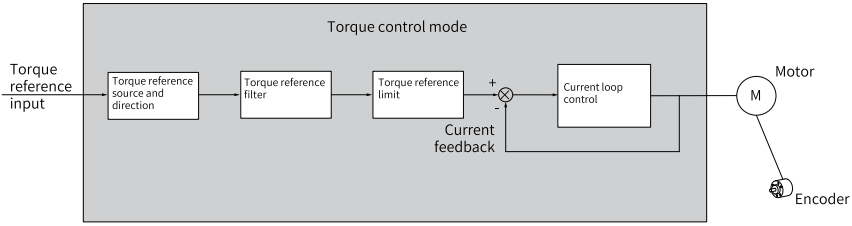


Figure 12-96 Block diagram of torque control mode

Set H02.00 (Control mode selection) to 2 (Torque control mode) through the keypad or the Inovance software tool to make the drive operate in the torque control mode. Set the drive parameters based on the mechanical structure and technical indicators. The following describes basic parameter settings in the torque control mode.

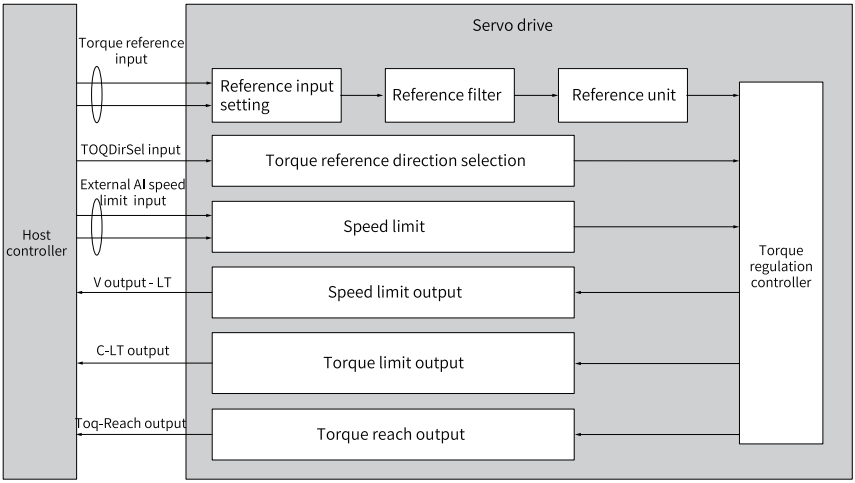


Figure 12-97 Signal exchange between the drive and the host controller

12.11.1Function Block Diagram

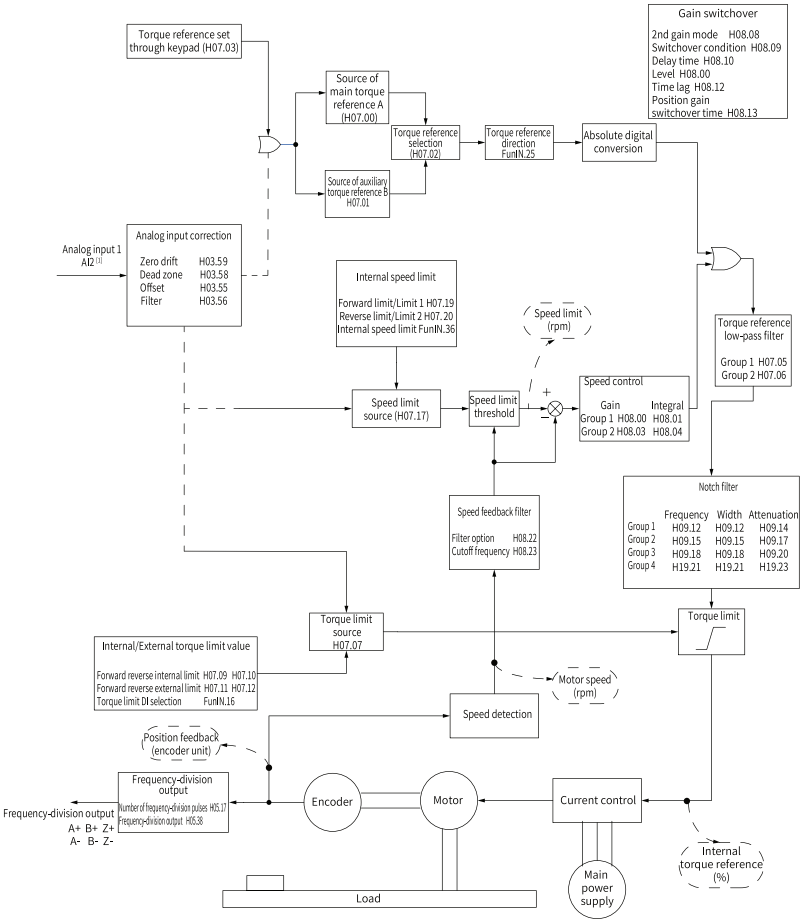


Figure 12-98 Block diagram of torque control

Note

[1]: When the analog input is AI1, the corresponding parameters are: zero drift: H03.54, dead time: H03.53, offset: H03.50, and filter H03.51.

12.11.2Torque Reference

Torque reference source

Five torque reference sources are available in the torque control mode, which can be set in H07.02.

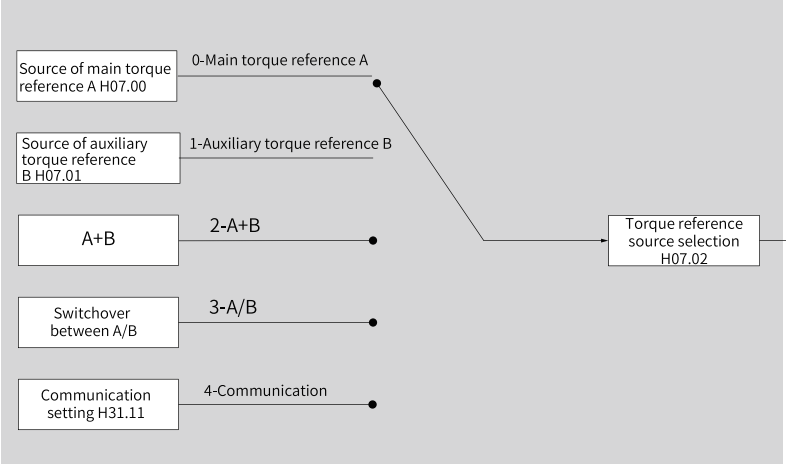


Figure 12-99 Torque reference sources

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.02	2007-03h	Torque reference source	0: Source of main torque reference A 1: Source of auxiliary torque reference B 2: Source of A+B 3: Switched between A and B 4: Communication	0	-	At stop

- **Source of main torque reference A**
  The source of main torque reference A include digital setting and analog voltage setting. Digital setting refers to the internal torque reference. Analog voltage setting refers to the external torque reference.

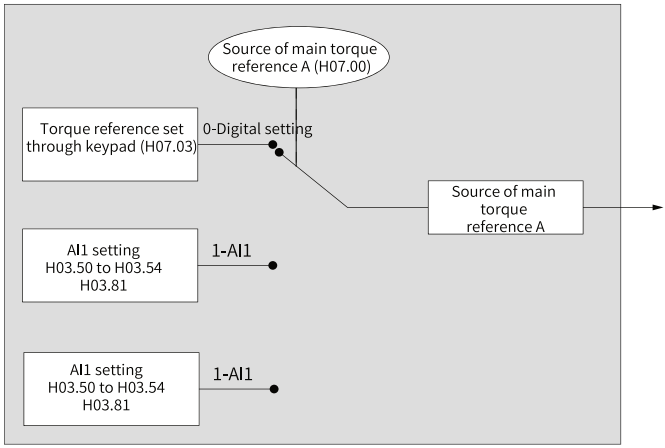


Figure 12-100 Description of source of main torque reference A

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.00	2007-01h	Source of main torque reference A	0: Keypad (H07.03) 1: AI1 2: AI2	0	-	At stop

■ **Digital setting**

In digital setting, the torque reference is set in H07.03, which defines the percentage of the torque reference to the rated torque of the motor.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.03	2007-04h	Torque reference set through keypad	-400.0% to 400.0%	0.0	%	Real-time

■ **Analog voltage setting**

The analog voltage signal output by the host controller or other devices is used as the torque reference after being processed.

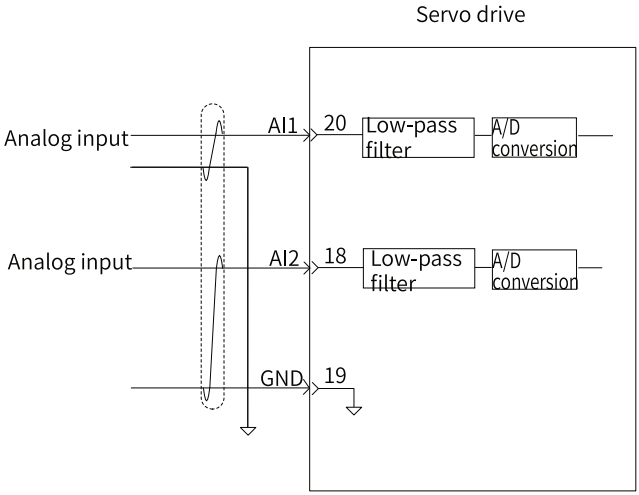
Analog voltage input terminal:

The servo drive comes with 2 AI channels for control: AI1 and AI2.

AI1 voltage input: 16-bit, -10 V to +10 V; max. allowable voltage: ±12 VDC; input impedance: approx. 74 kΩ.

AI2 voltage input: 12-bit, -10 V to +10 V; max. allowable voltage: ±12 VDC; input impedance: approx. 74 kΩ.

Analog input circuit:



Note

[P] Analog input/output terminal: AI1 corresponds to pin No. 20, AI2 corresponds to pin No. is 18, and GND corresponds to pin No. 19.

[N] Analog input/output terminal: AI1 corresponds to pin No. 25, AI2 corresponds to pin No. is 17, and GND corresponds to pin No. 8.

Steps:

The following takes AI1 as an example to describe how to set torque references through analog voltage.

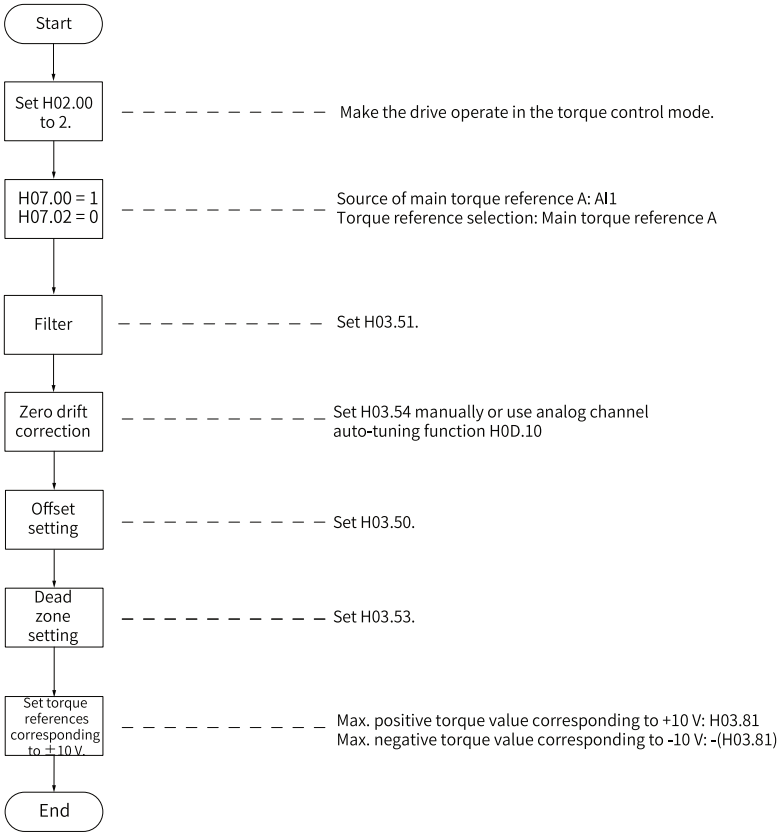


Figure 12-101 Operation flowchart for setting torque references through analog voltage

★ Definition of terms:

- Zero drift: Refers to the value of the drive sampling voltage relative to GND upon zero AI voltage.
- Offset: Refers to the AI voltage upon zero sampling voltage after zero drift correction.
- Dead zone: Refers to the AI voltage range upon zero sampling voltage.

In the following figure, y_1 represents the unprocessed AO voltage, y_6 represents the final torque reference after being processed by the servo drive.

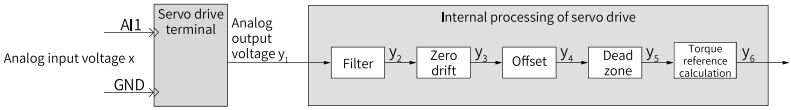


Figure 12-102 AI processing of the servo drive

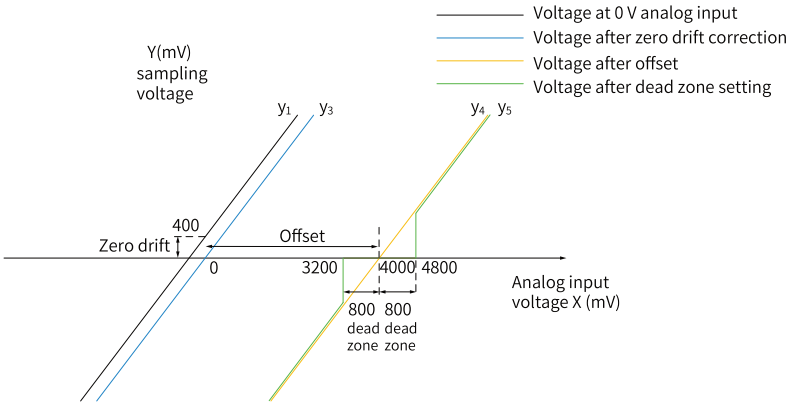


Figure 12-103 Example of the sampling voltage processed by AI

- **Filter:**
  The servo drive provides the analog channel filter function. Setting the filter time constant in H03.51 prevents motor reference fluctuation due to unstable AI voltage and eliminates motor malfunction caused by signal interference. The filter function cannot eliminate or suppress zero drift or dead zone.

- **Zero drift correction**
  Zero drift is used to correct the AO voltage value that deviates from 0 V upon 0 V voltage input.

  In the preceding figure, y_1 represents the AO voltage not processed by the servo drive. If H03.51 is set to 0.00 ms, the filtered sampling voltage y_2 is the same as y_1.

  Therefore, when the actual input voltage x is 0 and the output voltage y_1 is 400 mV, the zero drift is 400 mV.

  Set H03.54 to 400.0 (mV) manually. The sampling voltage after zero drift correction is shown by y_3. $y_3 = y_1 - 400.0$

  Zero drift can also be corrected automatically through H0d.10.

- **Offset setting**

Offset setting is used to define the actual input voltage corresponding to zero sampling voltage.

As shown in the preceding figure, when the preset sampling voltage y_4 is 0, the actual input voltage x is 4000 mV, therefore, the offset value is 4000 mV.

Set H03.50 to 4000 (mV) manually. The sampling voltage y_4 after offset = x - 4000 = y_3 - 4000.

- **Dead zone correction**

  Dead zone correction is used to define the effective voltage input range when the sampling voltage is not 0.

  After the offset is set, if the sampling voltage is always 0 when the input voltage x is within 3200 mV to 4800 mV, the dead zone is 800 mV.

  Set H03.53 to 800.0. The sampling voltage after dead zone correction is shown by y_5.

$$y_5 = \begin{cases} 0 & 3200 \leqslant x \leqslant 4800 \\ y_4 & 4800 < x \leqslant 10000 \text{ or } -10000 \leqslant x < 3200 \end{cases}$$

- **Torque reference**

  After setting the zero drift, offset, and dead zone, set the speed reference corresponding to 10 V (10000 mV) in H03.81 (Speed corresponding to 10 V) to obtain the actual torque reference y_6:

$$y_6 = \frac{y_5}{10000} x \ (\text{H03.81})$$

  This value is used as the torque reference set via analog in the torque control mode.

  The left figure below applies when no offset exists. The right figure below applies when offset exists. After proper settings, you can view the AI1 sampling voltage value through H0b.21 in real time or view the torque reference value corresponding to the input analog value through H0b.01.

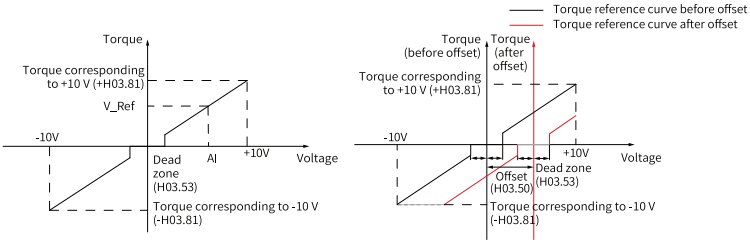


Figure 12-104 AI1 without offset (left) & AI1 after offset (right)

The relationship between the final torque reference y_6 and the input voltage x is as follows:

$$y_6 = \begin{cases} 0 & B\text{-}C \leqslant x \leqslant B\text{+}C \\ x\text{-}B & B\text{+}C < x \leqslant 10000 \text{ or } \text{-}10000 \leqslant x < B\text{-}C \end{cases}$$

in which, B represents the offset and C represents the dead zone.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H03.50	2003-33h	Voltage-type AI1 offset	-5000 mV to 5000 mV	0	mV	Real-time
H03.51	2003-34h	Voltage-type AI1 input filter time constant	0.00 ms–655.35 ms	2.00	ms	Real-time
H03.53	2003-36h	Voltage-type AI1 dead zone	0.0 mV to 1000.0 mV	10.0	mV	Real-time
H03.54	2003-37h	Voltage-type AI1 zero drift	-500.0 mV–500.0 mV	0.0	mV	Real-time
H03.55	2003-38h	Voltage-type AI2 offset	-5000 mV to 5000 mV	0	mV	Real-time
H03.56	2003-39h	Voltage-type AI2 input filter time constant	0.00 ms–655.35 ms	2.00	ms	Real-time
H03.58	2003-3Bh	Voltage-type AI2 dead zone	0.0 mV to 1000.0 mV	10.0	mV	Real-time
H03.59	2003-3Ch	Voltage-type AI2 zero drift	-500.0 mV–500.0 mV	0.0	mV	Real-time
H03.81	2003-52h	Torque corresponding to analog 10 V	0.00 to 8.00	1.00	Multiplier	At stop
H0d.10	200d-0Bh	Analog channel auto adjusting	0: No operation 1: Adjusted through AI1 2: Adjusted through AI2	0	-	At stop

- **Source of auxiliary torque reference B**
  Auxiliary torque reference B is set in the same way as main torque reference A. For the descriptions of related parameters, see *SV680-INT Series Servo Drive Parameter Guide*.

- **Switched between A and B**
  When setting H07.02 (Torque reference source) to 3 (Switched between A and B), you need to assign FunIN.4 (DI-SEL) to the corresponding DI. The input signal of this DI determines which source (A or B) is active.

☆ Related parameters:

Code	Name	Function Name	Description
FunIN.4	CMD-SEL	Reference switchover	OFF: Active reference being A ON: Active reference being B

- **Communication setting**
  When H07.02 (Torque reference source) is set to 4 (Communication), the torque reference is the value of H31.11. H31.11 is not displayed on the keypad, it can be set through communication only.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H31.11	2031-0Ch	Torque reference set through communication	-100.000% to 100.000%	0.000	%	Real-time

Torque reference direction

To switch the torque reference direction through DI, assign FunIN.25 (TorDirSel, torque reference direction) to the corresponding DI. The input signal of this DI determines the torque reference direction.

☆ Related parameters:

Code	Name	Function Name	Description
FunIN.25	ToqDirSel	Torque reference direction	Inactive: The actual torque reference direction is the same as the set direction. Active: The actual torque reference direction is opposite to the set direction.

The actual direction of rotation is related to the setting of H02.02 (Direction of rotation), the sign (+/-) of the torque reference value, and the logic of FunIN.25.

Table 12–24 Actual direction of rotation in the torque control mode

H02.02	Sign (+/-) of the Torque Reference Value	FunIN.25	Direction of Rotation
0	+	Inactive	CCW
0	+	Active	CW
0	-	Inactive	CW

H02.02	Sign (+/-) of the Torque Reference Value	FunIN.25	Direction of Rotation
0	-	Active	CCW
1	+	Inactive	CW
1	+	Active	CCW
1	-	Inactive	CCW
1	-	Active	CW

12.11.3Torque Reference Filter



Pay attention to the responsiveness during setting as an excessively high setpoint lowers down the responsiveness.

The servo drive smoothens torque references through the low-pass filter to reduce vibration in all the control modes.

The servo drive offers two low-pass filters for torque references, in which the low-pass filter 1 is used by default.

The servo drive switches to low-pass filter 2 when gain switchover is enabled (H08.08 = 1 and H08.09 ≠ 0) and the condition defined by H08.09 is met.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.05	2007-06h	Torque reference filter time constant 1	0.00 ms–30.00 ms	0.50	ms	Real-time
H07.06	2007-07h	Torque reference filter time constant 2	0.00 ms–30.00 ms	0.27	ms	Real-time

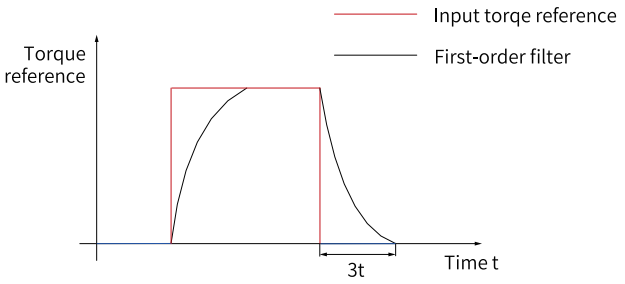


Figure 12-105 First-order filter for rectangular torque references

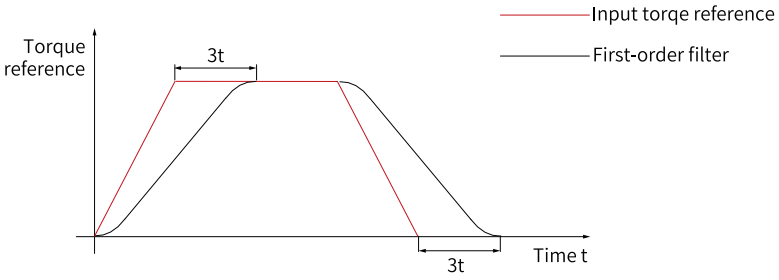


Figure 12-106 First-order filter for trapezoid torque references

12.11.4Torque Reference Limit

Caution

Torque reference limit is needed and active in all the control modes.

The torque reference limit is used to protect the servo drive and the motor.

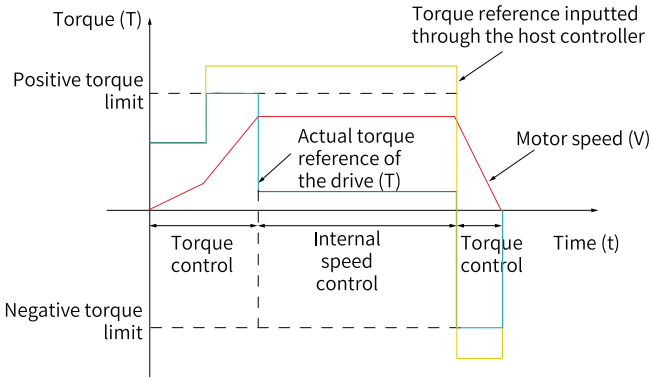


Figure 12-107 Torque reference and torque limit

When the absolute value of the torque reference input from the host controller or output by the speed regulator is higher than the absolute value of the torque reference limit, the actual torque reference of the drive is limited to the torque reference limit. Otherwise, the torque reference input from the host controller or output by the speed regulator is used.

Only one torque reference limit is valid at a moment. The positive/negative torque limit must be lower than or equal to the maximum torque of the drive and the motor and ±400.0% of the rated torque.

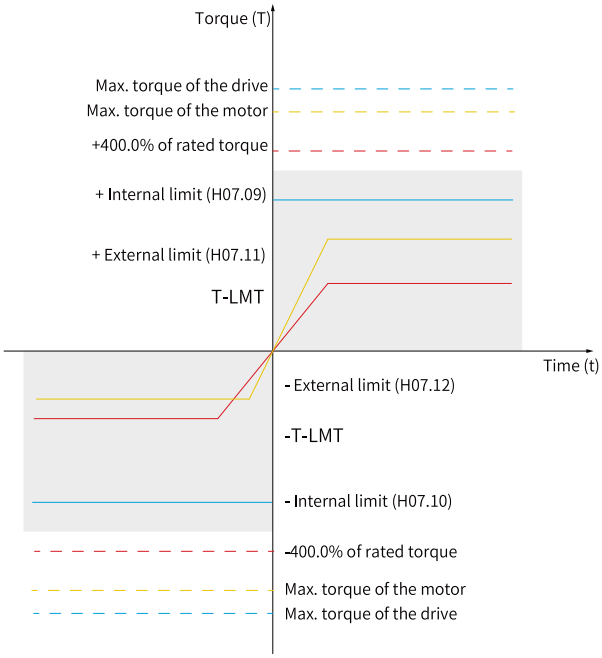


Figure 12-108 Example of torque limit

Torque limit source

You can set the torque limit source in H07.07.

After the torque limit is set, the torque limit applies when the torque reference exceeds the limit. The torque limit must be set according to the load conditions. An excessively low limit may weaken the acceleration/deceleration ability of the motor, causing the actual motor speed to fall below the required value during operating at a constant torque.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.07	2007-08h	Torque Limit source	0: Positive/Negative internal torque limit 1: Internal or external limit as defined by DI 2: T_LMT 3: T_LMT or external limit as defined by DI (FunIN.16 or FunIN.17) 4: T_LMT or internal limit (FunIN.16 or FunIN.17) as defined by DI	0	-	Real-time

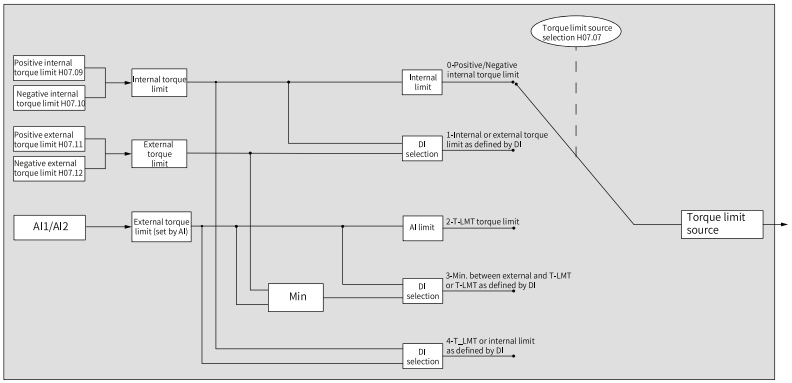


Figure 12-109 Torque Limit source

The following figures show examples in which absolute values of torque references input from the host controller exceed the absolute value of the torque limit in the torque control mode.

- H07.07 = 0 (Positive/Negative internal torque limit)
  The torque reference limit is determined only by H07.09 and H07.10.

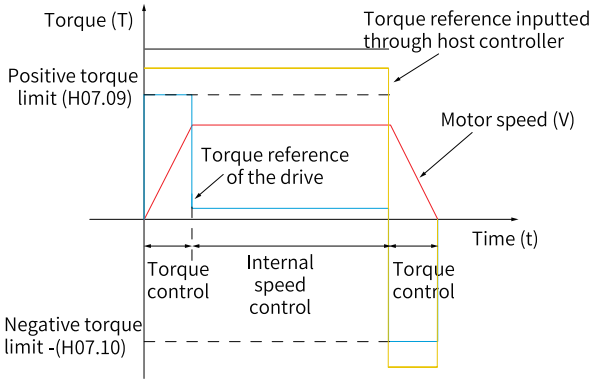


Figure 12-110 Torque limit curve (H07.07 = 0)

- H07.07 = 1 (internal or external limit as defined by DI)
  The torque reference limit is determined by the logic of the external DI signal. The positive torque limit is selected between H07.09 (Positive internal torque limit) and H07.11 (Positive external torque limit). The negative torque limit is selected between H07.10 (Negative internal torque limit) and H07.12 (Negative external torque limit).

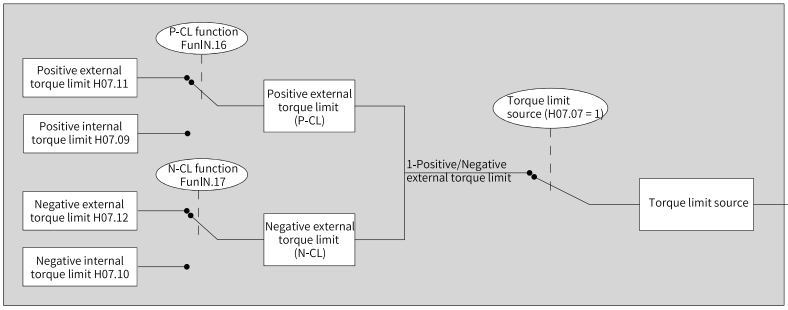
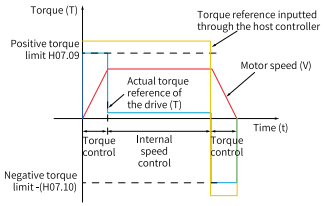
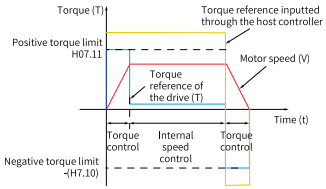
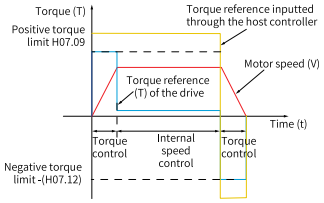
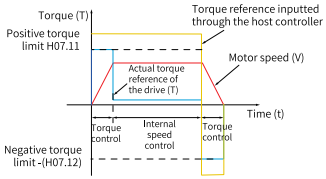


Figure 12-111 Torque limit source (H07.07 = 1)

Table 12–25 Description of H07.07 = 1

DI state		P-CL	
		OFF	ON
N-CL	OFF		
	ON		

Assign FunIN.16 (P-CL: Positive external torque limit) and FunIN.17 (N-CL: Negative external torque limit) to two DI of the drive and set the active logic of these DIs.

☆ Related parameters:

Code	Name	Function Name	Description
FunIN.16	P-CL	Positive external torque limit	The torque limit source is switched based on H07.07 (Torque limit source). H07.07 = 1: Active: Positive external torque limit activated Inactive: Positive internal torque limit activated
FunIN.17	N-CL	Negative external torque limit	The torque limit source is switched based on H07.07 (Torque limit source). H07.07 = 1: Active: Negative external torque limit activated Inactive: Negative internal torque limit activated

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.09	2007-0Ah	Positive internal torque limit	0.0% to 400.0%	350.0	%	Real-time
H07.10	2007-0Bh	Negative internal torque limit	0.0% to 400.0%	350.0	%	Real-time
H07.11	2007-0Ch	Positive external torque limit	0.0% to 400.0%	350.0	%	Real-time
H07.12	2007-0Dh	Negative external torque limit	0.0% to 400.0%	350.0	%	Real-time

- H07.07 = 2 (T-LMT as torque limit)

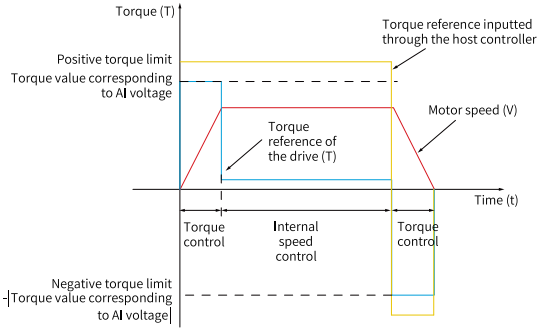


Figure 12-112 AI torque limit curve

- H07.07 = 3: T_LMT or external limit used as torque limit as defined by DI (FunIN.16 or 17)
  When the logic of the external DI signal (P-CL) is inactive, the positive torque limit is defined by the torque value corresponding to the input voltage of external AI. When the logic of the external DI signal (P-CL) is active, the positive torque limit is defined by the minimum of H07.11 and the AI value corresponding to the AI voltage.

  When the logic of the external DI signal (N-CL) is inactive, the negative torque limit is defined by the torque value corresponding to the external AI voltage. When the logic of the external DI signal (N-CL) .is active, the negative torque limit is defined by the minimum of H07.12 and the torque value corresponding to the AI voltage.

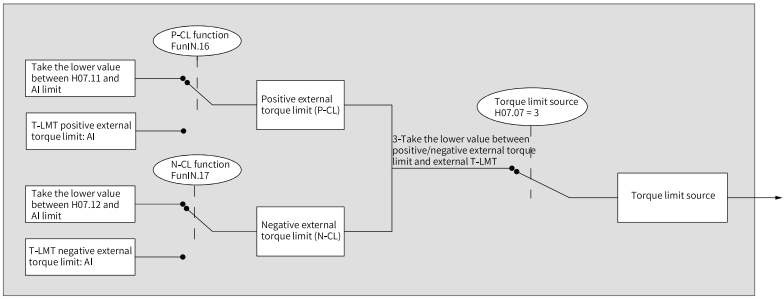
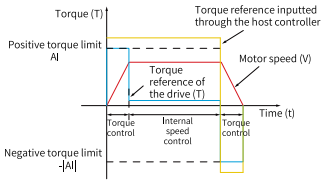
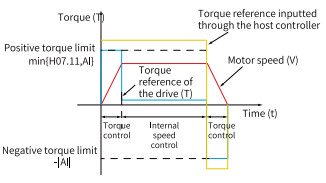
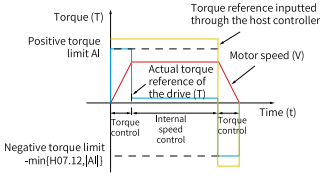
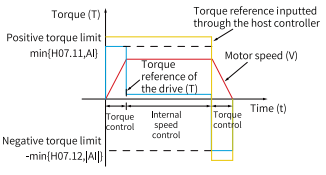


Figure 12-113 Torque limit source (H07.07 = 3)

Table 12–26 Description of H07.07 = 3

DI state		P-CL	
		OFF	ON
N-CL	OFF		
	ON		

- H07.07 = 4: T_LMT or internal limit used as torque limit as defined by DI

When the logic of the external DI signal (P-CL) is inactive, the positive torque limit is defined by H07.09. When the logic of the external DI (P-CL) is active, the positive torque limit is defined by the torque value corresponding to the AI voltage.

When the logic of the external DI signal (N-CL) is inactive, the negative torque limit is defined by H07.10. When the logic of the external DI-CL) is active, the negative torque limit is defined by the torque value corresponding to the AI voltage.

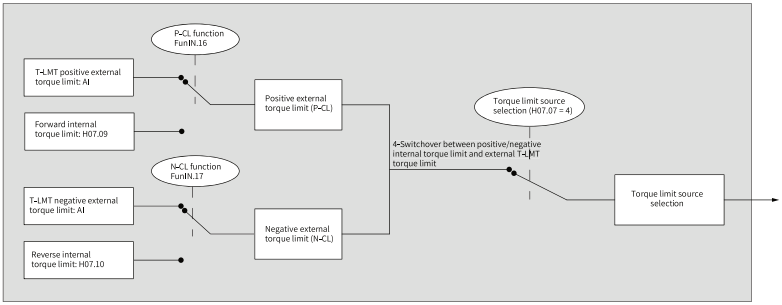
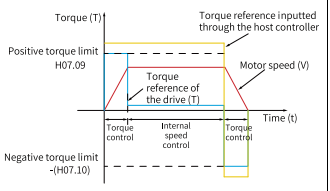
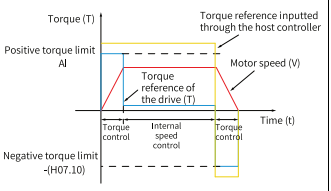
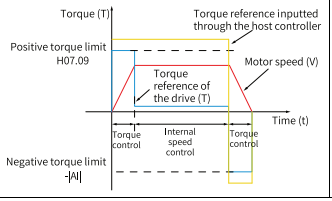
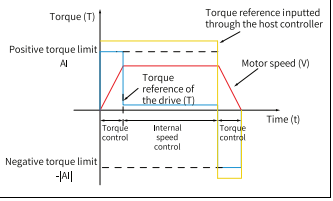


Figure 12-114 Torque limit source (H07.07 = 4)

Table 12–27 Description of H07.07 = 4

DI state		P-CL	
		OFF	ON
N-CL	OFF		
	ON		

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.09	2007-0Ah	Positive internal torque limit	0.0% to 400.0%	350.0	%	Real-time
H07.10	2007-0Bh	Negative internal torque limit	0.0% to 400.0%	350.0	%	Real-time
H07.11	2007-0Ch	Positive external torque limit	0.0% to 400.0%	350.0	%	Real-time
H07.12	2007-0Dh	Negative external torque limit	0.0% to 400.0%	350.0	%	Real-time

Setting torque limit DO signal [P]

The drive outputs the C-LT (FunOUT.7: torque limit) signal to the host controller when the torque reference reaches the limit. In this case, assign FunOUT.7 to a DO of the drive and set the active logic of this DO.

☆ Related parameters:

Code	Name	Function Name	Description
FunOUT.7	C-LT	Torque limit signal	Active: The torque reference value reaches the torque limit and is limited by the torque limit. Inactive: The torque reference does not reach the torque limit.

12.11.5Speed Limit in Torque Control Mode

In the torque control mode, the motor accelerates continuously if the torque reference is higher than the load torque on the machine side, which may lead to overspeed and damage the machine. A speed limit therefore must be set to protect the machine.

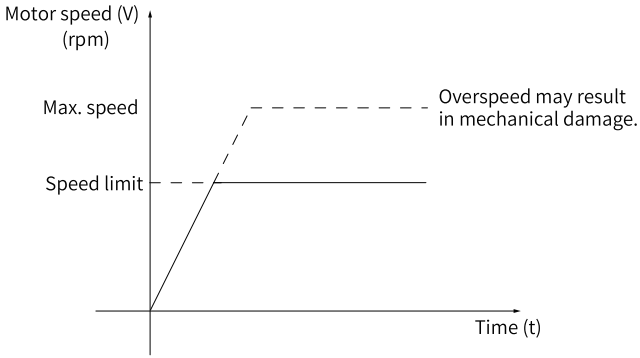


Figure 12-115 Speed limit in the torque control mode

Setting the speed limit source

In the torque control mode, you can set the speed limit source in H07.17. After the speed limit is set, the actual motor speed will be limited. After reaching the speed limit, the motor keeps operating at the speed limit constantly. Set the speed limit based on the operating requirements of the load.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.17	2007-12h	Speed limit source	0: Internal speed limit 1: V-LMT 2: H07.19 or H07.20 as defined by DI Note: For SV680P-INT, the parameter takes effect when H02.00 is not 8. For SV680N-INT, the parameter takes effect when H02.00 is not 9.	0	-	Real-time

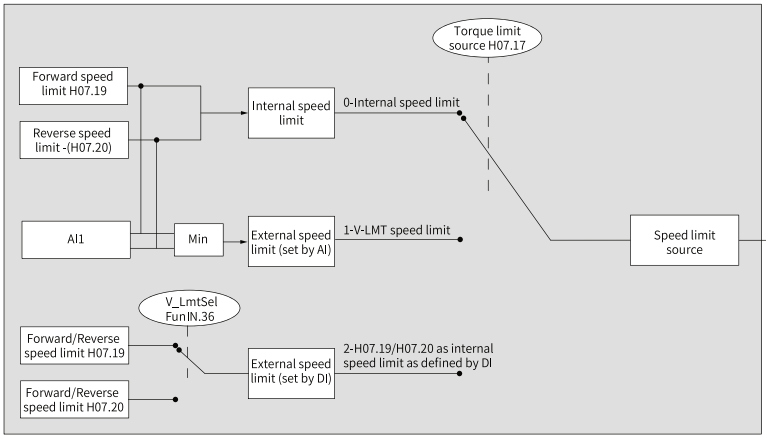


Figure 12-116 Speed limit source

- H07.17 = 0 (Internal speed limit)
  The speed limit is determined only by H07.19 (Positive speed limit) and H07.20 (Negative speed limit).

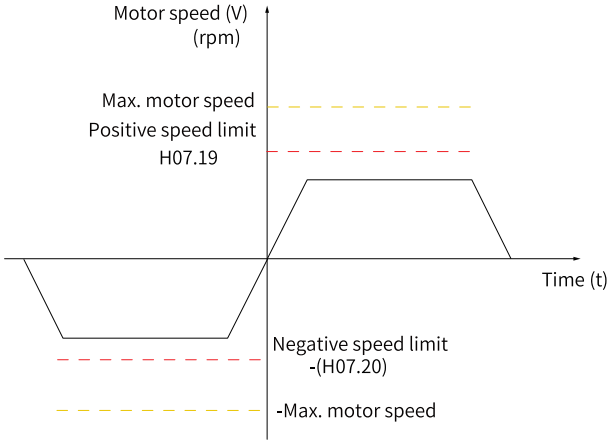


Figure 12-117 Speed limit curve (H07.17 = 0)

- H07.17 = 1 (V- LMT as speed limit)
  When the speed limit defined by AI is lower than the internal speed limit (H07.19/H07.20), the former applies. When the speed limit defined by AI is higher than the internal speed limit (H07.19/H07.20), the latter applies.

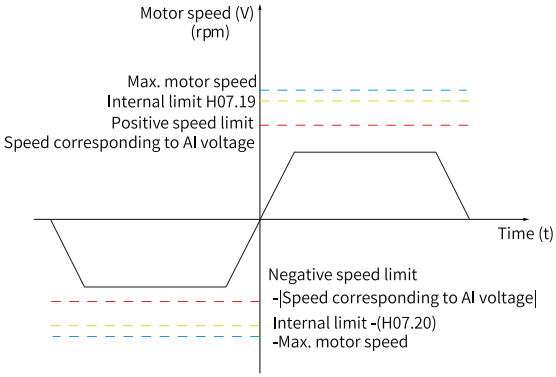


Figure 12-118 Speed limit curve (H07.17 = 1)

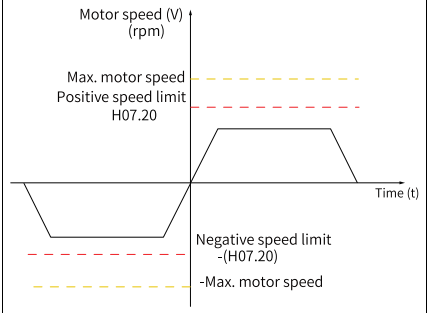
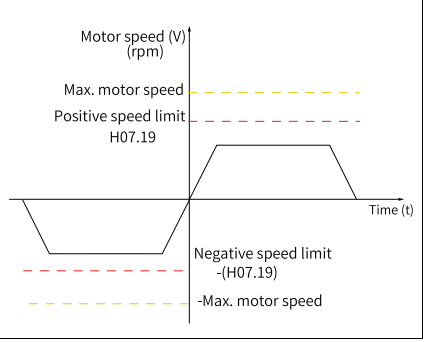
- H07.17 = 2 (H07.19 or H07.20 used as speed limit as defined by DI)
  H07.19 or H07.20 is used as the speed limit based on the logic of the DI.

  Before setting H107.17 to 2, assign FunIN.36 (V-LmtSel: internal speed limit source) to a DI first, and then set the active logic of this DI.

  ☆ Related parameters:

Code	Name	Function Name	Description
FunIN.36	V_LmtSel	Internal speed limit source	Inactive: H07.19 used as positive/ negative internal speed limit Active: H07.20 used as positive/ negative internal speed limit

Table 12–28 Descriptions of speed limit

V_LmtSel	
ON	OFF
	

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.19	2007-14h	Positive speed limit/Speed limit 1 in torque control	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	Real-time
H07.20	2007-15h	Negative speed limit/Speed limit 2 in torque control	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	Real-time

Speed limit DO signal [P]

In the torque control mode, the servo drive outputs the V- LT (FunOUT.8: speed limit) signal to the host controller when the absolute value of the motor speed keeps exceeding the speed limit in the period defined by H07.40. If either of the preceding two conditions is not satisfied, the speed limit signal will be deactivated.

Acknowledgment of the V-LT (Speed limit) signal is executed only during operation in the torque control mode.

To use the V-LT signal, assign FunOUT.8 to a DO of the drive and set DO active logic of this DO.

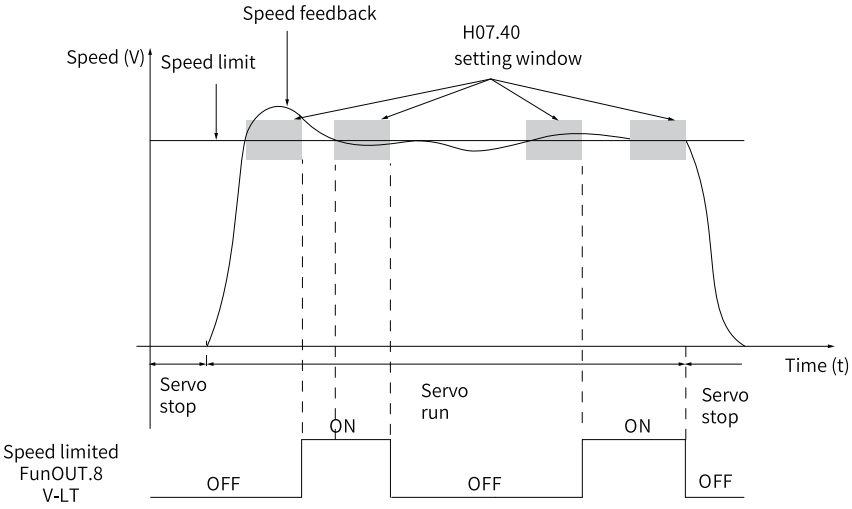


Figure 12-119 Example of speed limit DO waveform

☆ Related parameters:

Code	Name	Function Name	Description
FunOUT.8	V-LT	Speed limit	Inactive: The motor speed does not reach the speed limit. Active: The motor speed reaches the speed limit and a speed loop is built based on this limit.

12.11.6Torque Reach Output [P]

The torque reach output is used to determine whether the actual torque reference reaches the set range. The drive outputs TorReach (FunOUT.18: torque reach) signal to the host controller when the actual torque reference reaches the torque reference threshold.

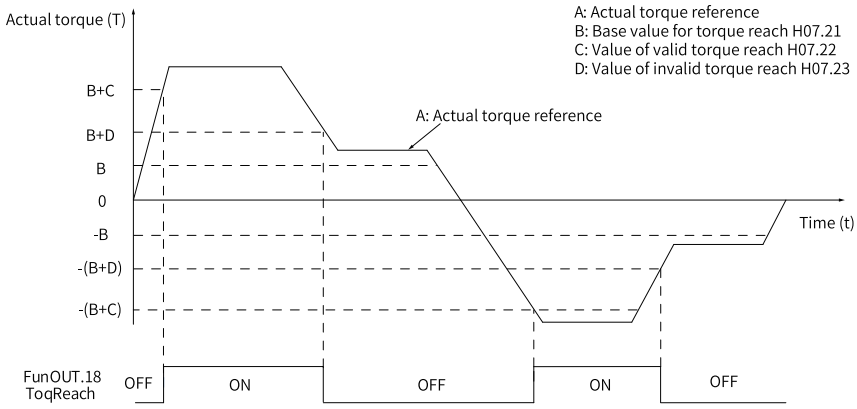


Figure 12-120 Example of TorReach signal waveform

- Actual torque reference (viewed in H0b.02): A
- Base value for torque reach (H07.21): B.
- Threshold of valid torque reach H07.22: C
- Threshold of invalid torque reach (H07.23): D.

C and D are the offset based on B.

The torque reach DO signal can be activated only when the actual torque reference meets the following condition: $|A| \geqslant B + C$. Otherwise, the torque reach DO signal remains inactive.

The torque reach signal is deactivated only when the actual torque reference meets the following condition: $|A| < B + D$. Otherwise, the torque reach signal remains active.

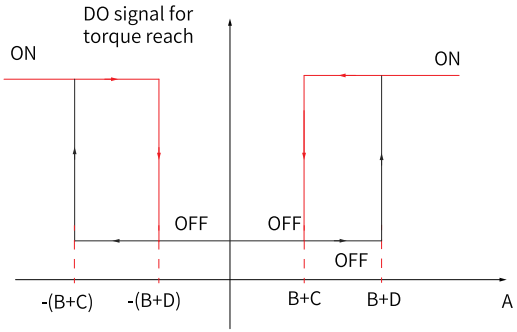


Figure 12-121 Description of torque reach output

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H07.21	2007-16h	Torque reach base value	0.0% to 400.0%	0.0	%	Real-time
H07.22	2007-17h	Torque reach valid value	0.0% to 400.0%	20.0	%	Real-time
H07.23	2007-18h	Torque reach invalid value	0.0% to 400.0%	10.0	%	Real-time

To use the TorReach (Torque reach) signal, assign FunOUT.18 (ToqReach, torque reach) to a DO of the drive and set the active logic of this DO.

☆ Related parameters:

Code	Name	Function Name	Description
FunOUT.18	ToqReach	Torque reach	Active: The absolute value of the torque reference reaches the setpoint. Inactive: The absolute value of the torque reference is lower than the setpoint.

13 Control Mode [P]

13.1 Mixed Control Mode

In the compound control mode, the control mode can be switched when the S-ON signal is switched on and the servo drive is in the "run" state. The following four compound control modes are available:

- Torque control mode → Speed control mode
- Speed control mode → Position control mode
- Torque control mode → Position control mode
- Speed control mode → Position control mode → Torque control mode

You can enable the compound control mode by setting H02.00 through the keypad or the software tool.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.00	2002-01h	Control mode	0: Speed control mode 1: Position control mode 2: Torque control mode 3: Torque/Speed control mode 4: Speed/Position control mode 5: Torque/Position control mode 6: Torque/Speed/Position compound mode 7: Process segment 8: CANopen mode	1	-	At stop

Set the parameters for different control modes based on the mechanical structure and technical indicators. For details, see *SV680-INT Series Servo Drive Parameter Guide*.

When H02.00 is set to 3, 4, or 5, assign a DI with FunIN.10 (M1_SEL, mode switchover 1) and set the active logic of this DI. When H02.00 is set to 6, assign two DIs with FunIN.10 (Mode switchover 1) and FunIN.11 (Mode DI 2) and set the active logic of these two DIs.

☆ Related parameters:

Code	Name	Function Name	Function
FunIN.10	M1_SEL	Mode switchover 1	Defines the present control mode during compound control when the servo drive is in the "run" state, as shown in *"Table 13–1 " on page 607*.
FunIN.11	M2_SEL	Mode switchover 2	Defines the present control mode during compound control when the servo drive is in the "run" state, as shown in *"Table 13–2 " on page 607*.

Table 13–1 Servo drive control mode

H02.00	M1_SEL terminal logic	Control mode
3	Inactive	Torque control mode
	Active	Speed control mode
4	Inactive	Speed control mode
	Active	Position control mode
5	Inactive	Torque control mode
	Active	Position control mode

Table 13–2 Servo drive control mode

H02.00	M2_SEL terminal logic	M1_SEL terminal logic	Control mode
6	-	Active	Position control mode
	Active	Inactive	Speed control mode
	Inactive	Inactive	Torque control mode

Note

It is recommended to switch from other control modes to the position control mode only in the zero speed state.

13.2 Interpolation Mode (IP)

The interpolation mode can be used to achieve synchronous operations of multi-axis servo drives or single-axis servo drives. When the servo drive is not enabled, after the host controller sets the interpolation cycle, the displacement curve is planned in

advance according to actual application requirements. When the servo drive is running, different absolute position points on the displacement curve are periodically sent to the slave. The slave synchronously receives the displacement reference, subdivides and evenly transmits the displacement reference increment based on the position loop control cycle. The servo drive executes the position control, speed control, and torque control.

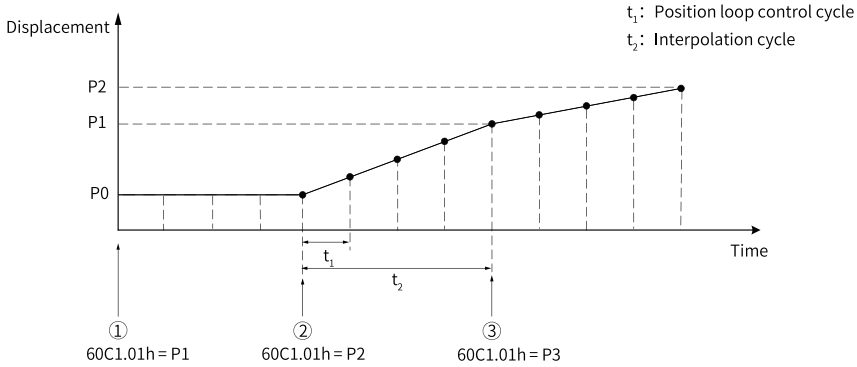
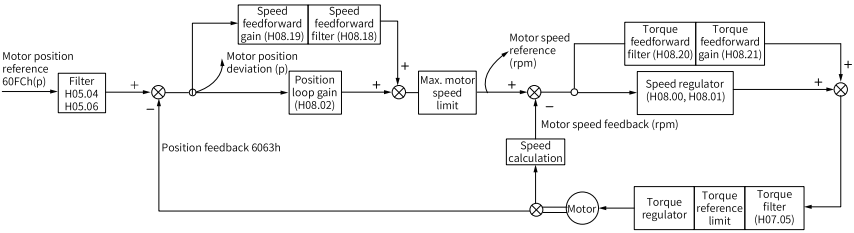


Figure 13-1 Displacement curve of single-axis linear interpolation motor

Note

- 1: The current absolute position of the motor is P0. After receiving the first absolute position reference P1, planning of the first displacement profile starts.
- 2: The current absolute position of the motor is P0. The motor starts to operate towards the first absolute position P1 and receives the second absolute position reference P2 at the same time, after which, planning of the second displacement profile starts.
- 3: After reaching the first absolute position P1, the motor starts to operate towards the second absolute position P2 and receives the 3rd absolute position reference P3 at the same time, after which, planning of the third displacement profile starts.
- t_1 - position loop control cycle, which is determined by the servo drive
- t_2 - interpolation cycle, which is set in the object dictionary 60C2h The SV680-INT servo drive supports the synchronization cycle in the range 1 ms to 20 ms. When a synchronization cycle beyond the range is set, the synchronization cycle is set to a limited value.
- P0/P1/P2 - absolute position. An absolute position reference is sent through 60C1.1h. The interpolation mode supports absolute position references only.
- The displacement reference increments in each synchronization cycle are P1-P0 and P2-P1.
- When using the interpolation mode, set the position loop period to 1 k.
- The displacement reference increments in each synchronization cycle are P1-P0 and P2-P1.

13.2.1Function Block Diagram



13.2.2Configuration Block Diagram

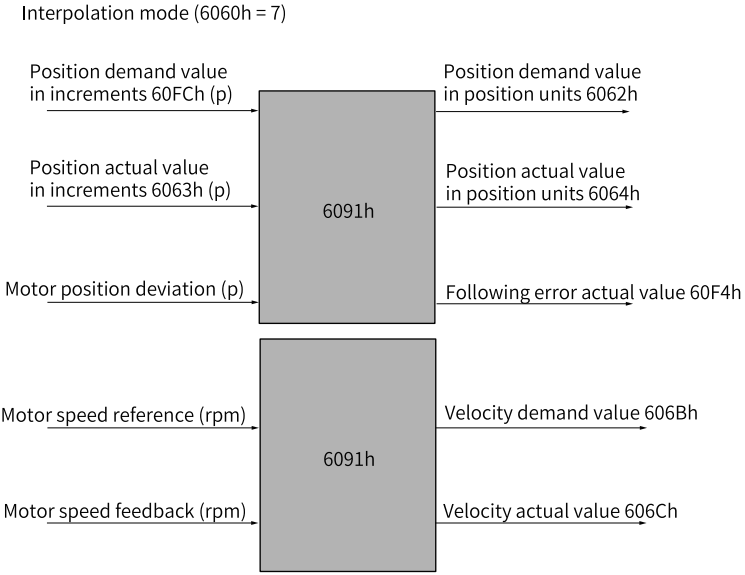


Figure 13-2 IP mode configuration

13.2.3Recommended Configuration

Basic configuration:

RPDO	TPDO	Remarks
6040h: control word	6041h: status word	Mandatory
60C1.01h: target position	6064h: position actual value	Mandatory
6060h: modes of operation	6061h: modes of operation display	Optional

13.2.4Related Parameters

The control word 6040h in the IP mode is described as follows:

6040h Control word

Address: 6040h
Min.: 0x0
Max.: 0xFFFF
Default: 0x0
Access: RW
Unit: -
Data Type: UInt16
Change: Real-time
Mapping: RPDO

Value Range:
0x0 to 0xFFFF

Description:
Defines the control command.

bit	Name	Value	Description
0–3	-	See the relationship between status switching and control commands	See the object dictionary.
4	Interpolation mode enable	-	0: Interpolation interrupted 1: Interpolation enabled bit4 must always be 1 during interpolation. bit12 of 6041h can be used as a feedback indicating whether the interpolation mode is activated.
5–6	N/A	-	-
7–15	-	See the relationship between status switching and control commands	See the object dictionary.

6041h Status word

Address: 6041h
Min.: 0x0
Max.: 0xFFFF
Default: 0x0
Access: RO
Unit: -
Data Type: UInt16
Change: Unchangeable
Mapping: TPDO

Value Range:
0x0 to 0xFFFF

Description:

Indicates the servo drive status.

bit	Name	Value	Description
0–9	-	See the relationship between status switching and control commands	See the object dictionary.
10	The target position is reached.	-	0: The target position is not reached. 1: The target position is reached.
11	Software internal setting exceeding limit	-	0: The position actual value does not reach the software internal position limit. 1: The actual position value reaches the software position limit.
12	Interpolation mode activated	-	0: Interpolation is not activated. 1: Interpolation is activated.
13	Position deviation	-	0: Acceptable position deviation 1: Excessive position deviation
14	N/A	-	-
15	Homing is completed.	-	0: Homing is not performed or done. 1: Homing is complete.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6060h	6060h	Servo drive mode	1: Profile position mode (pp) 3: Profile velocity mode (PV) 4: Profile torque mode (PT) 6: Homing mode (HM) 7: Interpolation mode (IP)	0	-	Real-time
6061h	6061h	Operation mode display	1: Profile position mode (pp) 3: Profile velocity mode (PV) 4: Profile torque mode (PT) 6: Homing mode (HM) 7: Interpolation mode (IP)	0	-	Unchangeable
6064h	6064h	Position actual value	-2147483648 to 2147483647	0	Reference unit	Unchangeable
6066h	6066h	Defines the time lapse to trigger	0 ms–65535 ms	0	ms	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
		excessive position deviation (EB00.0).				
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time
60C1.01h	60C1-01h	Interpolation displacement	-2147483648 to 2147483647	0	Reference unit	Real-time
60C2.01h	60C2-01h	Interpolation time period	1–20	1	-	Real-time
6081h	6081h	Profile velocity	0 to 4294967295	111848106	Reference unit/s	Real-time
6083h	6083h	Profile acceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time
6084h	6084h	Profile deceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time

13.2.5Related Functions

Positioning completed

Positioning completed: When position deviation fulfills the set condition, the positioning process is done. In this case, the servo drive sets bit10 of the status word 6041h, and the host controller, once receives the signal, acknowledges that positioning has been completed.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6067h	6067h	Position window	0 to 4294967295	46976	Reference unit	Real-time
6068h	6068h	Position window time	0 ms–65535 ms	0	ms	Real-time

Detection on excessive position deviation

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6065h	6065h	Following error window	0 to 4294967295	219895614	Reference unit	Real-time

Reference polarity

You can change the position reference direction through setting the position reference polarity.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time

13.3 Homing



- The homing trigger signal is shielded when interrupt positioning or multi-position reference is in progress.
- To use the homing function, ensure H11.00 is not set to 5 as the setpoint 5 indicates enhanced axis control mode, in which the homing function is shielded.
- Do not set H05.30 to 65 or 8 when the motor is operating by commands. Otherwise, speed fluctuation will occur.

Description

- Home (or mechanical home): Indicates the position of the home switch or Z signal depending on the value of H05.31 (Homing mode).
- Zero: positioning target point, represented as home + offset (set in H05.36). When H05.36 (Mechanical home offset) is set to 0, the zero position coincides with the home.

In the position control mode, when homing is triggered after the S-ON signal is activated, the motor starts searching for the zero position.

When homing is in progress, the servo drive does not respond to other position references (including another homing trigger signal) until homing is done.

This function includes two actions:

- Home attaining: After receiving the homing signal, the servo drive proactively locates the relative position between the motor shaft and the preset mechanical home reference point; it finds the home and then moves through the offset from the home reference point to the zero point. The homing mode usually applies in initial searching for the zero position.
- Electrical homing: After determining the absolute zero position through homing, the drive takes current position as the start position to execute a relative displacement.

After the homing function (both homing and electrical homing) is executed, The absolute position of the motor (H0b.07) is consistent with the home offset (H05.36).

The servo drive outputs the homing completed signal (FunOUT.16: HomeAttain) or electrical homing completed signal (FunOUT.17: ElecHomeAttain), and the host controller, upon receiving these two signals, acknowledges the homing function is done executing. HomeAttain or ElecHomeAttain signal is not related to the operation mode or operation state of the servo drive.

Table 13–3 Comparison between homing and electrical homing

Mode	Homing trigger mode (H05.30)	Homing Direction, Deceleration Point, Home	Trigger Signal	Total Motor Displacement
Homing	0	-	-	-
	1	Determined by H05.31	HomingStart signal	Determined by the mechanical home coordinate and offset displacement
	3		Servo ON	
	4		Servo ON	
	6	-	-	-
	8	-	-	-
Electrical homing	2	The homing direction is consistent with the motor displacement sign (+/-). The deceleration point or home signal is not needed.	HomingStart signal	(H05.36 - H0b.07) x Electronic gear ratio
	5		Servo ON	

Homing



- Do not set H05.30 to 6 or 8 when the motor is operating by commands. Otherwise, speed fluctuation will occur.
- Set mechanical limit switches before enabling the homing function. For homing upon hit-and-stop, set the offset to a value within the travel range to prevent the machine from collision due to high-speed operation during homing.
- When the motor hits the limit switch during homing, the drive reports E950.0 (Forward overtravel) or E952.0 (Reverse overtravel), and the motor, if H05.40 is set to 0 or 1, stops in the stop mode defined by H02.07.

The following part takes an example to describe homing attaining:

- Forward, home switch as deceleration point and home (H05.31 = 0)
- Reverse, home switch as deceleration point and home (H05.31 = 1)
- Forward, Z signal as deceleration point and home (H05.31 = 2)
- Reverse, Z signal as deceleration point and home (H05.31 = 3)
- Forward, home switch as deceleration point and Z signal as home (H05.31 = 4)
- Reverse, home switch as deceleration point and Z signal as home (H05.31 = 5)
- Forward direction, deceleration point and home being forward limit switch signal (H05.31 = 6)
- Reverse, negative limit switch as deceleration point and home (H05.31 = 7)
- Forward, positive limit switch as deceleration point and Z signal as home (H05.31 = 8)
- Reverse, negative limit switch as deceleration point and Z signal as home (H05.31 = 9)
- Forward, mechanical limit position as deceleration point and home (H05.31 = 10)
- Reverse, mechanical limit position as deceleration point and home (H05.31 = 11)
- Forward, mechanical limit position as deceleration point and Z signal as home (H05.31 = 12)
- Reverse, mechanical limit position as deceleration point and Z signal as home (H05.31 = 13)
- Forward single-turn homing (H05.31 = 14)
- Reverse single-turn homing (H05.31 = 15)
- Single-turn nearby homing (H05.31 = 16)

Note

In the following figure, "H" represents high speed 6099.01h, and "L" represents low speed 6099.02h, and “-” indicates reverse run.

- Forward, home switch as deceleration point and home (H05.31 = 0)

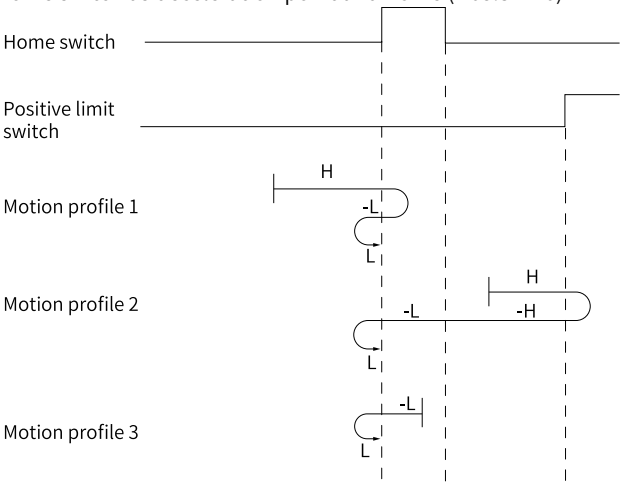


Figure 13-3 Motor running curve and speed in mode 0

  - Motion profile 1: The home switch (deceleration point) signal is active when the motor starts running, with the positive limit switch not triggered in the whole process.
  - Motion profile 2: The home switch (deceleration point) signal is inactive when the motor starts to run, with the positive limit switch triggered.
  - Motion profile 3: The home switch (deceleration point) signal is active when the motor starts running, with the positive limit switch not triggered in the whole process.
- Reverse, home switch as deceleration point and home (H05.31 = 1)

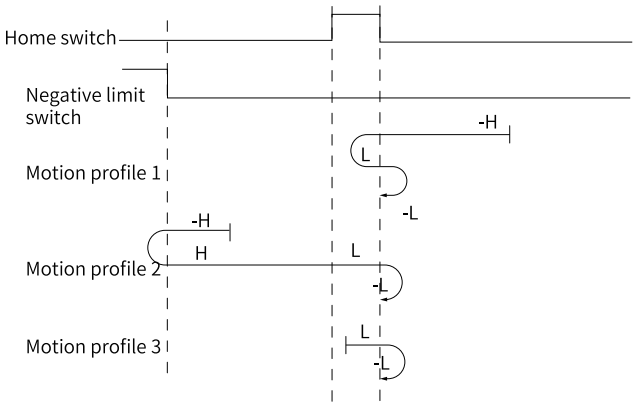


Figure 13-4 Motor running curve and speed in mode 1

- Motion profile 1: The home switch (deceleration point) signal is active when the motor starts running, with the negative limit switch not triggered in the whole process.
- Motion profile 2: The home switch (deceleration point) signal is inactive when the motor starts running, with the negative limit switch triggered.
- Motion profile 3: The home switch (deceleration point) signal is active when the motor starts running, with the negative limit switch not triggered in the whole process.

- Forward, Z signal as deceleration point and home (H05.31 = 2)

Caution

Note: In Modes 2 and 3 (H05.31 = 2 or 3) where the motor Z signal acts as the home and deceleration point, the actual stop position of the motor may not be on the rising edge on the same side of the motor Z signal. A deviation of ±1 pulse (in encoder unit) may be present in the stop position.

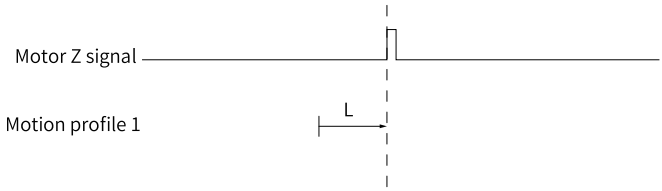


Figure 13-5 Motor running curve and speed in mode 2

- Motion profile 1: The Z signal is inactive when the motor starts running, with the positive limit switch not triggered in the whole process.

- Reverse, Z signal as deceleration point and home (H05.31 = 3)

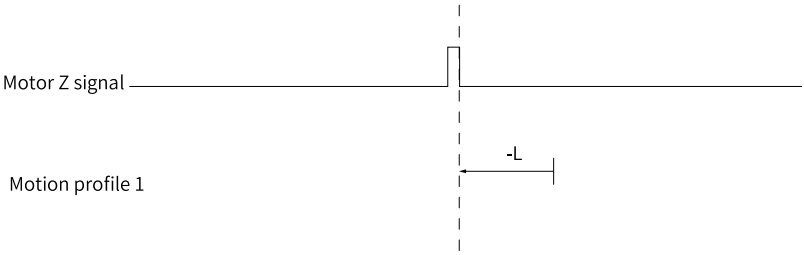


Figure 13-6 Motor running curve and speed in mode 3

  - Motion profile 1: The Z signal is inactive when the motor starts running, with the negative limit switch not triggered in the whole process.

- Forward, home switch as deceleration point and Z signal as home (H05.31 = 4)

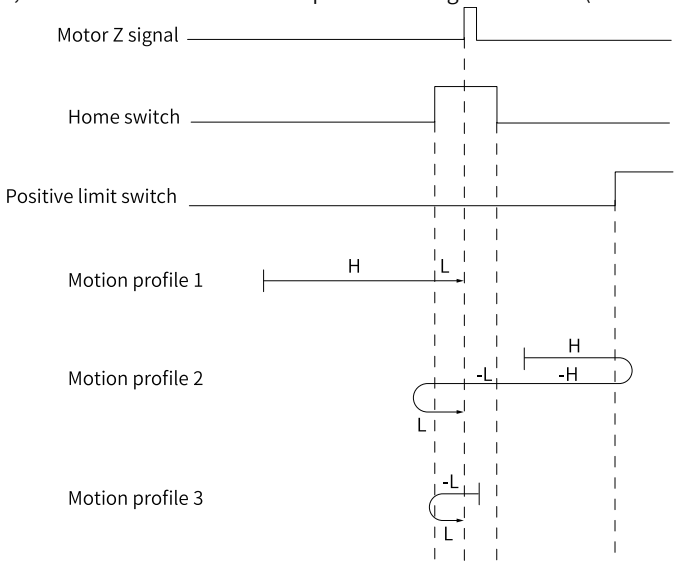


Figure 13-7 Motor running curve and speed in mode 4

  - Motion profile 1: The home switch signal is inactive when the motor starts running, with the positive limit switch not triggered in the whole process.
  - Motion profile 2: The home switch signal is inactive when the motor starts running, with the positive limit switch triggered.
  - Motion profile 3: The home switch signal is active when the motor starts running, with the positive limit switch not triggered in the whole process.

- Reverse, home switch as deceleration point and Z signal as home (H05.31 = 5)

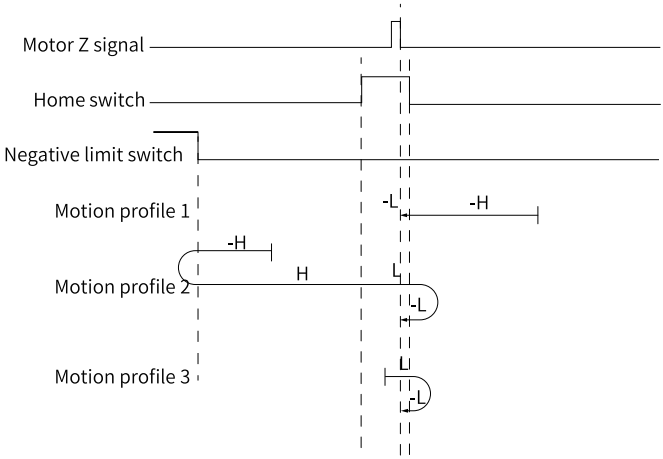


Figure 13-8 Motor running curve and speed in mode 5

- Motion profile 1: The home switch signal is inactive when the motor starts running, with the negative limit switch not triggered in the whole process.
- Motion profile 2: The home switch signal is inactive when the motor starts running, with the negative limit switch triggered.
- Motion profile 3: The home switch signal is active when the motor starts running, with the negative limit switch not triggered in the entire process.

- Forward direction, deceleration point and home being forward limit switch signal (H05.31 = 6)

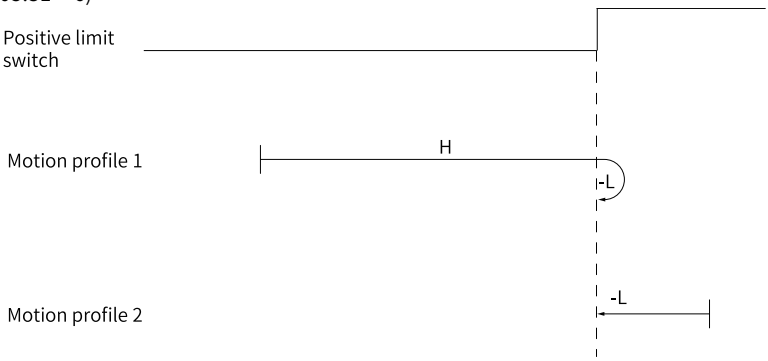


Figure 13-9 Motor running curve and speed in mode 6

- Motion profile 1: The positive limit switch signal is inactive when the motor starts running.
- Motion profile 2: The positive limit switch signal is active when the motor starts running.

- Reverse, negative limit switch as deceleration point and home (H05.31 = 7)

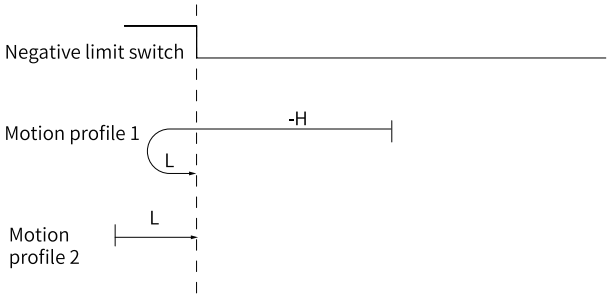


Figure 13-10 Motor running curve and speed in mode 7

- Motion profile 1: The negative limit switch signal is inactive when the motor starts running.
- Motion profile 2: The negative limit switch signal is active when the motor starts running.

- Forward, positive limit switch as deceleration point and Z signal as home (H05.31 = 8)



Figure 13-11 Motor running curve and speed in mode 8

- Motion profile 1: The positive limit switch signal is inactive when the motor starts running.
- Motion profile 2: The positive limit switch signal is active when the motor starts running.

- Reverse, negative limit switch as deceleration point and Z signal as home (H05.31 = 9)

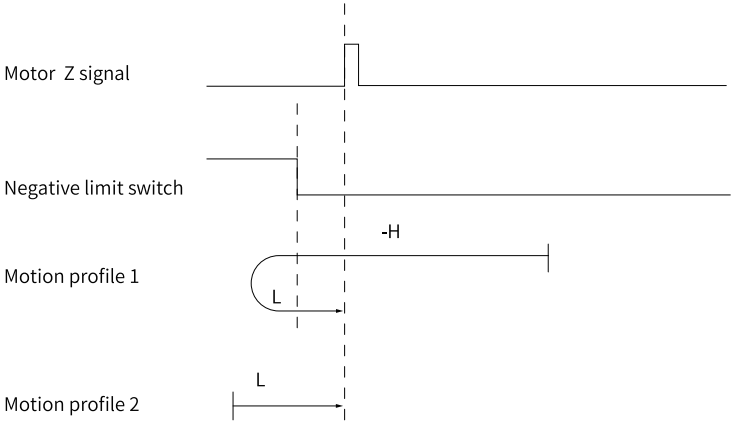


Figure 13-12 Motor running curve and speed in mode 9

- Motion profile 1: The negative limit switch signal is inactive when the motor starts running.
- Motion profile 2: The negative limit switch signal is active when the motor starts running.

- Forward, mechanical limit position as deceleration point and home (H05.31 = 10)

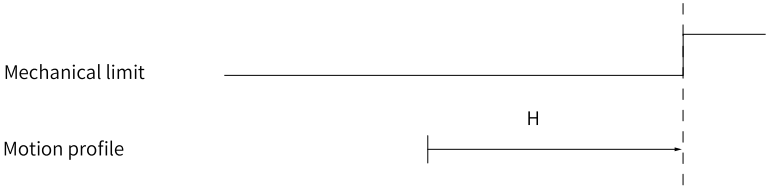


Figure 13-13 Motor running curve and speed in mode 10

- Motion profile: The positive limit switch signal is inactive when the motor starts running.

- Reverse, mechanical limit position as deceleration point and home (H05.31 = 11)

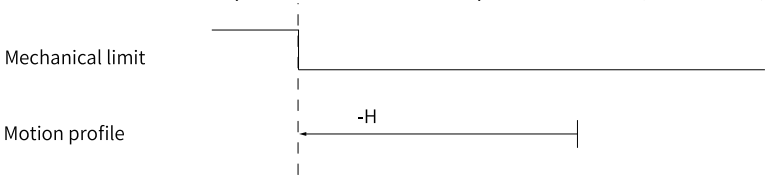


Figure 13-14 Motor running curve and speed in mode 11

- Motion profile: The negative limit switch signal is inactive when the motor starts running.

- Forward, mechanical limit position as deceleration point and Z signal as home (H05.31 = 12)

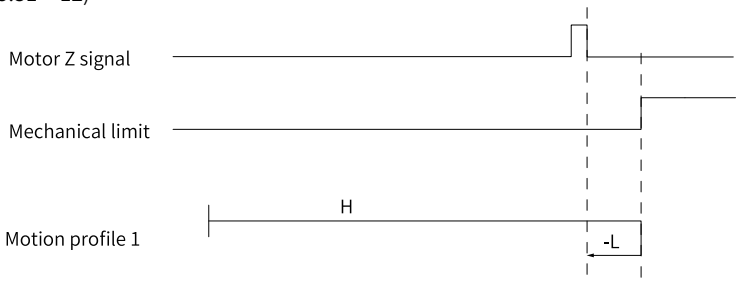


Figure 13-15 Motor running curve and speed in mode 12

  - Motion profile 1: The positive limit switch signal is inactive when the motor starts running.

- Reverse, mechanical limit position as deceleration point and Z signal as home (H05.31 = 13)

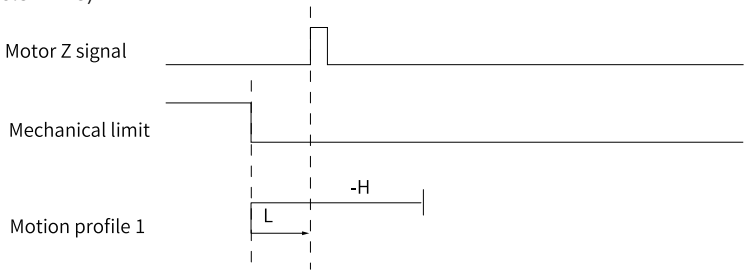


Figure 13-16 Motor running curve and speed in mode 13

  - Motion profile 1: The negative limit switch signal is inactive when the motor starts running.

- Forward single-turn homing (H05.31 = 14)

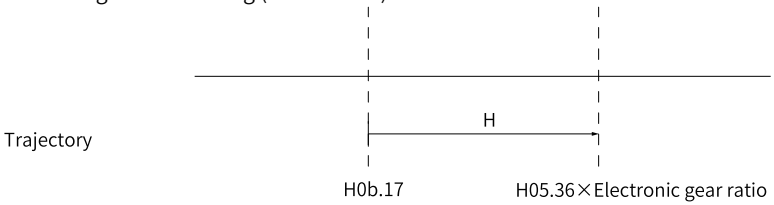


Figure 13-17 Motor running curve and speed in mode 14

  - Motion profile: The positive limit switch signal is inactive when the motor starts running.

Note

- When H05.31=14/15/16, the single-turn homing is only effective in absolute position single-turn mode (H02.01 = 4).
- If the home offset is set (H05.36 ≠ 0) and the mechanical home does not coincide with the mechanical zero (H05.40 = 0 or 2), the motor keeps running until H0b.07 = H05.36, and the absolute position defined by H0b.07 is cleared.
- If the home offset is set (H05.36 ≠ 0) and the mechanical home coincides with the mechanical zero (H05.40 = 1 or 3), the motor keeps running until H0b.07 = 0.

- Reverse single-turn homing (H05.31 = 15)

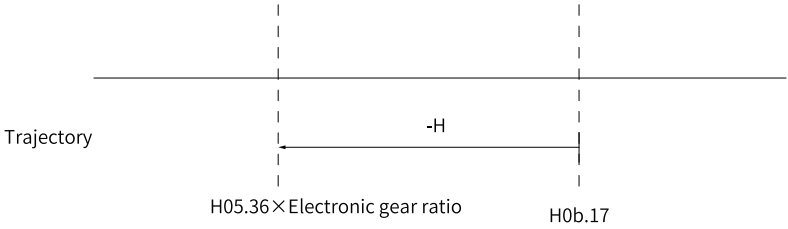


Figure 13-18 Motor running curve and speed in mode 15

  - Motion profile: The negative limit switch signal is inactive when the motor starts running.

Note

- When H05.31=14/15/16, the single-turn homing is only effective in absolute position single-turn mode (H02.01 = 4).
- If the home offset is set (H05.36 ≠ 0) and the mechanical home does not coincide with the mechanical zero (H05.40 = 0 or 2), the motor keeps running until H0b.07 = H05.36, and the absolute position defined by H0b.07 is cleared.
- If the home offset is set (H05.36 ≠ 0) and the mechanical home coincides with the mechanical zero (H05.40 = 1 or 3), the motor keeps running until H0b.07 = 0.

- Single-turn nearby homing (H05.31 = 16)

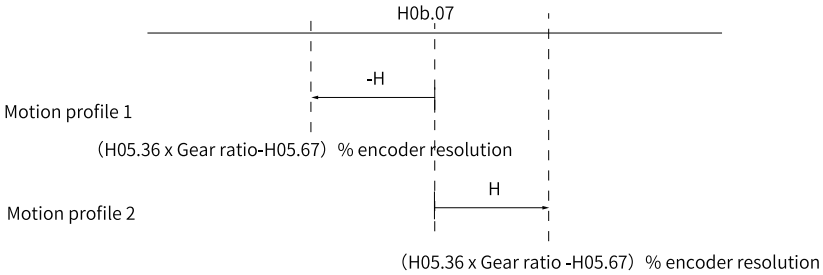


Figure 13-19 Motor running curve and speed in mode 16

- Motion profile 1: The positive limit switch signal is inactive when the motor starts running.
- Motion profile 2: The negative limit switch signal is inactive when the motor starts running.

Note

- When H05.31=14/15/16, the single-turn homing is only effective in absolute position single-turn mode (H02.01 = 4).
- If the home offset is set (H05.36 ≠ 0) and the mechanical home does not coincide with the mechanical zero (H05.40 = 0 or 2), the motor keeps running until H0b.07 = H05.36, and the absolute position defined by H0b.07 is cleared.
- If the home offset is set (H05.36 ≠ 0) and the mechanical home coincides with the mechanical zero (H05.40 = 1 or 3), the motor keeps running until H0b.07 = 0.

Evaluation condition for torque homing: After the motor reaches the hard limit, and the torque feedback reaches the limit value defined in H05.58 (mechanical torque limit, in 0.1%), the first Z signal in the reverse direction is searched for and regarded as the home after the motor stops.

Electrical homing: starting electrical homing (H05.30 = 5)

The mechanical zero position is obtained after homing is done. In this case, you can make the motor move from current position (H0b.07) to the designated position (H05.36) by setting H05.36 (Mechanical home offset).

In the electrical homing mode, the motor runs at the speed defined by H05.32 in the direction defined by the sign (+/-) of the displacement value. The total displacement is determined by the difference between H05.36 and H0b.07. The motor stops immediately after the displacement reference is done executing.

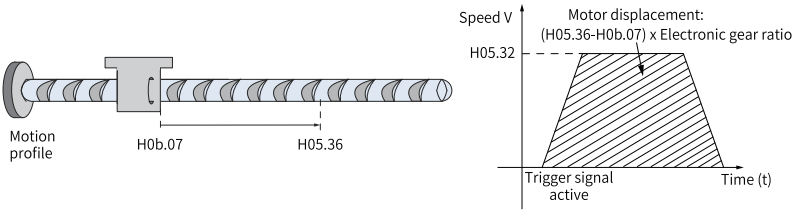
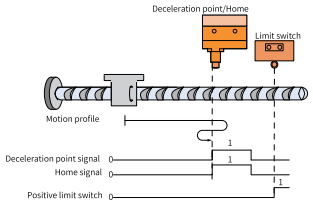
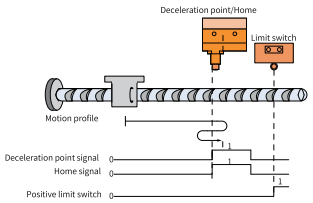
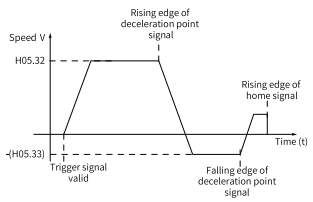
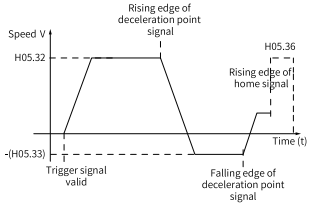


Figure 13-20 Motor running curve and speed in electrical homing

Mechanical home and mechanical zero

The following takes "H05.30 = 0" as example to describe the difference between mechanical home and mechanical zero.

Table 13–4 Description of mechanical home and mechanical zero

Mechanical Zero Different From Mechanical Home Reference Point	Mechanical Zero Same As Mechanical Home Reference Point
If the home offset is present (H05.36 ≠ 0) and the mechanical home differs from the mechanical zero (H05.40 = 0 or 2), the motor stops immediately after reaching the rising edge of the home signal during acceleration or forward operation at constant speed. After stop, the motor absolute position (H0b.07) is changed to the setpoint of H05.36 (Mechanical home offset) forcibly.	If the home offset is present (H05.36 ≠ 0) and the mechanical home coincides with the mechanical zero (H05.40 = 1 or 3), the motor continues running after reaching the rising edge of the home switch signal during acceleration or forward operation at constant speed until the absolute position (H0b.07) reaches the setpoint of H05.36 (Mechanical home offset).
	
	

Setting parameters

- Homing mode setting
  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.30	2005-1Fh	Homing enable selection	0: Disabled 1: Homing enabled through the HomingStart signal input from DI 2: Electrical homing enabled through the HomingStart signal input from DI 3: Homing started immediately upon power-on 4: Homing executed immediately 5: Electrical homing started 6: Current position as home 8: D-triggered position as home Note: For model N, only 0 and 6 is available.	0	-	Real-time
H05.31	2005-20h	Homing mode	0: Forward, home switch as deceleration point and home 1: Reverse, home switch as deceleration point and home 2: Forward, Z signal as deceleration point and home 3: Reverse, motor Z signal as deceleration point and home 4: Forward, home switch as deceleration point and Z signal as home 5: Reverse, home switch as deceleration point and Z signal as home 6: Forward, positive limit switch as deceleration point and home 7: Reverse, negative limit switch as deceleration point and home 8: Forward, positive limit switch as deceleration point and Z signal as home 9: Reverse, negative limit switch as deceleration point and Z signal as home 10: Forward, mechanical limit position as deceleration point and home 11: Reverse, mechanical limit position as deceleration point and home 12: Forward, mechanical limit position as deceleration point and Z signal as home 13: Reverse, mechanical limit position as deceleration point and Z signal as home 14: Forward single-turn homing 15: Reverse single-turn homing 16: Nearby single-turn homing	0	-	Real-time
H05.40	2005-29h	Mechanical home offset and action	0: H05.36 as the coordinate after homing, reverse homing applied after homing triggered again on overtravel	0	-	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
		upon overtravel	1: H05.36 as the relative offset after homing, reverse homing applied after homing triggered again on overtravel 2: H05.36 as the coordinate after homing, reverse homing auto-applied on overtravel 3: H05.36 as the relative offset after homing, reverse homing auto-applied on overtravel			

- Homing curve setting
  If the home signal is activated before the deceleration triggered by an active deceleration point signal is fully done executing, the final positioning may be unstable. Take the displacement required by deceleration into account before setting the deceleration point and homing signal input position. The acceleration/deceleration time during homing (H05.34) also affect the positioning stability.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.32	2005-21h	Speed of high-speed search for home switch signal	0 rpm to 3000 rpm	100	rpm	Real-time
H05.33	2005-22h	Speed of low-speed search for home switch signal	0 rpm to 1000 rpm	10	rpm	Real-time
H05.34	2005-23h	Acceleration/Deceleration time during homing	0 ms–1000 ms	1000	ms	Real-time
H05.35	2005-24h	Home search time limit	0 to 65535	10000	-	Real-time
H05.36	2005-25h	Mechanical home offset	-2147483648 to 2147483647	0	reference unit	Real-time

  ☆ Related parameters:

Code	Name	Function Name	Function
FunIN.31	HomeSwitch	Home switch	Active: Current position as home Set the logic of the DI assigned with FunIN.31 to "active high" or "active low" based on the output of the host controller. See the following table for details. See the following table for details.
FunIN.32	HomingStart	Homing enable	Active: Homing enabled (The HomingStart signal cannot be triggered repeatedly during homing.) Inactive: Homing inhibited
FunIN.41	HomingRecord	DI-triggered point as the home	The edge-triggered position is taken as the home.
FunOut.16	HomeAttain	Home find	Active: Homing completed in the position control mode Inactive: Homing not completed
FunOut.17	ElecHomeAttain	Electrical homing completed	Active: Electrical homing completed in the position control mode Inactive: Electrical homing not completed

DI Logic Set by HomeSwitch	Actual Active Level
0 (low level)	Low level
1 (high level)	High level

Sequence

- H05.30 = 1 or 2

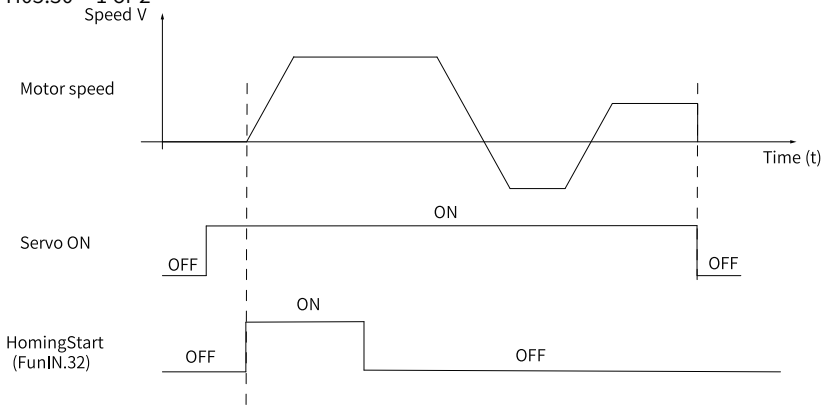


Figure 13-21 Sequence example

- Switch on the S-ON signal first and then the HomingStart signal.

- During homing, the S-ON signal remains active and the change of the HomingStart signal is shielded.
- During homing, the motor stops if the S-ON signal is switched off. To enable homing again, switch on the S-ON signal first and then the HomingStart signal.
- If E601.0 (Homing timeout) occurs, the motor stops, but the S-ON signal remains active. In this case, trigger the HomingStart signal again to reset E601.0, and execute homing again.
- The homing operation can be triggered repeatedly.

- H05.30 = 3
  - The homing operation is executed only when the S-ON signal is switched on for the first time after power-on.
  - The motor stops when E601.0 (Homing timeout) occurs. To reset E601.0, deactivate the S-ON signal.
  - The homing operation can only be triggered again at next power-on.
- H05.30 = 4 or 5
  - The homing operation is executed immediately after the S-ON signal is switched on upon power-on.
  - If the S-ON signal is deactivated during homing, the motor stops immediately. To trigger homing again, activate the S-ON signal again.
  - When E601.0 (Homing timeout) occurs, H05.30 is set to 0 and the motor stops. To reset E601.0, deactivate the S-ON signal. To perform homing again, reset H05.30. After homing is done, H05.30 is set to 0. To perform homing again, set H05.30 again.
- H05.30 = 6
  - To take the current position as the home and achieve home offset (H05.40 = 0 or 2, H05.36 ≠ 0), set H05.36 and H05.40 first, and then set H05.30 to 6. Failing to do so will cause H0b.07 to keep the previous value of H05.36 rather than the one set currently.
  - After homing is done, H05.30 will be set to 0. To enable homing again, re-write H05.36 and set H05.30 to 6.
- H05.30 = 8
  - To take the DI-triggered position as the home, assign FunIN.41 to a DI first and set the current position as the home.
  - To achieve home offset (H05.40 = 0 or 2, H05.36 ≠ 0), set H05.36 and H05.40 first, and then set H05.30 to 6. Failing to do so will cause H0b.07 to keep the previous value of H05.36 rather than the one set currently.

13.4 Interrupt Positioning



The interrupt positioning signal cannot be triggered during homing.

Description

If interrupt positioning is triggered in the position control mode, the servo drive halts current operation and turns to executing the pre-set fixed distance. To be specific, when the S-ON signal is active in the position control mode, if this function is enabled, the servo motor runs the position reference for interrupt positioning in the original direction (before the function is triggered).

When interrupt positioning is in progress, the servo drive does not respond to any other internal/external position references (including another interrupt positioning command). In this case, the input position reference counter (H0b.13) counts the interrupt positioning reference only. After interrupt positioning is done, the servo drive may or may not respond to the position references depending on the setpoint of H05.29 (Interrupt positioning clear signal). The position references received during interrupt positioning are invalid.

After interrupt positioning is done, the servo drive outputs the interrupt positioning completed (FunOUT.15: XintCoin) signal and positioning completed (FunOUT.5: COIN) signal, while the host controller, upon receiving XintCoin signal, acknowledges interrupt positioning is done. The XintCoin signal output is not related to the S-ON signal or the logic of DI8.

Interrupt positioning is effective only when the following conditions are met:

- The motor speed is higher than or equal to 10 rpm before interrupt positioning is triggered, or the setpoints of H05.26 (Constant operating speed in interrupt positioning) and H05.24 (Displacement of interrupt positioning) are not 0.
- The DI assigned with FunIN.33 (Interrupt positioning inhibited) is not used or the logic of this DI is inactive.

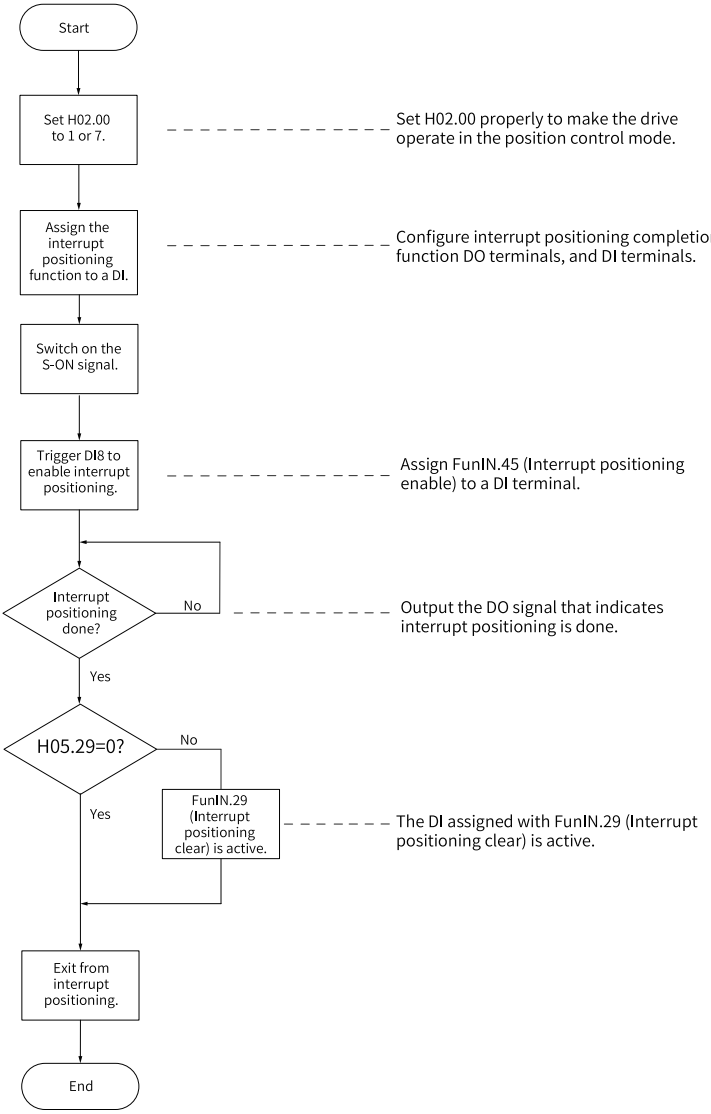


Figure 13-22 Flowchart of interrupt positioning signal

Setting parameters

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.24	2005-19h	Interrupt positioning displacement	-1073741824 to 1073741824	10000	Reference unit	Real-time
H05.26	2005-1Bh	Constant operating speed in interrupt positioning	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time
H05.27	2005-1Ch	Acc./Dec. time of interrupt positioning	0 ms–65535 ms	10	ms	Real-time
H05.29	2005-1Eh	Interruption fixed length unlock	0: Disabled 1: Enabled	1	-	Real-time

☆ Related parameters:

Code	Name	Function Name	Function
FunIN.29	XintFree	Interrupt positioning clear	Active: The interrupt positioning state is cleared, which means the servo drive can respond to other position references. Inactive: The interrupt positioning state is locked, which means the servo drive cannot respond to other position references.
FunIN.33	XintInHibit	Interrupt positioning inhibited	Active: Interrupt positioning inhibited Inactive: Interrupt positioning allowed
FunIN.45	XintEn	Interrupt positioning selection	Active: Interrupt positioning enabled Inactive: Interrupt positioning disabled The DI assigned with FunIN.45 (Interrupt positioning enable) is used to trigger interrupt positioning.
FunOut.15	XintCoin	Interrupt positioning completed	Active: Interrupt positioning completed in position control Inactive: Displacement in interrupt positioning not completed in position control

When DI7 is assigned with FunIN.45, the active logic of DI7 is as follows:

Table 13–5 Active logic of DI7 during interrupt positioning

H03.15	Active Logic of DI7
0	Active low
1	Active high

The constant operating speed during interrupt positioning is shown in the following figure.

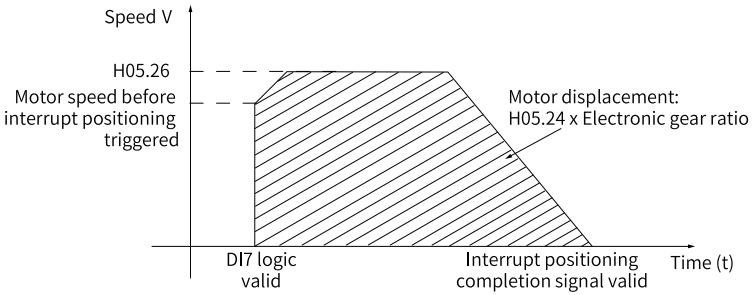


Figure 13-23 Motor operating curve during interrupt positioning

Table 13–6 Motor speed during interrupt positioning

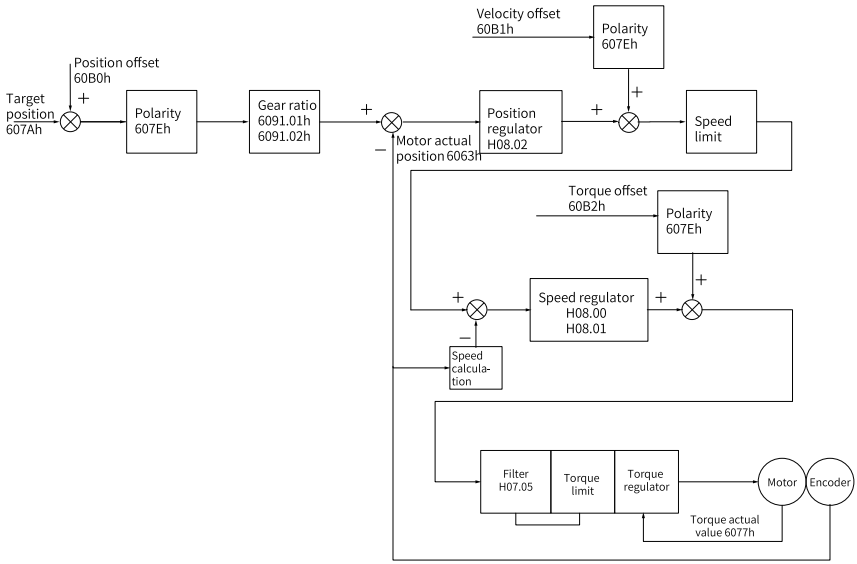
H05.26	Motor Speed (rpm) Before Triggering Interrupt Positioning	Interrupt Positioning	Constant operating speed in interrupt positioning
0	< 10	Inactive	-
	⩾ 10	Active	Motor Speed before Triggering Interrupt Positioning
1–6000	-	Active	H05.26

14 Control Mode [N]

14.1 Cyclic Synchronous Position Mode (CSP)

In CSP mode, the host controller generates the position references and sends the target position to the servo drive cyclically. The servo drive executes position control, speed control, and torque control.

14.1.1Function Block Diagram



14.1.2Configuration Block Diagram

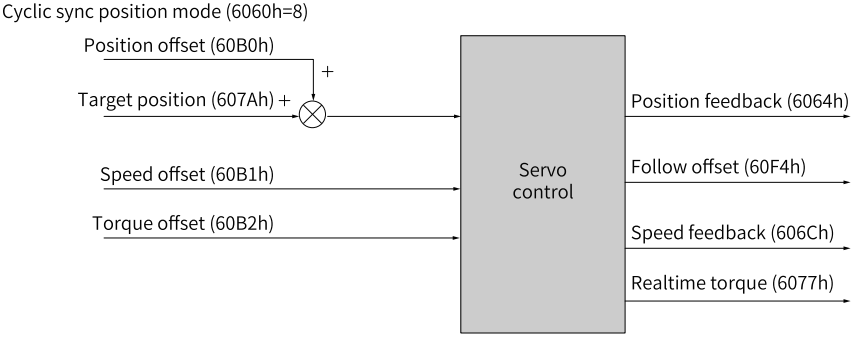


Figure 14-1 Cyclic synchronous position mode

14.1.3Recommended Configuration

RPDO	TPDO	Remarks
6040h: control word	6041h: status word	Mandatory
607Ah: target position	6064h: position actual value	Mandatory
6060h: modes of operation	6061h: modes of operation display	Optional

14.1.4Related Parameters

6040h Control word

Address: 6040h

Min.: 0x0 Unit: -

Max.: 0xFFFF Data Type: UInt16

Default: 0x0 Change: Real-time

Access: RW Mapping: RPDO

Value Range:

0x0 to 0xFFFF

Description:

Defines the control command.

bit	Name		Description
0	Switch on	Switch on	1: Enabled, 0: Disabled
1	Enable voltage	Enable voltage	1: Enabled, 0: Disabled
2	Quick stop	Quick stop	0: Enabled, 1: Disabled
3	Enable operation	Enable operation	1: Enabled, 0: Disabled

The CSP mode only supports absolute position references.

6041h Status word

Address: 6041h

Min.: 0x0 Unit: -

Max.: 0xFFFF Data Type: UInt16

Default: 0x0 Change: Unchangeable

Access: RO Mapping: TPDO

Value Range:

0x0 to 0xFFFF

Description:

Indicates the servo drive status.

bit	Name		Description
0	Ready to switch on	Ready to switch on	1: Enabled, 0: Disabled
1	Switch on	Switch on	1: Enabled, 0: Disabled
2	Enable operation	Operation enabled	1: Enabled, 0: Disabled
3	Fault	Fault	1: Enabled, 0: Disabled
4	Voltage enabled	Voltage enabled	1: Enabled, 0: Disabled
5	Quick stop	Quick stop	0: Enabled, 1: Disabled
6	Switch on disabled	Switch on disabled	1: Enabled, 0: Disabled
7	Alarm	Alarm	1: Enabled, 0: Disabled
8	Manufacturer-specific	Manufacturer-specific	Undefined
9	Remote	Remote	1: Enabled, control word activated 0: Disabled
10	Target reach	Target reach	Not supported, always being 1
11	Internal limit active	Internal limit active	0: Position reference within the limit 1: Position reference beyond the limit
12	Drive follows the command value	Drive follows the command value	Not supported, always being 1
13	Following error	Following error	0: EB00.0 (Excessive position deviation) not reported 1: EB00.0 (Excessive position deviation) reported
14	Manufacturer-specific	Manufacturer specific	Undefined
15	Home find	Home find	0: Home not found 1: Home found

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6060h	6060h	Servo drive mode	1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Real-time
6061h	6061h	Operation mode display	1: Profile position (PP) mode 3: Profile velocity (PV) mode	0	-	Unchangeable

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode			
6064h	6064h	Position actual value	-2147483648 to 2147483647	0	reference unit	Unchangeable
6065h	6065h	Following error window	0 to 4294967295	219895614	reference unit	Real-time
6066h	6066h	Defines the time lapse to trigger excessive position deviation (EB00.0).	0 ms–65535 ms	0	ms	Real-time
606Ch	606Ch	Actual speed	–2147483648 to +2147483647	0	Reference unit/s	Unchangeable
6077h	6077h	Actual torque	Setpoint range: -4000 to 4000 Actual value range: -400.0% to 400.0% Note: Actual value = Setpoint x Unit	0	0.10%	Unchangeable
607Ah	607Ah	Target position	-2147483648 to 2147483647	0	reference unit	Real-time
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time
60B0h	60B0h	Position offset	-2147483648 to 2147483647	0	reference unit	Real-time
60B1h	60B1h	Velocity offset	–2147483648 to +2147483647	0	Reference unit/s	Real-time
60B2h	60B2h	Torque offset	Setpoint range: -4000 to 4000 Actual value range: -400.0% to 400.0% Note: Actual value = Setpoint x Unit	0	0.10%	Real-time
60F4h	60F4h	Position deviation	-2147483648 to 2147483647	0	reference unit	Unchangeable

14.1.5Related Functions

Position deviation monitoring function

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6065h	6065h	Following error window	0 to 4294967295	219895614	reference unit	Real-time
6066h	6066h	Defines the time lapse to trigger excessive position deviation (EB00.0).	0 ms–65535 ms	0	ms	Real-time

Position reference polarity

You can change the position reference direction through setting the position reference polarity.

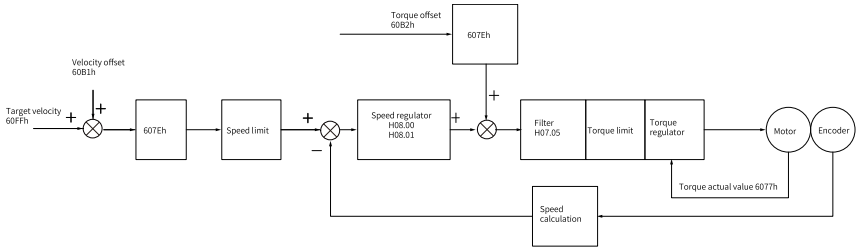
☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time

14.2 Cyclic Synchronous Velocity Mode (CSV)

In CSV mode, the host controller sends the target speed to the servo drive through cyclic synchronization. The servo drive executes speed control and torque control.

14.2.1Function Block Diagram



14.2.2Configuration Block Diagram

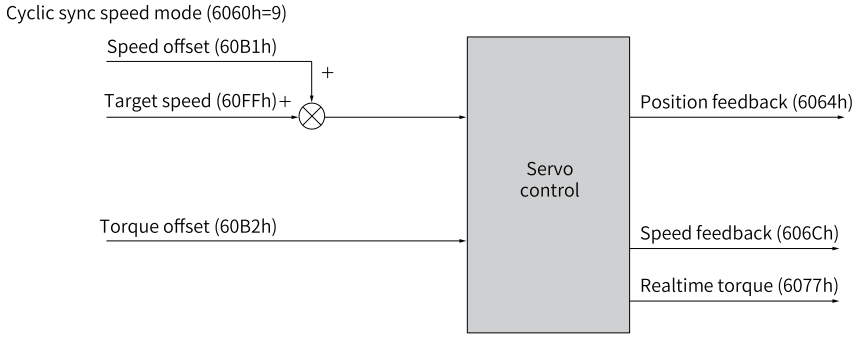


Figure 14-2 CSV mode

14.2.3Recommended Configuration

Basic configuration:

RPDO	TPDO	Remarks
6040h: control word	6041h: status word	Mandatory
60FFh: target velocity	-	Mandatory
-	6064h: position actual value	Optional
-	606Ch: velocity actual value	Optional
6060h: modes of operation	6061h: modes of operation display	Optional

14.2.4Related Parameters

6040h Control word

Address: 6040h
Min.: 0x0
Max.: 0xFFFF
Default: 0x0
Access: RW
Unit: -
Data Type: UInt16
Change: Real-time
Mapping: RPDO

Value Range:

0x0 to 0xFFFF

Description:

Defines the control command.

bit	Name		Description
0	Switch on	Switch on	1: Enabled, 0: Disabled
1	Enable voltage	Enable voltage	1: Enabled, 0: Disabled

bit	Name		Description
2	Quick stop	Quick stop	0: Enabled, 1: Disabled
3	Enable operation	Enable operation	1: Enabled, 0: Disabled

6041h Status word

Address: 6041h

Min.: 0x0 Unit: -

Max.: 0xFFFF Data Type: UInt16

Default: 0x0 Change: Unchangeable

Access: RO Mapping: TPDO

Value Range:

0x0 to 0xFFFF

Description:

Indicates the servo drive status.

bit	Name		Description
0	Ready to switch on	Ready to switch on	1: Enabled, 0: Disabled
1	Switch on	Switch on	1: Enabled, 0: Disabled
2	Enable operation	Operation enabled	1: Enabled, 0: Disabled
3	Fault	Fault	1: Enabled, 0: Disabled
4	Voltage enabled	Voltage enabled	1: Enabled, 0: Disabled
5	Quick stop	Quick stop	0: Enabled, 1: Disabled
6	Switch on disabled	Switch on disabled	1: Enabled, 0: Disabled
7	Alarm	Alarm	1: Enabled, 0: Disabled
8	Manufacturer-specific	Manufacturer-specific	Undefined
9	Remote	Remote	1: Enabled, control word activated 0: Disabled
10	Target reach	Target reach	Not supported, always being 1
11	Internal limit active	Internal limit active	0: Position reference within the limit 1: Position reference beyond the limit
12	Drive follows the command value	Drive follows the command value	Not supported, always being 1
13	-	N/A	N/A
14	Manufacturer-specific	Manufacturer-specific	Undefined
15	-	N/A	N/A

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6060h	6060h	Servo drive mode	1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Real-time
6061h	6061h	Operation mode display	1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Unchangeable
6064h	6064h	Position actual value	-2147483648 to 2147483647	0	reference unit	Unchangeable
606Ch	606Ch	Actual speed	–2147483648 to +2147483647	0	Reference unit/s	Unchangeable
6077h	6077h	Actual torque	Setpoint range: -4000 to 4000 Actual value range: -400.0% to 400.0% Note: Actual value = Setpoint x Unit	0	0.001	Unchangeable
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time
60B1h	60B1h	Velocity offset	–2147483648 to +2147483647	0	Reference unit/s	Real-time
60B2h	60B2h	Torque offset	Setpoint range: -4000 to 4000 Actual value range: -400.0% to 400.0% Note: Actual value = Setpoint x Unit	0	0.001	Real-time
60FFh	60FFh	PV, CSV mode speed reference	–2147483648 to +2147483647	0	Reference unit/s	Real-time

14.2.5Related Functions

Velocity reference polarity

You can change the speed reference direction through setting the speed reference polarity.

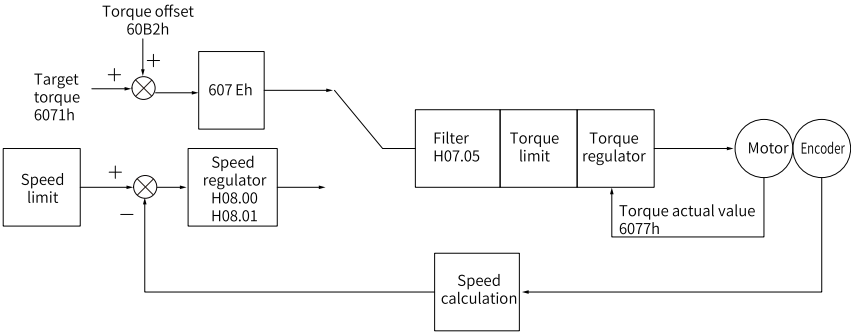
☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time

14.3 Cyclic Synchronous Torque Mode (CST)

In CST mode, the host controller sends the target torque to the servo drive through cyclic synchronization. The servo drive executes torque control.

14.3.1Function Block Diagram



14.3.2Configuration Block Diagram

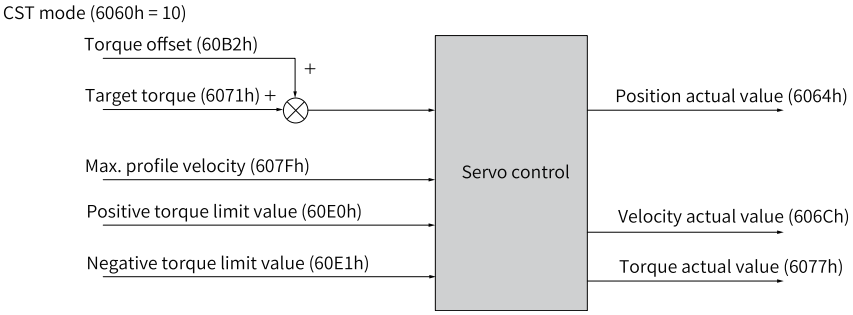


Figure 14-3 CST mode

14.3.3Recommended Configuration

Basic configuration:

RPDO	TPDO	Remarks
6040h: control word	6041h: status word	Mandatory
6071h: target torque	-	Mandatory

RPDO	TPDO	Remarks
-	6064h: position actual value	Optional
-	606Ch: velocity actual value	Optional
-	6077h: torque actual value	Optional
6060h: modes of operation	6061h: modes of operation display	Optional

14.3.4Related Parameters

6040h Control word

Address: 6040h
Min.: 0x0
Max.: 0xFFFF
Default: 0x0
Access: RW
Unit: -
Data Type: UInt16
Change: Real-time
Mapping: RPDO

Value Range:
0x0 to 0xFFFF
Description:
Defines the control command.

bit	Name		Description
0	Switch on	Switch on	1: Enabled, 0: Disabled
1	Enable voltage	Enable voltage	1: Enabled, 0: Disabled
2	Quick stop	Quick stop	0: Enabled, 1: Disabled
3	Enable operation	Enable operation	1: Enabled, 0: Disabled

6041h Status word

Address: 6041h
Min.: 0x0
Max.: 0xFFFF
Default: 0x0
Access: RO
Unit: -
Data Type: UInt16
Change: Unchangeable
Mapping: TPDO

Value Range:
0x0 to 0xFFFF
Description:
Indicates the servo drive status.

bit	Name		Description
0	Ready to switch on	Ready to switch on	1: Enabled, 0: Disabled
1	Switch on	Switch on	1: Enabled, 0: Disabled
2	Enable operation	Operation enabled	1: Enabled, 0: Disabled

bit	Name		Description
3	Fault	Fault	1: Enabled, 0: Disabled
4	Voltage enabled	Voltage enabled	1: Enabled, 0: Disabled
5	Quick stop	Quick stop	0: Enabled, 1: Disabled
6	Switch on disabled	Switch on disabled	1: Enabled, 0: Disabled
7	Alarm	Alarm	1: Enabled, 0: Disabled
8	Manufacturer-specific	Manufacturer-specific	Undefined
9	Remote	Remote	1: Enabled, control word activated 0: Disabled
10	Target reach	Target reach	Not supported, always being 1
11	Internal limit active	Internal limit active	0: Position reference within the limit 1: Position reference beyond the limit
12	Drive follows the command value	Drive follows the command value	Not supported, always being 1
13	-	N/A	N/A
14	Manufacturer-specific	Manufacturer-specific	Undefined
15	-	N/A	N/A

☆ Related parameters:

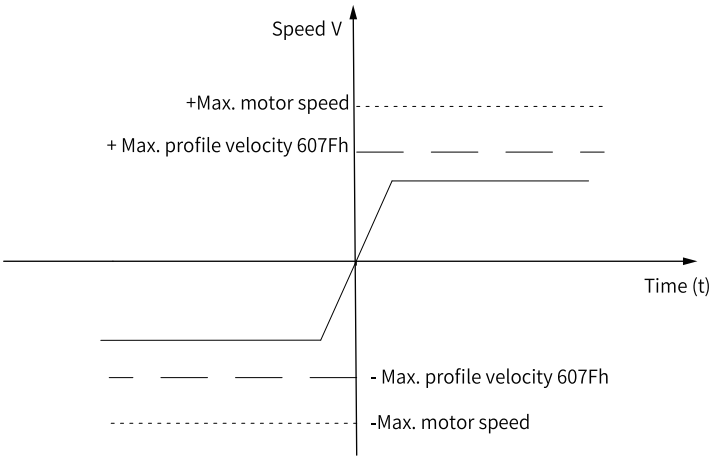
Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6060h	6060h	Servo drive mode	1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Real-time
6061h	6061h	Operation mode display	1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Unchangeable
6071h	6071h	Target torque	Setpoint range: -4000 to 4000 Actual value range: -400.0% to 400.0% Note: Actual value = Setpoint x Unit	0	0.10%	Real-time
6072h	6072h	Max. torque reference	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0%	3500	0.10%	Real-time

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
			Note: Actual value = Setpoint x Unit			
6074h	6074h	torque reference	Setpoint range: -4000 to 4000 Actual value range: -400.0% to 400.0% Note: Actual value = Setpoint x Unit	0	0.10%	Unchangeable
6077h	6077h	Actual torque	Setpoint range: -4000 to 4000 Actual value range: -400.0% to 400.0% Note: Actual value = Setpoint x Unit	0	0.10%	Unchangeable
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time
60B2h	60B2h	Torque offset	Setpoint range: -4000 to 4000 Actual value range: -400.0% to 400.0% Note: Actual value = Setpoint x Unit	0	0.10%	Real-time
60E0h	60E0h	Positive torque limit	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0% Note: Actual value = Setpoint x Unit	3000	0.10%	Real-time
60E1h	60E1h	Negative torque limit	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0% Note: Actual value = Setpoint x Unit	3000	0.10%	Real-time

14.3.5Related Functions

Speed limit in the torque control mode

In the torque mode, 607Fh can be used to limit the maximum speed in forward/ reverse operation. Note that the maximum speed cannot exceed the maximum running speed allowed by the motor.

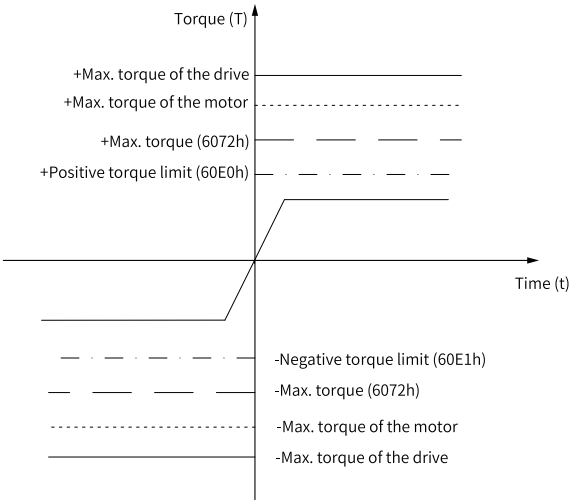


☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time

Torque limit

To protect mechanical devices, you can limit the torque reference in the position, speed, and torque control modes by setting 6072h (Maximum torque), 60E0h (Positive torque limit value), and 60E1h (Negative torque limit value). Note that the maximum torque allowed by the servo drive cannot be exceeded.



☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
6072h	6072h	Max. torque reference	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0% Note: Actual value = Setpoint x Unit	3500	0.001	Real-time
60E0h	60E0h	Positive torque limit	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0% Note: Actual value = Setpoint x Unit	3000	0.001	Real-time
60E1h	60E1h	Negative torque limit	Setpoint range: 0 to 4000 Actual value range: 0.0% to 400.0% Note: Actual value = Setpoint x Unit	3000	0.001	Real-time

Torque reference polarity

You can change the torque reference direction through setting the torque reference polarity.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time

15 Function Applications

15.1 Absolute System

15.1.1 Overview

- For the servo motor:
  The absolute encoder is used to detect the motor position within one turn and count the number of motor revolutions. For example, a 26-bit encoder has a single-turn resolution of 67108864 (2^{26}),and can record 26-bit multi-turn data. The absolute system integrated with the absolute encoder works in absolute position linear mode or absolute position rotating mode. These modes apply to position control, speed control, and torque control modes. The absolute encoder with a battery can back up data when the servo drive is powered off. This enables the servo drive to calculate the absolute mechanical position upon power-on again. Therefore, the homing operation is not required.

  To match an Inovance 26-bit absolute encoder with the SV680-INT, set H00.00 (Motor code) to 14102 (Inovance 26-bit absolute encoder). Then set H02.01 (Absolute system selection) based on actual conditions. E731.0 (Encoder battery failure) will occur upon initial power-on of the battery. Set H0d.20 (Absolute encoder reset function) to 1 to reset E731.0 before performing the homing operation.

- For the direct drive motor:
  There are two types of absolute systems: absolute position linear mode and incremental mode, which can be used in position, speed and torque control modes. With the absolute mode, the drive can calculate the absolute mechanical position through the encoder feedback after re-power-on, removing the need for homing. Set H02.01 (absolute system selection) according to the matched motor.

Note

When you change the value of H02.02 (Direction of rotation) or H0d.20 (Absolute encoder reset selection), the absolute position recorded by the encoder changes suddenly, causing the mechanical absolute position reference to change. In this case, perform the homing operation. After homing is done, the deviation between the mechanical absolute position and that recorded in the encoder will be calculated automatically and saved in the EEPROM of the servo drive.

Table 15–1 Absolute modes supported by the motor of SV680-INT

Type	Incremental mode	Absolute position linear mode	Absolute position rotation mode	Single-turn absolute mode
DDL motor + ABZ incremental encoder (TTL signal)	✓	×	×	×
DDL motor + Inovance incremental encoder	✓	×	×	×
DDL motor + Analog encoder + Inovance T5 interpolator	✓	×	×	×
DDL motor + BiSS-C encoder	✓	✓[1]	×	×
DDL motor + SSI encoder	✓	✓[1]	×	×
DDL motor + EnDat 2.2 encoder	✓	✓[1]	×	×
DDR motor + ABZ incremental encoder (TTL signal)	✓	×	×	×
DDR motor + Inovance absolute encoder	✓	✓	✓	✓
DDR motor + Analog encoder + Inovance T5 interpolator	✓	×	×	×
DDR motor + BiSS-C encoder	✓	×	×	✓
Servo motor + ABZ incremental encoder (TTL signal)	✓	×	×	×
Servo motor + Inovance absolute encoder	✓	✓	✓	✓
Servo motor + Analog encoder + Inovance T5 interpolator	✓	×	×	×
Servo motor + BiSS-C encoder	✓	×	×	✓
Servo motor + EnDat 2.2 encoder	✓	×	×	✓
Servo motor +Nikon absolute encoder	✓	✓	✓	✓

Type	Incremental mode	Absolute position linear mode	Absolute position rotation mode	Single-turn absolute mode
Servo motor + TAMAGAWA absolute encoder	✓	✓	✓	✓
Servo motor + SSI encoder	✓	✓	×	×

Note 1.

- Check whether the used encoder is compatible.
- Set H02.01 absolute mode according to the above table. If the mode is not supported, E122.0 will be triggered.

15.1.2Related Parameters

Absolute encoder system settings

Select the motor through H00.00, and select the absolute position mode through H02.01.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H00.00	2000-01h	Motor SN	20000: Linear motor - ABZ incremental encoder (TTL signal) 14203: Linear motor - BiSS-C encoder 14206: Linear motor - SSI encoder 14207: Linear motor - EnDat2.2 encoder 14202: Linear motor - Inovance communication 23-bit encoder 14205: Linear motor - Inovance T5 interpolator 20001: DDR motor - ABZ incremental encoder (TTL signal) 14210: DDR motor - Inovance T5 interpolator 14201: DDR motor - Inovance communication 23-bit encoder 14211: DDR motor - BiSS-C encoder 14212: DDR motor - EnDat2.2 encoder 14213: DDR motor - SSI encoder 20002: Rotary motor - ABZ incremental encoder (TTL signal) 14000: Rotary motor - Inovance communication 20-bit encoder 14101: Rotary motor - Inovance communication 23-bit encoder 14102: Rotary motor - Inovance communication 26-bit encoder 14020: Rotary motor - Harmonic 20-bit encoder - 2.5M baud rate 14021: Rotary motor - Harmonic 17-bit encoder - 2.5M baud rate 14022: Rotary motor - Harmonic 17-bit encoder - 4M baud rate 14120: Rotary motor - Nikon 20-bit encoder - 2.5M baud rate 14121: Rotary motor - Nikon 17-bit encoder - 2.5M baud rate 14122: Rotary motor - Nikon 17-bit encoder - 4M baud rate 14130: Rotary motor - TAMAGAWA 17-bit encoder 14131: Rotary motor - TAMAGAWA 23-bit encoder 14140: Rotary motor - EnDat2.2 encoder 14150: Rotary motor - SSI encoder 14160: Rotary motor - BiSS-C encoder	14102	-	At stop
H00.08	2000-09h	Bus encoder type	0 to 65535	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.01	2002-02h	Absolute system selection	0: Incremental mode 1: Absolute position linear mode 2: Absolute position rotation mode 3: Absolute position linear mode (without encoder overflow alarm) 4: Absolute position single-turn mode	0	-	At stop

Note

In the absolute position mode, the system detects the motor code automatically to check whether the motor used is configured with an absolute encoder. If not, E122.0 (Product mismatch in the absolute position mode) occurs.

Encoder feedback data

The encoder feedback data is divided into the number of revolutions and the single-turn position. For the incremental position mode and single-turn absolute position mode, the number of revolutions is not recorded.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0b.70	200b-47h	Number of absolute encoder revolutions	-32768Rev to 32767Rev	0	Rev	Unchangeable
H0b.71	200b-48h	Single-turn position fed back by the absolute encoder	0 to 2147483647	0	encoder unit	Unchangeable
H0b.77	200b-4Eh	Encoder position (low 32 bits)	0 to 4294967295	0	encoder unit	Unchangeable
H0b.79	200b-50h	Encoder position (high 32 bits)	-2147483648 to 2147483647	0	encoder unit	Unchangeable

Absolute position linear mode

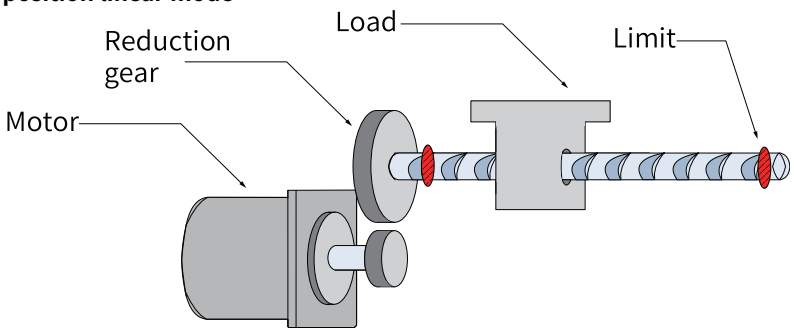


Figure 15-1 Servo motor linear mode mechanism

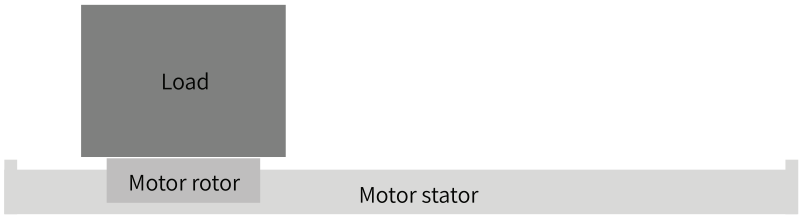


Figure 15-2 Linear motor linear mode mechanism

The SV680-INT is compatible with DDL motors, BiSS-C encoders and EnDat 2.2 encoders, and is suitable for absolute position linear mode.

Assume that the electronic gear ratio is B ÷ A, the mechanical absolute position (H0b.58 and H0b.60) is P_M, then the following formula applies: H0b.07 (Absolute position counter) = P_M ÷ (B ÷ A) H0b.07 indicates present mechanical absolute position (in reference unit).

The range of H0b.70 (absolute encoder revolutions) is -32768 to 32767. If H0b.70 overflows, E735.0 (Encoder multi-turn counting overflow) occurs. In this case, set H0d.20 to 2 (Reset multi-turn data), and then perform homing again. In special occasions, you can set H0A.36 to 1 to hide E735.0 or use absolute position linear mode 2.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.36	2005-25h	Mechanical home offset	-2147483648 to 2147483647	0	reference unit	Real-time
H05.46	2005-2Fh	DI selection of multi-turn	0: No operation 1: DI1	0	-	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
		frequency-division Z starting point	2: DI2 3: DI3 4: DI4 ...			
H0b.07	200b-08h	Absolute position counter	-2147483648 to 2147483647	0	reference unit	Unchangeable
H0b.58	200b-3Bh	Mechanical absolute position (low 32 bits)	0 to 4294967295	0	encoder unit	Unchangeable
H0b.60	200b-3Dh	Mechanical absolute position (high 32 bits)	-2147483648 to 2147483647	0	encoder unit	Unchangeable

Absolute position rotation mode

This mode applies in cases where the load travel range is unlimited and the number of unidirectional revolutions is lower than 32767 upon power failure, as shown in the following figure.

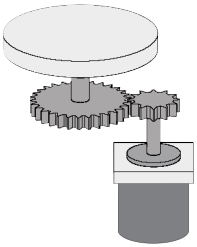
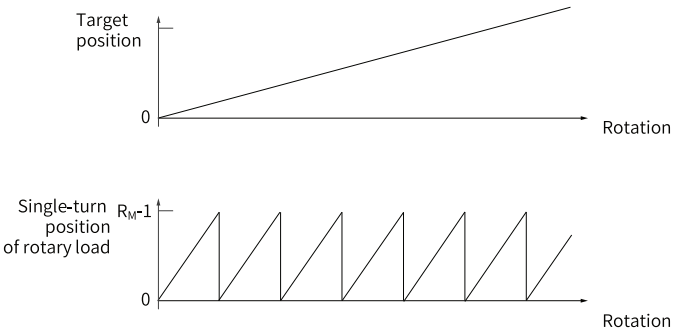
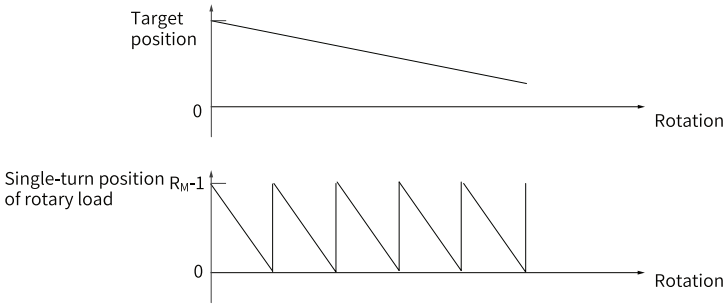


Figure 15-3 Application of the linear mode

The single-turn position range of the rotary load is 0 to (RM - 1) (RM: Encoder pulses per load revolution). When the gear ratio is 1:1, the variation law of the target position and the single-turn position of the rotary load during forward operation is shown as follows.



The variation law of the target position and the single-turn position of the rotary load during reverse operation is shown as follows.



When the motor operates in the absolute rotation mode and the drive operates in the HM mode, the setting range of the home offset is 0 to (R_M - 1). If the home offset is set to a value outside this range, the drive reports EE09.1 (Home setting error).

The multi-turn data range is unlimited in the absolute position rotation mode. Therefore, E735.0 (Encoder multi-turn counting overflow) is hidden automatically.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H05.50	2005-33h	Mechanical gear ratio in absolute position rotation mode (numerator)	1 to 65535	1	-	At stop
H05.51	2005-34h	Mechanical gear ratio in absolute position	1 to 65535	1	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
		rotation mode (denominator)				
H05.52	2005-35h	Pulses per revolution of the load in absolute position rotation mode (low 32 bits)	0 to 4294967295	0	encoder unit	At stop
H05.54	2005-37h	Pulses per revolution of the load in absolute position rotation mode (high 32 bits)	0 to 4294967295	0	encoder unit	At stop
H0b.81	200b-52h	Single-turn position of the rotary load (low 32 bits)	0 to 4294967295	0	encoder unit	Unchangeable
H0b.83	200b-54h	Single-turn position of the rotary load (high 32 bits)	-2147483648 to 2147483647	0	encoder unit	Unchangeable
H0b.85	200b-56h	Single-turn position of the rotary load (reference unit)	0 to 4294967295	0	reference unit	Unchangeable

Single-turn absolute mode

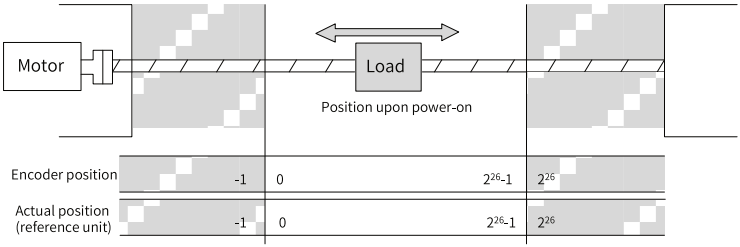
This mode applies to applications where the load travel range is within the single-turn range of the encoder. In this case, the absolute encoder needs no battery as it records the single-turn data only.

- Target position input range
  If a 26-bit absolute encoder is used in the single-turn absolute mode, the drive operates in the position control mode, and the electronic gear ratio 1:1, then:

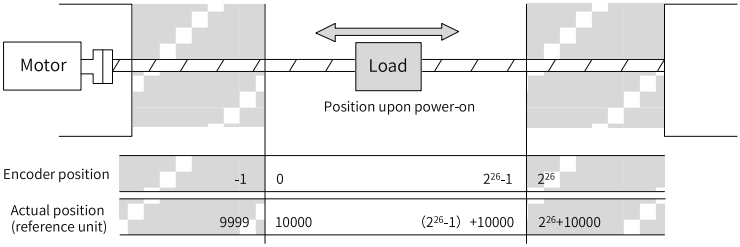
  When H05.36 (Mechanical home offset) is set to 0, the target position range is 0 to (2^{26} - 1).

  After homing is done, the target position range is H05.36 to (2^{26} - 1 + H05.36).

- Example
  Gear ratio: 1:1; H05.36 = 0:



Gear ratio: 1:1; H05.36 = 10000:



15.1.3Precautions for Using the Battery Box

This section only applies to Inovance servo motors.

E731.0 (Encoder battery failure) will occur at initial power-on of the battery. Set H0d.20 (Absolute encoder reset function) to 1 to reset E731.0 before further operations.

When the battery voltage detected is lower than 3.0 V, E730.0 (Encoder battery alarm) occurs.

In this case, replace the battery according to the following steps.

1. Power on the servo drive and make it stay in the non-operational state.
2. Replace the battery.
3. After the servo drive resets E730.0 automatically. If no other alarm occurs, continue to operate the servo drive.

Note

- If you replace the battery after powering off the servo drive, E731.0 (Encoder battery failure) will occur at next power-on, leading to an abrupt change in the multi-turn data. In this case, set H0d.20 to 1 to reset the encoder fault. Then perform the homing operation again.
- Ensure the maximum motor speed does not exceed 6000 rpm upon power-down of the servo drive. This is to enable the encoder to record the position accurately.
- Keep the battery in environments within the required ambient temperature range and ensure the battery is in reliable contact and carries sufficient power capacity. Otherwise, encoder data loss may occur.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0d.20	200d-15h	Absolute encoder reset	0: No operation 1: Reset fault 2: Reset fault and multi-turn data 3: Reset Inovance 2nd encoder fault 4: Reset Inovance 2nd encoder fault and multi-turn data	0	-	At stop

Note

The absolute position recorded by the encoder changes abruptly after multi-turn data reset. In this case, perform mechanical homing.

15.2 Full Closed-loop

15.2.1 Full Closed-loop Parameter Setting

After setting basic gain parameters, check that the servo drive operates properly without overshoot and stops without generating unexpected noise. When basic operating conditions are met, set the closed-loop parameters based on the following procedure.

1. **Set the external encoder feedback type.**
   Set H0F.03 based on the external encoder type.

Note

- The SV680-INT supports five secondary encoder types, including the ABZ incremental encoder (TTL signal), Inovance communication encoder, BiSS-C encoder, SSI encoder and EnDat 2.2 encoder.
- After enabling the fully closed-loop function, enable the JOG function to observe whether the value of H0F.20 (External position pulse feedback display) changes. In the case of improper wiring, the value of H0F.20 does not change and a fully closed-loop fault will be reported. In this case, rectify the fault and perform a power cycling until the value of H0F.20 changes without fault alarm.
- If the feedback type of the external encoder is ABZ incremental pulses without Z signal (TTL signal), set H0F.22 to 1 to hide the detection on phase Z.

Note

- BiSS-C encoder:
  - The BiSS-C encoder generally has a data bit and an error bit. You can obtain their data lengths in the corresponding encoder user guide. The data length of the error bit is usually 2 bits.
  - You can obtain the communication frequency and recovery time from the encoder user guide.
  - CRC is used.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).
- SSI encoder:
  - The SSI encoder generally has a data bit and an error bit. You can obtain their data lengths in the corresponding encoder user guide.
  - Parity check is used.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).
- EnDat2.2 encoder:
  - You need to set the data length for the EnDat2.2 encoder.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).

2. **Confirm the operating direction of the external encoder.**

Check whether the operating directions of the internal and external encoders are the same, if not, runaway can occur due to positive feedback.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0F.01	200F-02h	External encoder usage mode	0: Standard operating direction 1: Reverse operating direction	0	-	Real-time

The following describes how to confirm the operating direction of the external encoder.

Enter the JOG mode, and perform jogging at low speed in one direction. Observe the value of H0F.18 (Feedback pulse counter of internal encoder) and H0F.20 (Feedback pulse counter of external). If these two values change in the same way (increase or decrease simultaneously), set H0F.01 to 0; if not, set H0F.01 to 1.



- Perform necessary inspections before motor trial run. See *SV680-INT Series Servo Drive Quick Installation and Commissioning Guide* for details.
- Set H0F.01 properly. If H0F.01 is set improperly, runaway fault may occur.

3. **Determine the resolution of external encoder (external encoder pulses per revolution)**
   Rotate the motor and observe the value of H0F.18 (Feedback pulse counter of internal encoder) to confirm the motor has rotated for a full turn. Then calculate the variation of H0F.20 (Feedback pulse counter of external encoder), and incorporate this value into H0F.04.

   ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0F.04	200F-05h	External encoder pulses per revolution	1 to 2147483647	10000	-	At stop

Caution

- Suppose the values of H0F.18 and H0F.20 before the motor rotates are X_1 and Y_1 respectively, and their values change to X_2 and Y_2 after the motor rotates, then the following formula applies:

$$\text{H0F.04} = \text{Number of internal encoder pulses per motor revolution} \times \frac{Y_2-Y_1}{X_2-X_1}$$

- The calculation result must be a positive value. If it is a negative value, it indicates H0F.01 is set improperly. In this case, check the value of H0F.01 again.
- Set H0F.04 properly. If H0F.04 is set to a wrong value, EB02.0 (Position deviation too large in fully closed-loop mode) may occur when the drive is operating.

4. **Set the electronic gear ratio of external encoder.**

   If H0F.00 is set to 1, set H05.07/H05.09. If H0F.00 is set to 2, set H05.07/H05.09 for inner loop H05.11/H05.13 for outer loop.

   See the related section for how to set the electronic gear ratio.

   Suppose for a fully closed-loop device,
   the external mechanical displacement corresponding to each X_1 pulse reference sent by the host controller is Y_1.
   Then perform the following operations:

   a. Step 1: Set the electronic gear ratio to 1:1.

   b. Step 2: Make the host controller send X_2 pulses. The external mechanical displacement measured is Y_2,
   then the electronic gear ratio fulfills the needs.

Note

- To set the fully closed-loop electronic gear ratio in internal/external closed-loop position switchover mode, set the electronic gear switchover switch (Gear_Sel) to the external closed-loop state.
- This method also applies to internal closed-loop mode. In the internal closed-loop mode, ensure the present state is internal closed-loop state.
- Set the electronic gear ratio correctly. Failure to comply will result in mechanical deviation.

5. **Set the alarm threshold.**

   Set H0F.08 and H0F.10 as follows.

   - Set H0F.08 (Excessive deviation in compound control).

H0F.08 defines the position deviation threshold at which the servo drive reports EB02.0 (Position deviation too large in fully closed-loop mode). Its unit is one reference unit (same as one external encoder unit).

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0F.08	200F-09h	Excessive deviation threshold in compound control mode	0 to 2147483647	1000	-	Real-time

For example, if H0F.08 is set to 1000, EB02.0 (Position deviation too large in fully closed-loop mode) will be outputted if the deviation between the mechanical displacement driven by the motor and the mechanical displacement (compound deviation) measured by the external encoder exceeds the displacement corresponding to 1000 external encoder pulses.

Note

- If it is set to 0, EB02.0 (Position deviation too large in fully closed loop) will not be output.
- H0F.08 must be set to a value (such as H0F.04 x H0F.10 x 50%) lower than H0F.04 x H0F.10. Otherwise, EB02.0 cannot be outputted.

- Set H0F.10 (Clear deviation in compound control).
  The value of H0F.10 indicates the revolutions to be ran by the motor per deviation clear in the compound control mode.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0F.10	200F-0Bh	Clear deviation in compound control mode	0 RPM –100 RPM	1	rpm	Real-time

If its value is set to 0, the deviation in compound control will not be cleared.

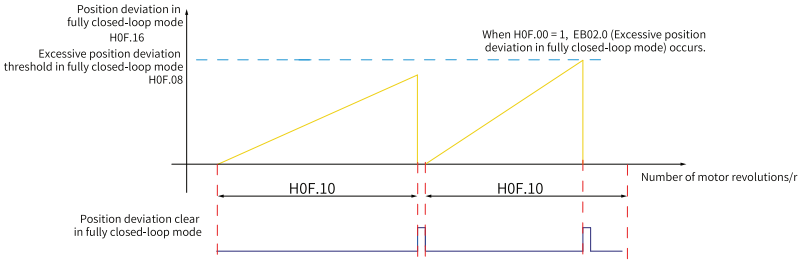


Figure 15-4 Description of position deviation clear in the fully closed-loop mode

The number of revolutions defined by H0F.10 is detected through internal encoder feedback pulses.

For example, if H0F.10 is set to 50, the servo drive detects whether the deviation in compound control exceeds the pulse unit defined by H0F.08 when the motor is in the process of rotating within 50 turns. If yes, EB02.0 will be reported. If not, the servo drive clears the deviation after the motor rotates for more than 50 turns, and then starts monitoring again.

- Set the first-order low-pass filter for deviation in compound control.
  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0F.13	200F-0Eh	Compound vibration suppression filter time	0.0 ms–6553.5 ms	0.0	ms	At stop

The first-order filter time constant is used to filter vibration of the deviation in compound control, smoothening the speed in fully closed-loop mode.

- Set the source of touch probe Z signal in fully closed-loop mode.
  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0F.25	200F-1Ah	Set the source of touch probe Z signal in fully closed-loop mode.	0: Motor Z signal 1: External feedback Z signal	0	-	Real-time

H0F.25 (Source of touch probe Z signal in fully closed-loop mode) defines the source of Z signal during homing in the fully closed-loop mode. The setpoint 0 indicates Z signal of inner loop of used as the source and the setpoint 1

indicates Z signal of the outer loop is used as the source. When the Z signal of outer loop is used as the source, ensure Z signal is wired correctly. Otherwise, Z signal may fail to be detected.

Caution

- Set H0F.10 properly for clearing deviation in compound control. Given the setpoint of H0F.08, if H0F.10 is set to an excessively low value, protection against excessive deviation in compound control can fail.
- Pay attention to encoder limit setting during use.
- Set this warning properly. Failure to comply may incur physical injuries due to runaway accident.

15.2.2Enable Fully Closed-loop

After setting preceding fully closed-loop parameters, observe the internal/external encoder feedback through H0F.18 and H0F.20, and check whether the fully closed-loop wiring and the application mode of the external encoder are proper. If yes, enable the fully closed-loop function.

Set the following parameters while enabling the fully closed-loop function:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H03.02	2003-03h	DI1 function	For details, see the commissioning software or *SV680-INT Series Servo Drive Parameter Guide*.	14	-	Real-time
H0F.00	200F-01h	Encoder feedback mode	0: Internal encoder feedback 1: External encoder feedback 2: Inner/Outer loop switchover	0	-	Real-time

Note

To switch between inner and outer loops, you need to set H0F.00 to 2, rather than changing it to 0 or 1 in realtime.

15.3 Software Limit

Function

Hardware position limit is implemented by inputting external encoder signals to CN1 of the servo drive.

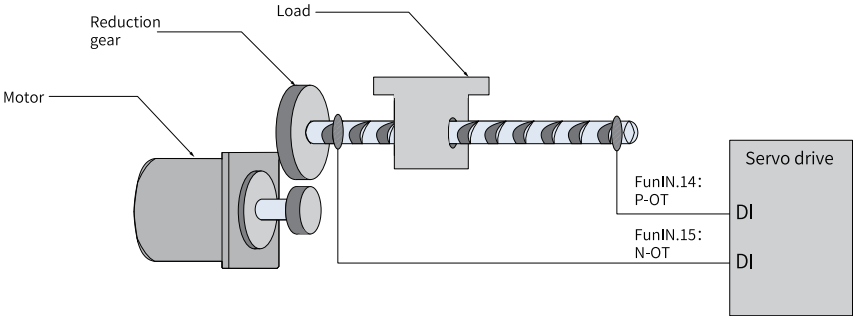


Figure 15-5 Installation of limit switches

Software position limit is implemented through a comparison between the internal position feedback and the set limit value. If the set limit value is exceeded, the servo drive reports an alarm and stops immediately. Software position limit is available both in the absolute position mode and the incremental position mode. To use the software position limit in the incremental position mode, set H0A.01 (Software position limit) to 2 (Enabled after homing) first, and then perform homing upon power-on before applying software position limit.

Table 15–2 Comparison between the hardware position limit and software position limit

Hardware Position Limit		Software position limit	
1	Restricted to linear motion and single-turn rotational motion.	1	Applicable to both the linear motion and the rotational motion.
2	Requires an external mechanical limit switch.	2	Removes the need for hardware wiring, preventing malfunction due to poor cable contact.
3	Suffered from the risk of mechanical slip.	3	Prevents malfunction due to mechanical slip through internal position comparison.
4	Unable to sense or detect an overtravel fault after power-off.		

Related objects

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0A.00	200A-01h	Power input phase loss and failure protection	0: Enable 1: Disable	0	-	Real-time
H0A.41	200A-2Ah	Forward position of software position limit	-2147483648 to 2147483647	2147483647	encoder unit	At stop
H0A.43	200A-2Ch	Reverse position of software position limit	-2147483648 to 2147483647	-2147483648	encoder unit	At stop

Communication mode:

- When H0A.01 is set to 0 (disable absolute position limit), software limit is disabled.
- When H0A.01 is set to 1 (enable absolute position limit), software limit is enabled immediately upon power-on. 607D.01h (min. position limit) and 607D.02h (max. position limit) are used by the function. Ensure the value of 607D.01h is lower than or equal to 607D.02h. If 607D.01h is set to a value higher than 607D.02h, EE09.0 (Software limit setting error) will occur.
- If H0A.01 is set to 2 (enable absolute position limit after homing), software position limit is not enabled after homing upon power-on. When the value of the absolute position counter is higher than the value of 607D.02h after homing, E950.0 (Forward overtravel alarm) occurs and the drive stops accordingly. When the value of the absolute position counter is lower than the value of 607D.01h after homing, E952.0 (Reverse overtravel alarm) occurs and the drive stops accordingly.

Non-communication mode:

- When H0A.01 is set to 0 (disable absolute position limit), software limit is disabled.
- When H0A.01 is set to 1 (enable absolute position limit), software limit is enabled immediately upon power-on. When the value of the absolute position counter (H0b.07) is higher than the value of H0A.41, E950.0 (Forward overtravel warning) occurs and the drive stops accordingly.
  When the value of the absolute position counter (H0b.07) is lower than the value of H0A.43, E952.0 (Reverse overtravel warning) occurs and the drive stops accordingly.
- If H0A.01 is set to 2 (enable absolute position limit after homing), software limit is not enabled after homing upon power-on. When the value of the absolute position counter (H0b.07) is higher than the value of H0A.41 after homing, E950.0 (Forward overtravel warning) occurs and the drive stops accordingly. When the value of the absolute position counter (H0b.07) is lower than the value of H0A.43 after homing, E952.0 (Reverse overtravel warning) occurs and the drive stops accordingly.

Note

Ensure the value of 607Ch (Home offset) is within the software position limit. Otherwise, the servo drive reports EE09.1.

15.4 Software Reset

Function

The software reset function applies when power cycling of the drive is not allowed on the application site.

Related objects

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0d.00	200d-01h	Software Reset	0: No operation 1: Enable	0	-	At stop

15.5 Motor Protection

Motor overload protection

The motor generates heat continuously due to thermal effect of the current after power-on. The heat is then dissipated to the surroundings. When the heat generated exceeds the heat dissipated, the motor temperature will rise to a point that could damage the motor. To prevent such risks, the drive offers the motor overload protection function to prevent the motor from being damaged due to over-temperature.

The motor is compliant with NEC and CEC requirements and equipped with protective functions against overload and overtemperature.

Set the motor overload protection gain (H0A.04) to adjust the report time of fault E620.0. Use the default value of H0A.04 in general conditions, however, in case of one of the following situations, modify H0A.04 based on the actual heating condition.

- The motor works in environments with high temperature.
- The motor is in the cyclic motion featuring short motion cycle and frequent acceleration/deceleration.

You can also hide motor overload detection (H0A.26 = 1) when you are sure that the motor will not be damaged due to overtemperature.

Caution

Take caution when hiding the motor overload fault as it may damage the motor.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0A.04	200A-05h	Motor overload protection gain	50 to 300	100	-	Real-time
H0A.26	200A-1Bh	Motor overload detection	0: Show motor overload alarm (E909.0) and fault (E620.0) 1: Hide motor overload alarm (E909.0) and fault (E620.0)	0	-	Real-time

Locked rotor over-temperature protection

When the motor is stalled, the motor speed is nearly 0 RPM while the current is large. In this case, the motor is overheated significantly. The motor is capable of operating upon stall in an allowable period of time, exceeding of which can damage the motor due to overtemperature. To prevent such risks, the drive offers motor overtemperature protection to protect the motor from being damaged by overtemperature.

You can set the time for reporting E630.0 (Motor stall over-temperature fault) by setting the time threshold for motor overtemperature protection (H0A.32). The motor overtemperature protection function is enabled by default (H0A.33 = 1).

Caution

Take caution when hiding motor stall over-temperature protection as it may result in a damage to the motor.

Use the dedicated motor for the SV680P series servo drive. Failure to comply will result in the risk of short circuit due to aging of insulation.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0A.32	200A-21h	Time threshold for locked motor overheat protection	10 ms–65535 ms	200	ms	Real-time
H0A.33	200A-22h	Locked motor overheat protection	0: Disabled 1: Enabled	1	-	Real-time

Motor overspeed protection

An excessively high speed may damage the motor or machine. Motor overspeed protection is used to protect the motor in case of overspeed, preventing the motor or machine from being damaged due to overtemperature.

$$\text{Overspeed threshold} = \begin{cases} \text{Max. motor speed} \times 1.2 & \text{H0A.08} = 0 \text{ or H0A.08} > \text{Max. motor speed} \times 1.2 \\ \text{H0A.08} & \text{H0A.08} \neq 0 \text{ and H0A.08} < \text{Max. motor speed} \times 1.2 \end{cases}$$

Caution

- The servo drive also offers motor runaway protection to prevent motor stall caused by lose of control.
- In applications where the motor drives a vertical axis or is driven by load, set H0A.12 to 0 to hide runaway fault detection. Use this function with caution.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0A.08	200A-09h	Overspeed threshold	0[mm/s]/[rpm]–20000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time
H0A.12	200A-0Dh	Runaway protection enable	0: Disabled 1: Runaway protection scheme 1 2: Runaway protection scheme 2	1	-	At stop

Besides runaway protection, the drive also allows you to set the speed limit in the speed/torque control mode to protect the motor and the machine.

15.6 DI Filter Time [P]

Function

The drive provides 8 physical DI terminals, in which DI1 to DI6 are normal DI terminals, and DI7 to DI8 are high-speed DI terminals. Assign the function of interrupt positioning to DI7 or DI8 to guarantee precision.

When regular functions (touch probe and interrupt position functions excluded) are assigned to DIs, the filter time of these DIs is set in H03.60...H03.67. Ensure the effective level hold time of the DI assigned with regular function is above 0.5 ms. Otherwise, the DI function may not be responded to.

When a high-speed DI is assigned with the touch probe function, the filter time of this DI is defined by H0A.19 and H0A.20. When a high-speed DI is DI with the interrupt positioning function, the filter time of this DI is defined by H0A.19. Ensure the effective level hold time of the high-speed DI is longer than the filter time.

Related objects

The drive provides two high-speed DIs with input signal frequency up to 4 kHz. When the DI signal is being disturbed, set the filter time in H0A.19 and H0A.20.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H03.60	2003-3Dh	DI1 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H03.61	2003-3Eh	DI2 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H03.62	2003-3Fh	DI3 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H03.63	2003-40h	DI4 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H03.64	2003-41h	DI5 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H03.65	2003-42h	DI6 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H03.66	2003-43h	DI7 filter time	0.00 ms–500.00 ms	0.00	ms	Real-time
H03.67	2003-44h	DI8 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H0A.19	200A-14h	Filter time constant of touch probe 1	0.00μs to 6.30μs	2.00	μs	Real-time
H0A.20	200A-15h	Filter time constant of touch probe 2	0.00μs to 6.30μs	2.00	μs	Real-time

15.7 DI Filter Time [N]

Function

The drive provides 5 physical DI terminals, in which DI1 to DI3 are normal DI terminals, and DI4 to DI5 are high-speed DI terminals. Assign the probe function to DI4 or DI5 to guarantee precision.

When regular functions (touch probe excluded) are assigned to DIs, the filter time of these DIs is set in H03.60...H03.62. Ensure the effective level hold time of the DI assigned with regular function is above 0.5 ms. Otherwise, the DI function may not be responded to.

When a high-speed DI is assigned with the touch probe function, the filter time of this DI is defined by H0A.19 and H0A.20. Ensure the effective level hold time of the high-speed DI is longer than the filter time.

Related objects

The drive provides two high-speed DIs with input signal frequency up to 4 kHz. When the DI signal is being disturbed, set the filter time in H0A.19 and H0A.20.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H03.60	2003-3Dh	DI1 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H03.61	2003-3Eh	DI2 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H03.62	2003-3Fh	DI3 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H03.63	2003-40h	DI4 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H03.64	2003-41h	DI5 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time
H0A.19	200A-14h	Filter time constant of touch probe 1	0.00μs to 6.30μs	2.00	μs	Real-time
H0A.20	200A-15h	Filter time constant of touch probe 2	0.00μs to 6.30μs	2.00	μs	Real-time

15.8 Communication-forced DO [P]

Function

When CANopen switches to the operational (OP) status, the forced DO is determined by 60FE.01h and 60FE.02h. In the non-operational (non-OP) status (including CAN network), the following two DO options are available by default:

- Status unchanged: The servo status switches to the non-OP status and the forced DO status stays unchanged.

- No output: No forced DO is generated when the servo drive is in the non-OP status.

Related objects

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H04.23	2004-18h	Communication-forced DO logic in non-OP status	bit0: DO1 0: Status unchanged 1: No output bit1: DO2 0: Status unchanged 1: No output bit2: DO3 0: Status unchanged 1: No output bit3: DO4 0: Status unchanged 1: No output bit4: DO5 0: Status unchanged 1: No output	0	-	Real-time

Setting method:

1. Assign DO function 31 to the DO to be controlled forcibly by CiA402 protocol, and then set the bit of H04.23 as needed to select the forced DO status in the non-OP status.
2. Configure 60FE.01h/02h as RPDO, and operate on bit16...bit20 to control the DO.

15.9 EtherCAT-forced DO [N]

Function

Two DO options are available by default in the non-operational (non-OP) status (including network offline) for EtherCAT-forced DO status:

1. Status unchanged in the non-OP status: The servo status switches to the non-OP status and the forced DO status stays unchanged.
2. Initialization status: No forced DO is generated when the servo drive is in the non-OP status.
   When the network switches to the operational (OP) status, the forced DO is determined by 60FE.01h and 60FE.02h.

Select the forced DO function by bits. You can select the DO as EtherCAT-forced DO by bits, which means both the local functions and EtherCAT forced-DO function can be supported by the DO.

Related objects

See the following for related parameter settings.

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H04.23	2004-18h	ECAT communication-forced DO logic in non-OP status	Bit0: DO1 0: Maintain output 1: No output Bit1: DO2 0: Maintain output 1: No output	0	-	Real-time

Descriptions for the setpoints are shown in the following *"Table 15–3 " on page 674table*.

Table 15–3 Description of setpoints

Value	DO Function
0	Status of DO1 and DO2 is unchanged in the nonoperational status
1	No output in DO1 and status of DO2 unchanged in the non-operational status
2	No output in DO2 and status of DO1 unchanged in the non-operational status
3	No output in DO1 and DO2 in the nonoperational status

Setting method:

1. Assign DO function 31 (EtherCAT-forced DO) to the DO to be controlled forcibly by EtherCAT, and then set the bit of H04.23 as needed to select the forced DO status in the non-OP status.
2. Configure 60FE.01h/60FE.02h as RPDO, and operate on bit16...bit18 to control the DO.

15.10Position Comparison

Function

Position comparison works by comparing the instantaneous position feedback with the value pre-saved in the data array and, once available, outputting a DO signal with pulse width settable or an ABZ/OCZ signal. Position comparison is applicable to high-speed motion axes as comparison actions are implemented by FPGA, removing the risk of software communication delay between processors.

Note

During position comparison, if any one of the comparison start point, end point, or comparison mode is modified, position comparison will be executed again.

The following table describes the specifications of position comparison output.

Specifications of Position Comparison Output		Function
Trigger output	Output terminal	DO or ABZ/OCZ signals.
	Logic	The effective level of DO is defined by the DO logic in group H04.
		The effective level of ABZ/OCZ output is defined by H18.06.
	Pulse width	The pulse output width is defined by H18.05.
	Delay compensation	Defined by H18.14 and used to compensate for hardware output delay.
Comparison source	Motor encoder feedback	Supported
	Pulse feedback fully closed-loop (ABZ)	Supported
	Communication-type fully closed-loop	Supported
Comparison value	Number of comparison points	40 points, signed 32-bit integer
Comparison attribute	Attribute of comparison point	Defines the attribute of the comparison point.
		Defines the output terminal for comparison.

Related objects

When position comparison is enabled, you can assign FunOUT.25 (Position comparison) to any one of the DOs. The DO you select will be used to output the position comparison output signal. You can also use the ABZ/OCZ signal as the position comparison output terminal by setting H18.16.

Position comparison output parameters:

Parameter	Name	Description
H18: Position comparison output		
H18.00	Position comparison output selection	0: Disable 1: Enable (rising edge-triggered)
H18.01	Position comparison output feedback source	0: Motor encoder feedback 1: Fully closed-loop feedback
H18.02	Position comparison resolution[1]	Defines the number of pulses per revolution. For example, if H18.02 is set to 1, the number of pulses per revolution is 2^{23}. 0: 24-bit 1: 23-bit 2: 22-bit 3: 21-bit 4: 20-bit 5: 19-bit 6: 18-bit 7: 17-bit
H18.03	Position comparison mode	0: Individual comparison 1: Cyclic comparison 2: Fixed cyclic comparison
H18.04	Current position as zero	0: Disable 1: Enable (rising edge-triggered) Note: This function needs to be used when the comparison state is inactive, otherwise the comparison logic may malfunction.
H18.05	Position comparison output width	Defines the active pulse width of the DO when the comparison point is reached. The value range is 0.1 to 204.7 (in ms).
H18.06	Position comparison output ABZ polarity	Bit 0: OCZ output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic Bit 1: Z port output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic bit2: A/B output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic
H18.07	Start point of position comparison	Activated when H18.00 is set to 1 again.
H18.08	End point of position comparison	Activated when H18.00 is set to 1 again.
H18.09	Current state of position comparison	0: No comparison; n: Waiting for the comparison point N
H18.10	Real-time position of position comparison	Displays the current comparison position value Value range: -2^{31} to (2^{31} - 1)

Parameter	Name	Description
H18: Position comparison output		
H18.12	Zero offset of position comparison	Defines the offset value after current position is taken as the zero point Value range: -2^{31} to $+2^{31}$ - 1
H18.14	Position comparison output delay compensation	Comparison delay compensation time: -12 μs to +12 μs
H18.15	Fixed cyclic comparison	1–65535
H18.16	ABZ output function setting	bit0: OCZ output function 0: Frequency-division output 1: Position comparison bit1: Z port output function 0: Frequency-division output 1: Position comparison bit2: A/B port output function 0: Frequency-division output 1: Position comparison
H18.17	Number of fixed mode cycles	Range: 0 to 65535

Note

[1]: When the source of position comparison is full closed-loop feedback, it is only effective for Inovance encoders.

Parameter	Name	Description
H19: Target position parameters		
H19.00	Target value of position comparison 1	Defines the target value of position comparison 1. Value range: -2^{31} to 2^{31} - 1
H19.02	Attribute value of position comparison 1	Attribute setting of position comparison point 1 bit0: 1: Current position changes from "less than" to "more than" the comparison point 0: N/A bit1: 1: Current position changes from "more than" to "less than" the comparison point 0: N/A bit2 to bit6: N/A bit7:

Parameter	Name	Description
H19: Target position parameters		
		1: DO1 output enabled 0: N/A bit8: 1: DO2 output enabled 0: N/A bit9: 1: DO3 output enabled 0: N/A bit10: 1: DO4 output enabled 0: N/A bit11: 1: DO5 output enabled 0: N/A bit12: 1: Frequency-division A output enabled 0: N/A bit13: 1: Frequency-division B output enabled 0: N/A bit14: 1: Frequency-division C output enabled 0: N/A bit15: 1: Frequency-division OCZ output enabled 0: None
H19.03	Target value of position comparison 2	Defines the target value of position comparison 2. Value range: -2^{31} to 2^{31} - 1
H19.05	Attribute value of position comparison 2	Defines the attribute value of position comparison 2. Value range: Same as H19.02
...	...	...
H19.117	Target value of position comparison 40	Defines the target value of position comparison 40. Value range: -2^{31} to 2^{31} - 1
H19.119	Attribute value of position comparison 40	Defines the attribute value of position comparison 40. Value range: Same as H19.02

Function operation

1. Description

   Position comparison works by comparing the instantaneous position feedback with the value pre-saved in the data array and, once available, outputting a DO signal

with pulse width settable for future use in subsequent motion control. Position comparison is applicable to high-speed motion axes as comparison actions are implemented by FPGA, removing the risk of software communication delay between processors.

- Position comparison switch
  When the value of H18.00 (Position comparison switch) changes from 0 to 1, position comparison starts and the value of H18.09 (Current state of position comparison) is updated to the start point of position comparison. When the value of H18.00 changes to 0, position comparison stops and the current comparison state will be cleared.

- Position comparison resolution
  The comparison resolution defines the number of pulses per revolution. Given the maximum and minimum limits on the target position (defined by group H19), you can reset the resolution when data overflow occurs on the comparison value. For example, when H18.02 is set to 7, the maximum value of the target position is 2^{31} - 1, and the motor rotates (2^{31} - 1)/2^{17} turns. When the SV680-INT works with a linear motor (DDL), H18.02 (position comparison output resolution) is ineffective.

Note

The target position in group H19 is only related to the set resolution.

- Individual comparison mode
  In the individual comparison mode, when comparison of the end point is done, the comparison function is switched off automatically and the current comparison value is cleared. Position comparison can be enabled again only when the position comparison switch is switched on again.

  The real-time position feedback in the individual comparison mode is an absolute value, which means it is an accumulative value based on preceding comparison points, which cannot be cleared automatically.

- Cyclic comparison
  In the cyclic comparison mode, position comparison will not be switched off when the comparison end point is reached, and current position comparison value will be reset as the start point for position comparison. After comparison of each point is done, the real-time position feedback (H18.10) will be cleared and counted again for cyclic comparison. In the cyclic comparison mode, the target position is a relative (incremental) value. Each time a comparison point is reached, the real-time position feedback is cleared and counted again for comparison with the new target.

- Fixed cyclic comparison
  In fixed cyclic comparison mode, the comparison process works in the same way as the cyclic comparison mode. The number of cycles is defined by H18.15. After the set number of cycles are done executing, comparison will be disabled automatically.
- Position comparison output width
  When the position comparison conditions are fulfilled, the servo drive outputs DO active level signal. The width of the active signal can be set in H18.05 (value range: 1 to 2047 x 0.1 ms). 1 to 2047 × 0.1 ms.

  When position comparison DO is active, the comparison logic is suspended and no comparison will be performed. In this case, ensure the operating time between two target points is larger than the output width of DO.
- Target value of position comparison
  There are 40 target values for position comparison. The target value and attribute value of position comparison must be updated to parameters in group H19 in advance.

Note

Set the target position properly. overflow comparison (H18.10) is not supported in the position comparison mode.

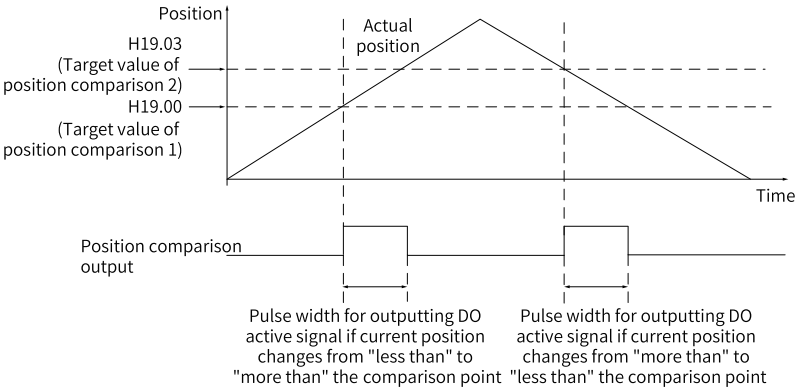
- Start point for comparison
  The start point indicates the position of the first comparison point. For example, if the start point is set to 5, the comparison starts from position comparison 5.
- End point for comparison
  The end point indicates the position of the last comparison point. For example, if the end point is set to 7, the comparison stops or restarts from the start point after position comparison 7 is reached.
- Zero offset of position comparison
  The value of H18-10 (Real-time position feedback) will be changed to the offset value defined by H18-12 (Zero offset of position comparison) at the rising edge (0 → 1) of H18-04 (Present position as zero).

Note

Check whether zero offset needs to be set before enabling position comparison output. Otherwise, comparison error may occur.

2. Function operation

- When the position feedback of the encoder passes the target position comparison points, the output width of the output terminal is defined by H18.05 (Position comparison output width).

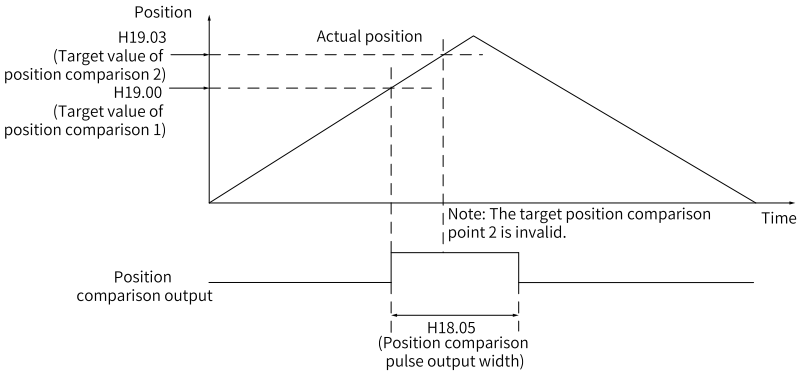


When the attribute of the comparison point is set to "bit0 = 1" (Output DO active signal if current position changes from "less than" to "more than" the comparison point), the DO outputs the position comparison signal when the axis passes the target position comparison point with position changing from "less than" to "more than" the comparison point position.

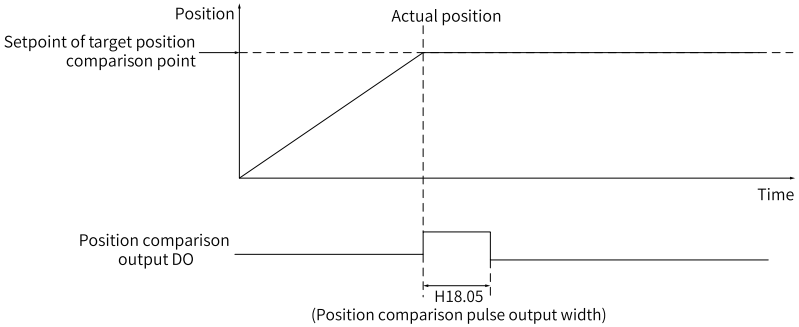
When the attribute of the comparison point is set to "bit1 = 1" (Output DO active signal if current position changing from "more than" to "less than" the comparison point), the DO outputs the position comparison signal when the axis passes the target position comparison point with position changing from "more than" to "less than" the comparison point position.

When the attribute of the comparison point is set to "bit0/bit1 = 1" (Output DO active signal in both situations), the DO outputs the position comparison signal when the position feedback passes the target position comparison point.

- When multiple position comparison values are set, no comparison will be performed once the position comparison output terminal is active. Therefore, ensure the operating time between two position comparison points is larger than the pulse output width.
  As shown in the following figure, comparison is not performed when the position changing from "more than" to "less than" the comparison point position. This is because the operating time between the two comparison points is lower than the pulse output width.



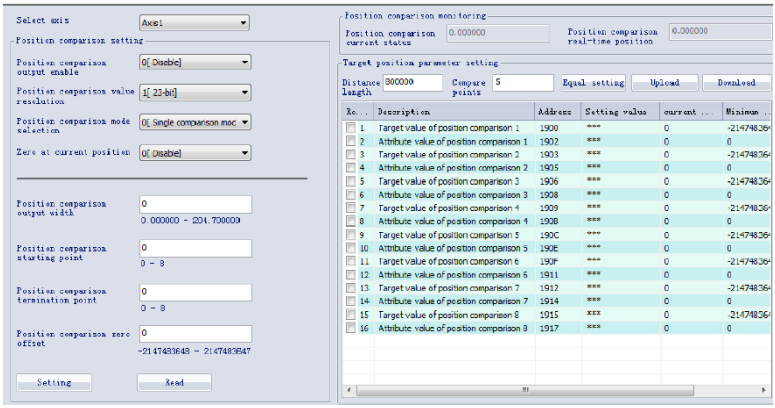
- Only one pulse will be outputted when the stop position is the same with the target value of position comparison. See the following figure.



3. Interface of the software tool

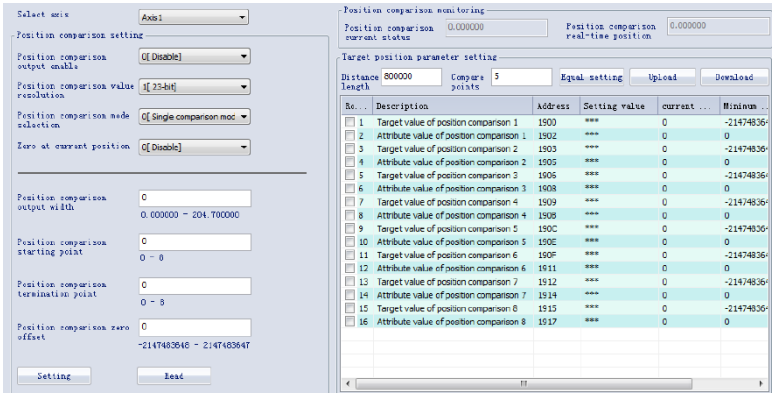
- Individual comparison mode

  a. Set H18.03 (Position comparison mode) to 0 (Individual position comparison).



b. **Target position parameter setting**: **Distance length** (total operating distance) and **Compare points**

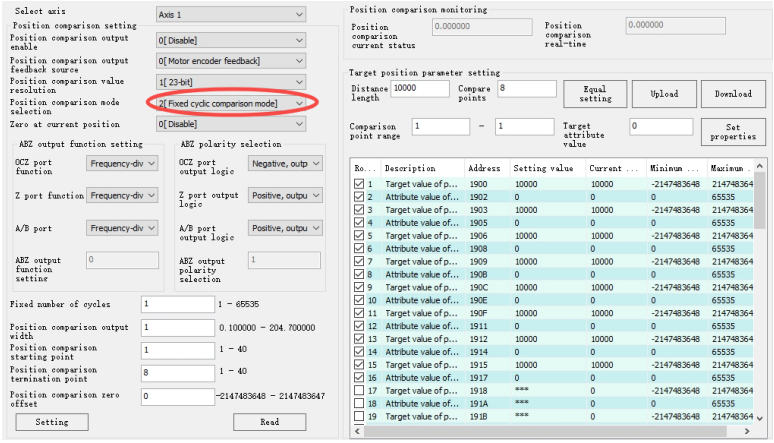
c. In the single comparison mode, set the total running distance and number of comparison points. After clicking "Equal Setting", the target value of the first point is updated to "Offline x 1/Number of comparison points", the target value of the second point is updated to "Distance x 2/Number of comparison points", and the target value of the Nth point is updated to "Distance x N/ Number of comparison points". Distance x N/Compare points



When H18.00 (Position comparison output selection) changes from 0 to 1 (Enable rising edge-triggered), H18.09 (Current state of position comparison) changes from 0 to 1 and the first target position value will be compared. When H18.10 (Real-time position feedback) reaches the value of the first target position, H18.09 changes from 1 to 2, and so on.

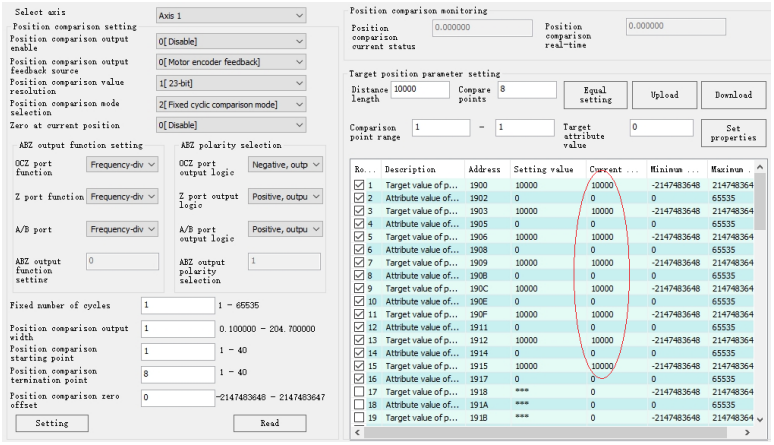
- Cyclic comparison mode/Fixed cyclic comparison mode

  a. Set **Position comparison mode selection** to **1 (Cyclic comparison mode)**.



b. **Target position parameter setting**: **Distance length** (distance between two adjacent points) and **Compare points** (points to be compared cyclically)

c. After clicking **Equal setting**, the target values of the 1st point to the Nth point are updated to equal interval distance values.



When H18.00 (Position comparison output selection) changes from 0 to 1 (Enable rising edge-triggered), H18.09 (Current state of position comparison) changes from 0 to 1 and the first target position value will be compared. When H18.10 (Real-time position feedback) reaches the value of the first target position, H18.09 changes from 1 to 2, and so on.

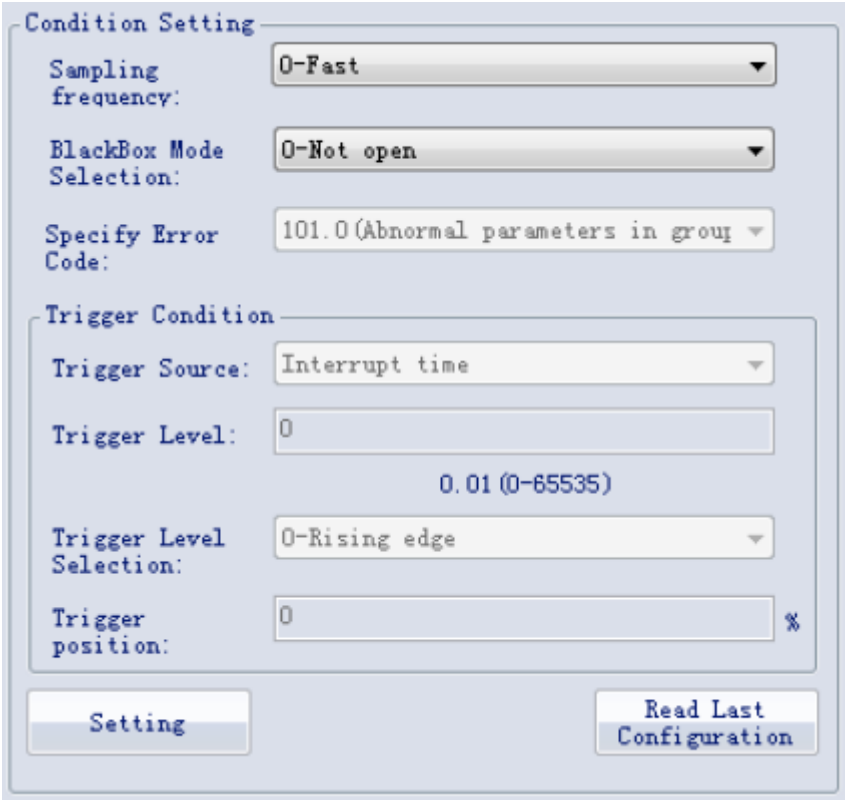
15.11Black Box

Function

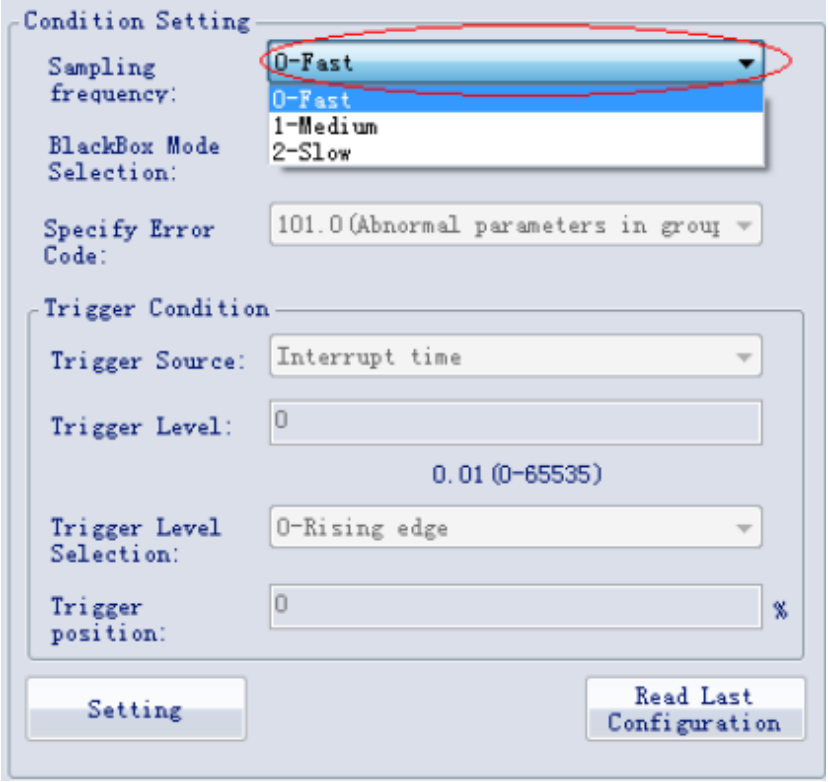
The black box function is used to capture and save the data generated upon occurrence of faults or under designated conditions. Such data can be read and uploaded by users through the software tool to facilitate troubleshooting. You can set black box channels through H32.45 to specifically analyze different types of issues. For example, in the real-time target speed (60FF)/electrical angle channel, real-time target absolute position (607A) is acquired when H32.45=0, and the electrical angle is acquired when H32.45=1.

The black box is enabled by default in the SV680-INT. It is triggered upon occurrence of a fault or a sampling frequency of 16k. The black box function will be turned off automatically after it is being triggered, or turned on automatically upon fault reset or power cycling.

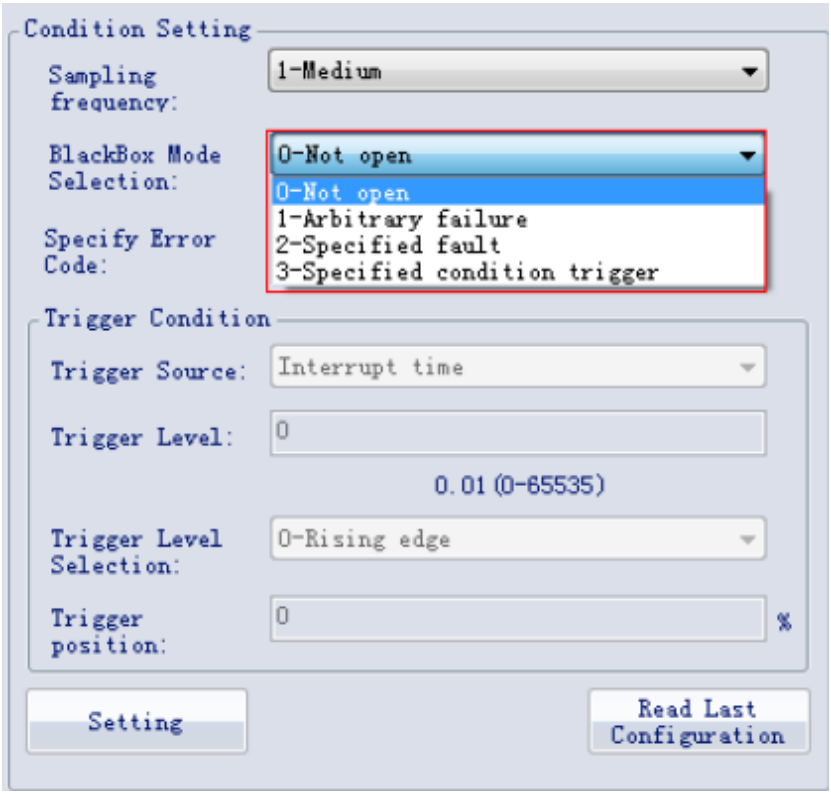
Triggering the black box



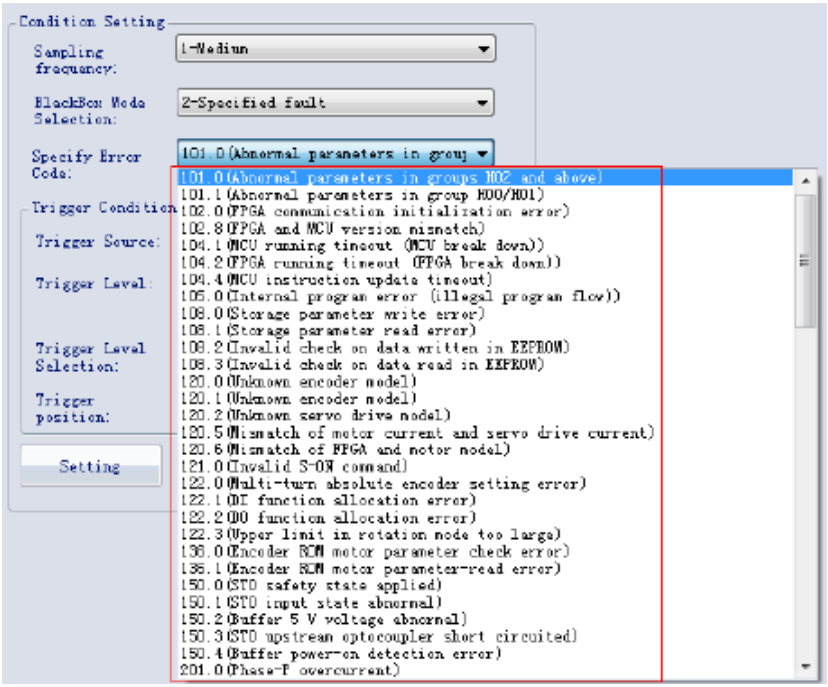
1. Sampling frequency of SV680P-INT: including three sampling frequencies, namely 16k (Fast), 8k (Medium), and 1k (Slow).
   Sampling frequency of SV680N-INT: including three sampling frequencies, namely 16k (Fast), 4k (Medium), and 0.5k (Slow).



2. Black box mode selection: including three modes, namely Arbitrary failure, Specified fault, and Specified condition trigger.



3. Select designated fault in the combo box, as shown below.



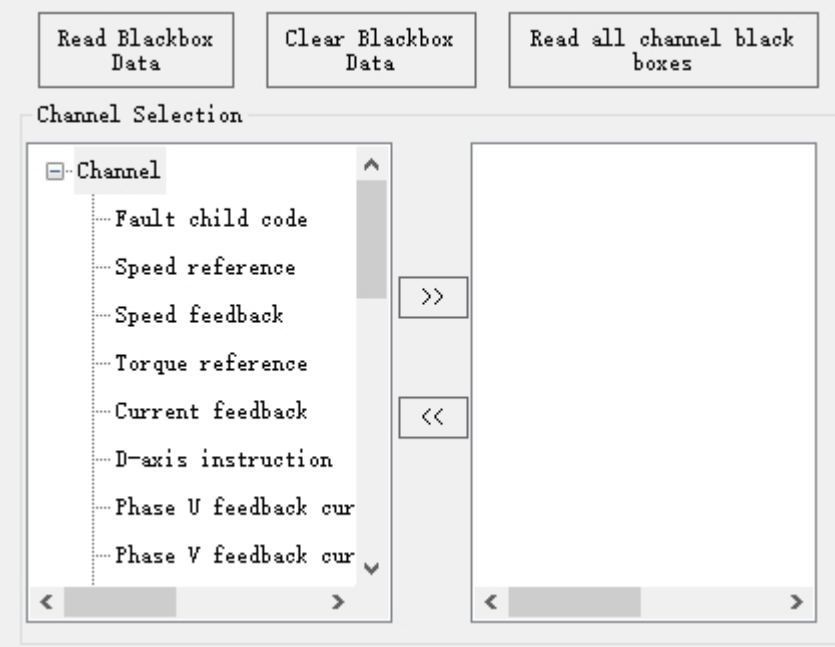
4. The Trigger Condition includes Trigger Source, Trigger Level, and Trigger Level Selection, as shown below.



5. Trigger position is used to set the position of the trigger time in the total sampling time, which is set to 75% by default.
6. After the black box is set, click Setting to download configuration parameters to the servo drive.

Reading black box data

You can select the black box channels (4 channels at most) by clicking >> or <<, or read data of all the channels by clicking Read all, then click Save to save the waveform files.



15.12Touch Probe

Function

The touch probe function is the same as the position latch function. Position feedback sources include motor position and full closed-loop feedback. This feature latches the position information (in reference unit) when an DI signal or Z signal changes.

The drive offers 2 touch probes to record position values corresponding to the rising edge and falling edge of each touch probe signal, which means 4 position values can be latched simultaneously.

When a DI is used to trigger the touch probe, the relation between the DI logic and the touch probe edge is shown in the following table. Note that the probe is only available for high speed DI.

Table 15–4 Description of bit3 of H0A.40

Bit3 of H0A.40	Touch Probe Edge	DI logic	DI switch
0	Rising Edge	NO	OFF→ON
		NC	ON→OFF
	Falling Edge	NO	ON→OFF
		NC	OFF→ON

Bit3 of H0A.40	Touch Probe Edge	DI logic	DI switch
1	Rising Edge	NO/NC	OFF→ON
	Falling Edge	NO/NC	ON→OFF

When a DI is used to trigger the touch probe, you can set the filter window of the touch probe signal through H0A.19 and H0A.20.

The DI touch probe supports hardware action delay compensation to compensate for the precision loss incurred by ON/OFF delay of the DI. Related parameters are shown in the following table.

Parameter		Description
H0A.40	bit1	Touch probe rising edge compensation: 1: Enabled, 0: Disabled
	bit2	Touch probe falling edge compensation: 1: Enabled, 0: Disabled
H0A.53		DI probe DI on compensation time (DI switch off→on)
H0A.54		DI probe DI off compensation time (DI switch on→off)

To shorten the hardware delay to about 7 μs, it is recommended to set the touch probe latch through the ON-edge of the DI.

There are three Z touch probe triggers: motor Z signal, frequency-division output Z signal, and fully closed-loop Z signal, as shown in the following table.

Feedback Source	Parameter	Description
Motor encoder	H05.41.bit2 = 0, motor Z signal	The Z touch probe is triggered by the motor Z signal.
	H05.41.bit2 = 1, frequency-division output Z signal	The Z touch probe is triggered by the frequency-division output Z signal, including the multi-turn Z signal.
Fully closed-loop feedback	H0F.25 = 0, motor Z signal	When there is no Z signal input in the pulse-type fully closed-loop mode, you can trigger the touch probe through the motor Z signal to latch external position feedback.
	H0F.25 = 1, fully closed-loop Z signal	When there is Z signal input in the pulse-type fully closed-loop mode, you can trigger the touch probe latch function through the fully closed-loop Z signal.

Related objects

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
60B8h	60B8h	Touch probe function	0x0 to 0xFFFF	0x0	-	Real-time
60B9h	60B9h	Touch probe status	0x0 to 0xFFFF	0x0	-	Unchangeable
60BAh	60BAh	Touch probe 1 positive edge position value	-2147483648 to 2147483647	0	Reference unit	Unchangeable
60BBh	60BBh	Touch probe 1 negative edge position value	-2147483648 to 2147483647	0	Reference unit	Unchangeable
60BCh	60BCh	Touch probe 2 positive edge position value	-2147483648 to 2147483647	0	Reference unit	Unchangeable
60BDh	60BDh	Touch probe 2 negative edge position value	-2147483648 to 2147483647	0	Reference unit	Unchangeable
60D5h	60D5h	Touch probe 1 positive edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable
60D6h	60D6h	Touch probe 1 negative edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable
60D7h	60D7h	Touch probe 2 positive edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable
60D8h	60D8h	Touch probe 2 negative edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable

Steps

Example:

Use DI5 to trigger the touch probe. Background: touch probe 1 positive edge, continuous latching

Observe the following steps:

1. Set the function of DI5 (H03.14 = 38). Set the DI5 logic to NO (H03.11 = 0).
2. Set the touch probe function in 60B8h.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
60B8h	60B8h	Touch probe function	0x0 to 0xFFFF	0x0	-	Real-time

Assignment of each bit of the touch probe function (60B8h) is shown in the following table.

bit	Name	Description
0	Touch probe 1 function selection 0: Probe 1 disabled 1: Probe 1 enabled	Bit0 to bit5: settings related to probe 1 When a DI is used to trigger the touch probe function, the DI source cannot be changed once the touch probe function is enabled. For absolute encoders, Z signal refers to the zero point of the single-turn position feedback.
1	Touch probe 1 trigger mode 0: Single trigger mode (Latches the position at the first trigger event.) 1: Continuous trigger mode	
2	Touch probe 1 trigger signal selection 0: DI signal 1: Z signal	
3	N/A	
4	Touch probe 1 positive edge 0: Latching at positive edge disabled 1: Latching at positive edge enabled	
5	Touch probe 1 negative edge 0: Latching at negative edge disabled 1: Latching at negative edge enabled	
6–7	N/A	-
8	Touch probe 2 function selection 0: Probe 2 disabled 1: Probe 2 enabled	Bit8 to bit13: settings related to probe 2
9	Touch probe 2 trigger mode 0: Single trigger mode (Latches the position at the first trigger event.) 1: Continuous trigger mode	
10	Touch probe 2 trigger signal selection 0: DI signal 1: Z signal	
11	N/A	
12	Touch probe 2 positive edge 0: Latching at positive edge disabled 1: Latching at positive edge enabled	
13	Touch probe 2 negative edge 0: Latching at negative edge disabled 1: Latching at negative edge enabled	
14–15	N/A	-

Set 60B8h to 0x0013 in this example.

3. Read the touch probe status in 60B9h.
   ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
60B9h	60B9h	Touch probe status	0x0 to 0xFFFF	0x0	-	Unchangeable

Assignment of each bit of 60B9h is shown in the following table.

bit	Name	Description
0	Touch probe 1 function selection 0: Probe 1 disabled 1: Probe 1 enabled	Bit0 to bit2: Status of probe 1
1	Touch probe 1 positive edge value 0: No positive edge value latched 1: Edge value latched	
2	Touch probe 1 negative edge value 0: No negative edge value latched 1: Negative edge value latched	
3–5	N/A	-
6–7	When the function of probe 1 is selected as continuous sampling, the total number of times the probe is triggered	When the function of probe 1 is selected as continuous sampling, the total number of times (0–3) the probe is triggered
8	Probe 2 enable: 0: Probe 2 disabled 1: Probe 2 enabled	Bit8 to bit10: Status of probe 2
9	Touch probe 2 positive edge value 0: No positive edge value latched 1: Edge value latched	
10	Touch probe 2 negative edge value 0: No negative edge value latched 1: Negative edge value latched	
11–13	N/A	-
14–15	When the function of probe 2 is selected as continuous sampling, the total number of times the probe is triggered	When the function of probe 2 is selected as continuous sampling, the total number of times (0–3) the probe is triggered

In this example, you can read bit1 of 60B9h to check whether the touch probe 1 positive edge value is latched.

4. Read latch position of touch probe
   The four position values of the touch probe are recorded in 60BAh to 60BDh.

In this example, if the function of position latch at positive edge of touch probe 1 is executed, you can read the position value in 60BAh (Touch probe 1 positive edge, reference unit). The latching count can be read in 60D5h.

Illustration

The following figure shows touch probe function settings and status feedback sequence when DI5 is used as the trigger signal in case of latching at positive edge and continuous triggering.

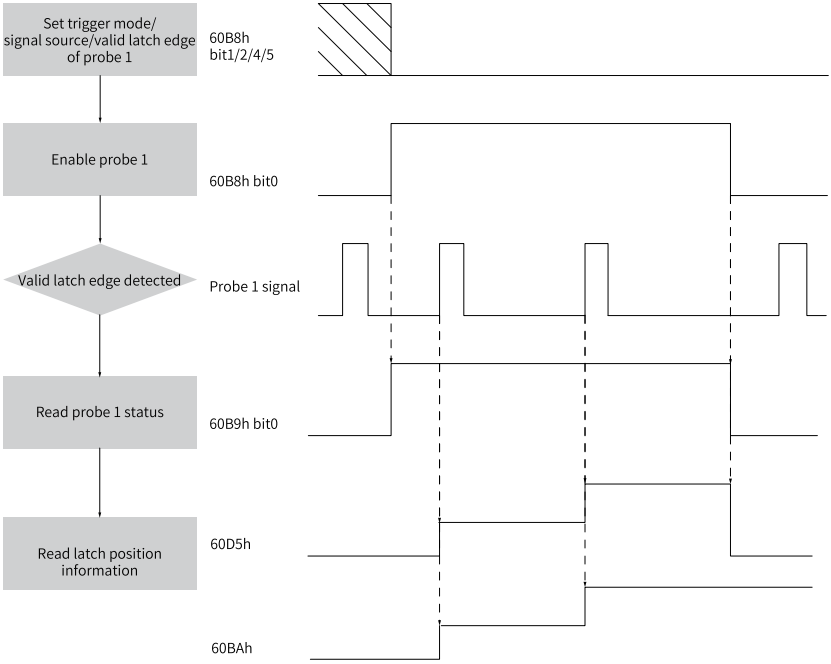


Figure 15-6 Procedure for use of the touch probe

15.13SEMI F47 Voltage Drop

Description

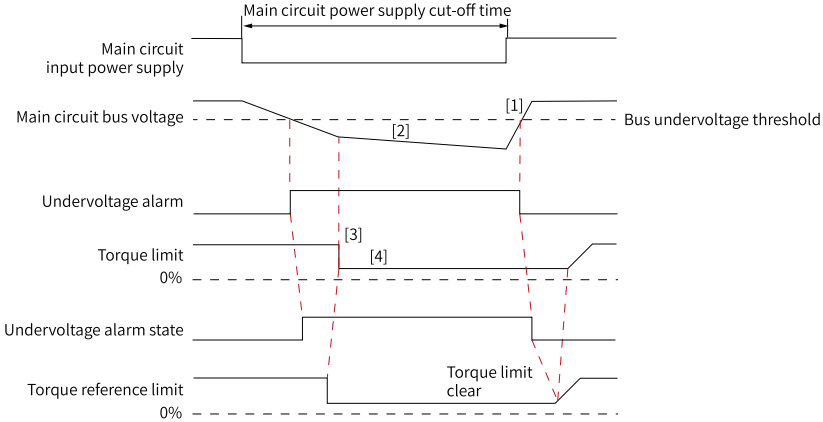
When the DC voltage of the main circuit of the drive is lower than the undervoltage threshold due to instantaneous power failure or temporary low power supply voltage of the main circuit, E971.0 is reported and the output current is limited. The alarm can be masked by setting bit 1 of H0A.88.

With combination of this function and H0A.84 (instantaneous power outage holding time), the drive can continue to run when the power supply voltage decreases, and it will not stop because of alarm.

Description

This function can be executed by the instruction issued by the host controller or the servo drive. You can choose through H0A.81 (enable voltage drop protection).

- **When executed by the host controller (H0A.81 = 1)**
  After receiving the warning of undervoltage E971.0, the host controller limits the torque, and removes torque limit after receiving E971.0 warning release signal.



Note

- [1]: After the main circuit power supply is restored, the bus voltage of the main circuit rises.
- [2]: By limiting the output torque, you can reduce the bus voltage of the main circuit gently.
- [3]: Torque limiting starts.
- [4]: Limit torque after an undervoltage warning is received.

  - When H07.07 = 0:
    For SV680P-INT: the forward torque limit is H07.09 and the negative torque limit is H07.10;

    For SV680N-INT: the forward torque limit is the minimum value of 60E0h and 6072h and the negative torque limit is the minimum value of 60E1h and 6072h.

  - When H07.07 is set to 1, the torque reference limit is determined by the logic of the external DI signal.
    For SV680P-INT: The positive torque limit is selected between H07.09 (Positive internal torque limit) and H07.11 (Positive external torque limit). The negative

torque limit is selected between H07.10 (Negative internal torque limit) and H07.12 (Negative external torque limit).

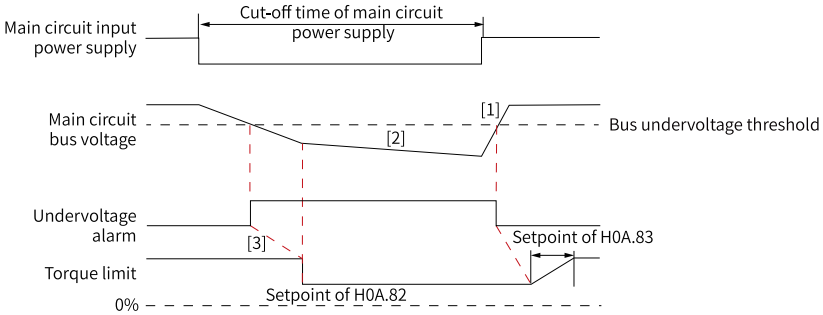
For SV680N-INT: The positive torque limit is selected between min {60E0h,6072h} and H07.11. The negative torque limit is selected between min {60E1h,6072h} and H07.12.

- When H07.07=2, you select AI1 or AI2 as the torque limit input source for T-LMT through H07.08.
- When H07.07 = 3:
  If DI-PCL (Forward External Torque Limit) is ineffective, the forward limit is determined by AI input. If DI-PCL (Forward External Torque Limit) is effective, the forward limit is determined by the smaller one between H07.11 and the torque corresponding to AI input voltage.

  If DI-NCL (Reverse External Torque Limit) is ineffective, the reverse limit is determined by AI input. If DI-NCL (Reverse External Torque Limit) is effective, the reverse limit is determined by the smaller one between H07.12 and the torque corresponding to AI input voltage.
- When H07.07 = 4:
  For SV680P-INT:
  - If DI-PCL (Forward External Torque Limit) is ineffective, the forward limit is determined by H07.09. If DI-PCL is effective, the forward limit is determined by AI input voltage.
  - If DI-NCL (Reverse External Torque Limit) is ineffective, the reverse limit is determined by H07.10. If DI-NCL is effective, the reverse limit is determined by AI input voltage.

  For SV680N-INT:
  - If DI-PCL is ineffective, the forward limit is determined by min{60E0h,6072h}. If DI-PCL is effective, the forward limit is determined by AI input voltage.
  - If DI-NCL is ineffective, the reverse limit is determined by min{60E1h,6072h}. If DI-NCL is effective, the reverse limit is determined by AI input voltage.

- **When executed by the drive (H0A.81 = 2)**
  According to the undervoltage E971.0 warning, apply torque limit inside the servo drive; After receiving the undervoltage warning release signal, the torque limit value is controlled in the servo drive according to the set time.



Note

- [1]: After the main circuit power supply is restored, the bus voltage of the main circuit rises.
- [2]: By limiting the output torque, you can reduce the bus voltage of the main circuit gently.
- [3]: Torque limiting starts.

- **The E971.0 undervoltage warning is not detected (H0A.81 = 0)**
  Voltage drop does not trigger E971. 0 alarm, but E410.0.

Related parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0A.81	200A-52h	Voltage drop protection enable	0: No operation 1: Host controller executes torque limit 2: Servo executes torque limit	0	-	At stop
H0A.82	200A-53h	Voltage drop torque limit	0.0% to 100.0%	50.0	%	Real-time
H0A.83	200A-54h	Torque limit cancel time	0 ms–1000 ms	100	ms	Real-time
H0A.84	200A-55h	Instantaneous power failure holding time	20 ms–50000 ms	1000	ms	Real-time

Note

- This function is suitable for instantaneous power outage with the voltage and time specified by SEMI F47. If the voltage and time beyond this range, a standby power supply is needed.
- When the power supply of the main circuit is restored, use the torque limit of the host controller or servo drive to set the torque, so as to avoid the output torque being greater than the commanded acceleration torque.
- When used on vertical axes, do not limit the torque below the holding torque.
- This function is to limit the torque within the capacity of the powered off servo drive, and is not applicable to all load conditions or operating conditions. The parameter to be set may vary with the actual device.
- After you set H0A.84, the time from disconnecting the power supply to stopping the motor power will become longer. You can power off the motor immediately through the input and output of servo ON input signal.

15.14Accuracy Compensation

15.14.1Function

Accuracy compensation is only for DDL and DDR motors.

Precision electromechanical applications (such as silicon crystal/semiconductor/TP industry) usually require high absolute precision control. However, due to the inherent errors of the direct drive (such as parallelism/flatness/concentricity of motor installation, thermal deformation of materials, design tolerance, and so on), encoder errors (such as design tolerance of the scale, uneven scale marks, thermal deformation of the scale, insufficient parallelism/concentricity of the scale and reader), and motor wear errors caused by long-term operation, the actual position of the motor is different from that fed back by the encoder. In practical applications, the servo drive can only control the motor position based on the position information fed back by the encoder. If the fed back information is inaccurate, it is impossible to achieve accurate absolute precision control of the direct drive motor.

As a response, the SV680-INT come with a compensation feature for motor physical precision. The schematic diagram is as shown in *"Figure 15–7 " on page 699* .

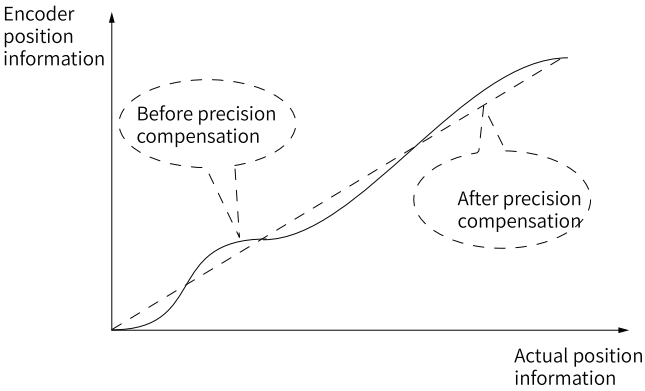


Figure 15-7 Accuracy compensation

The basic principle is as follows: An accuracy error compensation table is obtained by means of external high-precision ranging/angle measuring devices, and the current position is compensated in real time according to the accuracy compensation error table in the application stage, to obtain the corrected position information.

The accuracy compensation function of SV680-INT has different applications for different encoder types and motor types.

No.	Application
1	For DDL motor equipped with ABZ incremental encoder (TTL signal)
2	For DDL motor equipped with Inovance incremental encoder
3	For DDL motor equipped with Biss-C absolute encoder
4	For DDR motor equipped with ABZ incremental encoder (TTL signal)
5	For DDR motor equipped with Inovance incremental encoder
6	For DDR motor equipped with Inovance absolute encoder

All application modes involve two stages: accuracy compensation table acquisition and real-time accuracy compensation. The SV680-INT provides a software tool to help you with that.



The following is an example of a DDL motor with an ABZ incremental encoder (TTL signal) (the same applies to DDL with an Inovance communication incremental encoder):

Preparation

1. Acquire the accuracy compensation data table, as shown in *"Figure 15–8 " on page 700* . Linear motor ①, encoder ②, drive ③, controller ④, computer ⑤, laser interferometer and lens ⑥ are involved.

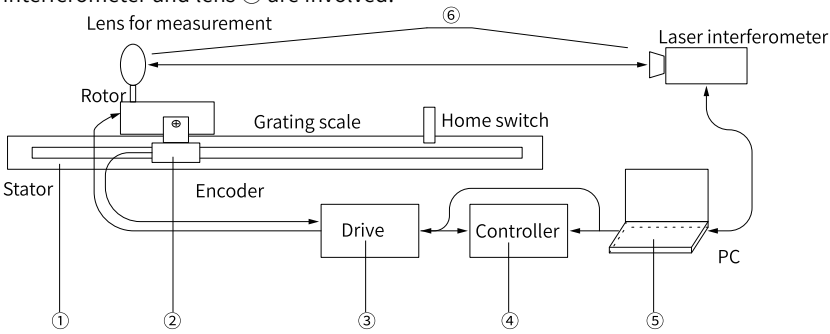


Figure 15-8 Schematic diagram of acquisition of accuracy compensation table

2. Apply accuracy compensation control, as shown in *"Figure 15–9 " on page 700* . Encoder ①, linear motor ②, drive ③ and controller ④ are involved.

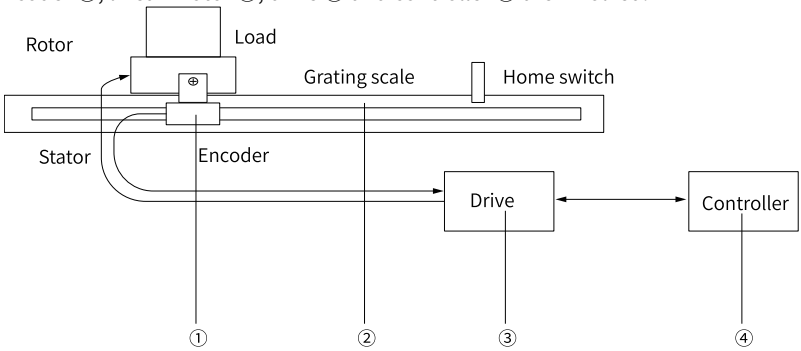


Figure 15-9 Schematic diagram of accuracy compensation of linear motor

Note

That basically also applies to DDR, except that you need to use an angle measuring laser interferometer rather than a laser ranging interferometer.

Table making (acquisition of accuracy compensation table)

- At this stage, the user obtains the accuracy compensation table. See the following schematic diagram *"Figure 15–10 " on page 701* and flow chart *"Figure 15–11 " on page 701* .

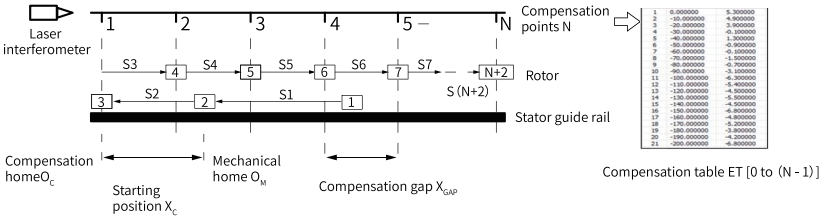


Figure 15-10 Schematic diagram of acquisition of accuracy compensation table

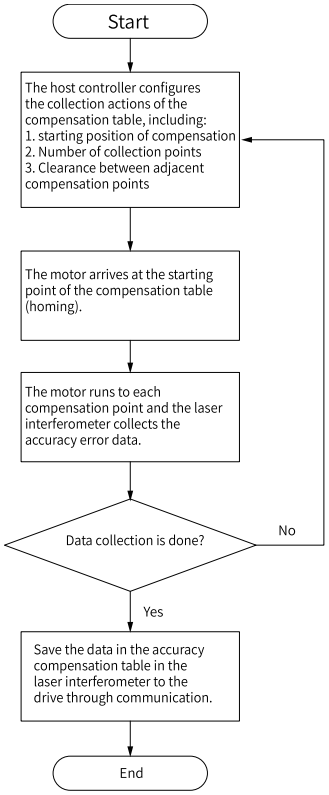
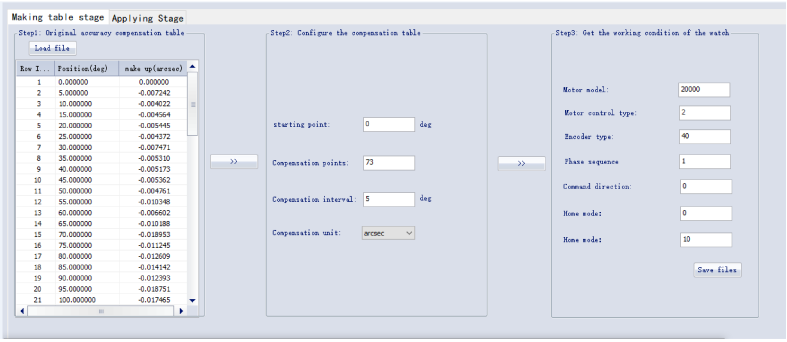


Figure 15-11 Flow chart of acquisition of accuracy compensation table

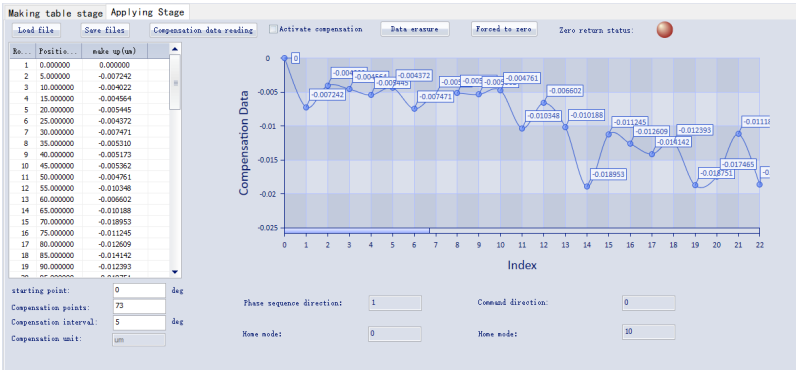
The steps are as follows:

- S1: The controller (or PR module accuracy compensation control in InoDriverShop) controls the linear motor for homing, from any power-on position back to the mechanical origin O_M;
- S2: The controller runs the linear motor from the mechanical origin O_M to compensation origin O_C (that is, the base point of the compensation coordinate system). The moving distance is the starting position X_{OCOM} of the compensation point;
- S3: The laser interferometer performs base point calibration at compensation origin O_C, and obtains compensation error of the first compensation point. After that, the controller runs the linear motor according to compensation interval X_{GAP} to the next compensation point to obtain the position.
- S4–S(N+2): The laser interferometer obtains the compensation error data of the current compensation point. After that, the controller runs the linear motor according to compensation interval X_{GAP} to the position. This process continues until the desired number of compensation points N are obtained and a compensation table ET[0–(N-1)] is formed.
- S(N+3): Open InoDriverShop and connect the drive. Go to **Accuracy Compensation** -> **Making Table Stage** and operate according to the following figure to preprocess the accuracy compensation error table obtained by the laser interferometer.

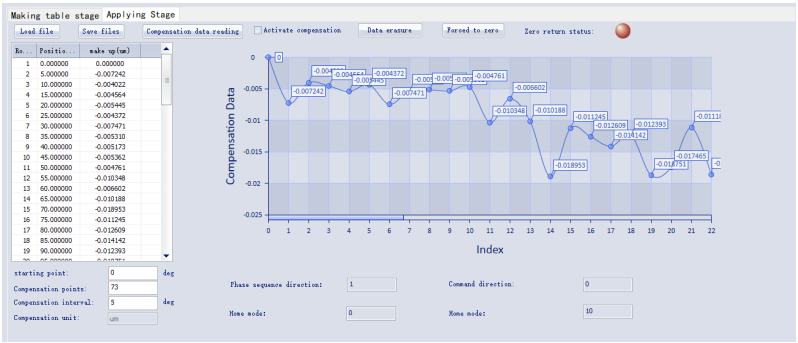


Application (drive receives and enables the accuracy compensation table)

- S1: Open InoDriverShop and connect the drive. Go to **Accuracy Compensation** -> **Application Stage** and operate according to the following figure to send the preprocessed accuracy compensation data to the drive and enable accuracy compensation.



Functions of other keys on this interface are as follows:



- S2: After the driver receives the accuracy compensation table an E941.0 error is reported. The table becomes effective after power-off. After power-on again, and angle auto-tuning and homing are completed, accuracy compensation is enabled. When the motor mover is pushed within the effective compensation travel range, you can see that the line number index of the loaded file jumps accordingly,

indicating that accuracy compensation is effective.

Ro...	Positio...	make up(um)
1	0.000000	0.000000
2	5.000000	-0.007242
3	10.000000	-0.004022
4	15.000000	-0.004564
5	20.000000	-0.005445
6	25.000000	-0.004372
7	30.000000	-0.007471
8	35.000000	-0.005310
9	40.000000	-0.005173
10	45.000000	-0.005362
11	50.000000	-0.004761
12	55.000000	-0.010348
13	60.000000	-0.006602
14	65.000000	-0.010188
15	70.000000	-0.018953
16	75.000000	-0.011245
17	80.000000	-0.012609
18	85.000000	-0.014142
19	90.000000	-0.012393

Applications of other encoders and motors

Table 15–5 DDL with BISS-C absolute encoder

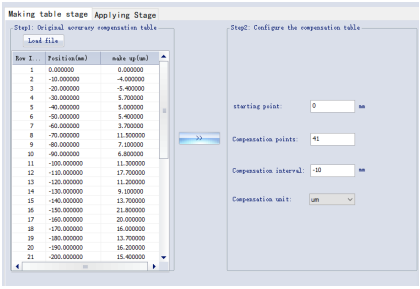
Compared with DDL with ABZ incremental encoder (TTL signal)	
Preparation	Same.
Table making	• Homing is not required: • The starting position is the absolute position value of the starting point of the laser interferometer. 
Application	The drive obtains the accuracy compensation table, which takes effect directly after restart, without homing.

Table 15–6 DDR with ABZ incremental encoder (TTL signal) or Inovance communication incremental encoder

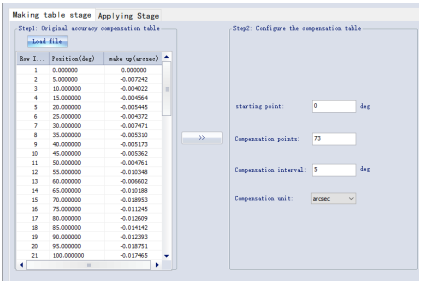
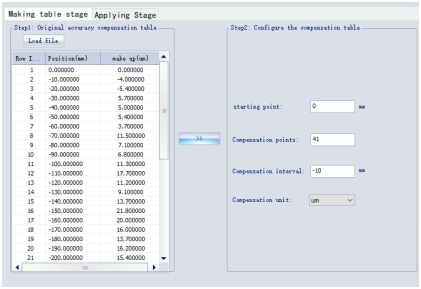
Compared with DDL with ABZ incremental encoder (TTL signal)	
Preparation	The laser interferometer is changed from ranging to angle measuring.
Table making	The units become deg and arcsec, and the rest are the same. 
Application	Same.

Table 15–7 DDR with Inovance absolute encoder

Compared with DDL with ABZ incremental encoder (TTL signal)	
Preparation	The laser interferometer is changed from ranging to angle measuring.
Table making	Homing is not required: The starting position is the absolute position value of the starting point of the laser interferometer. The units become deg and arcsec, and the rest are the same. 
Application	Same.

Note

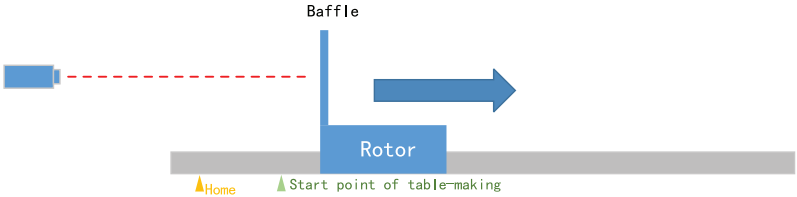
- The accuracy compensation function of the SV680-INT has the same accuracy compensation effect for frequency division output.
- In DDR application mode, to avoid logic confusion, the maximum angle corresponding to the number of compensation points must not exceed 360° (that is, correction point count x correction interval ⩽ 360°).

15.14.2Application Cases

This case provides a setting mode. The specific parameters should be adjusted according to the actual accuracy requirements.

Case 1

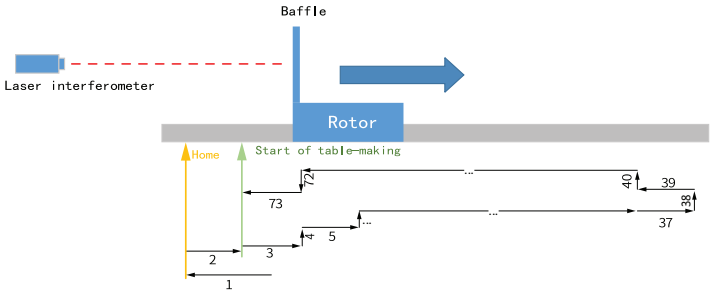
Suppose there is a linear motor, whose mover has an effective travel of 1m. It comes with a pulse quadrature encoder,with a resolution of 0.1 μm/pulse. The home is a limit switch near the left limit position. The direction from left to right is the positive direction. The start point of table making is 10cm away from the home in the positive direction. You must make a table every 5cm from the table making position.



Home offset calculation 10cm = 100000μm = 100000μm ÷ （0.1μm ÷ pulse） = 1000000pulse

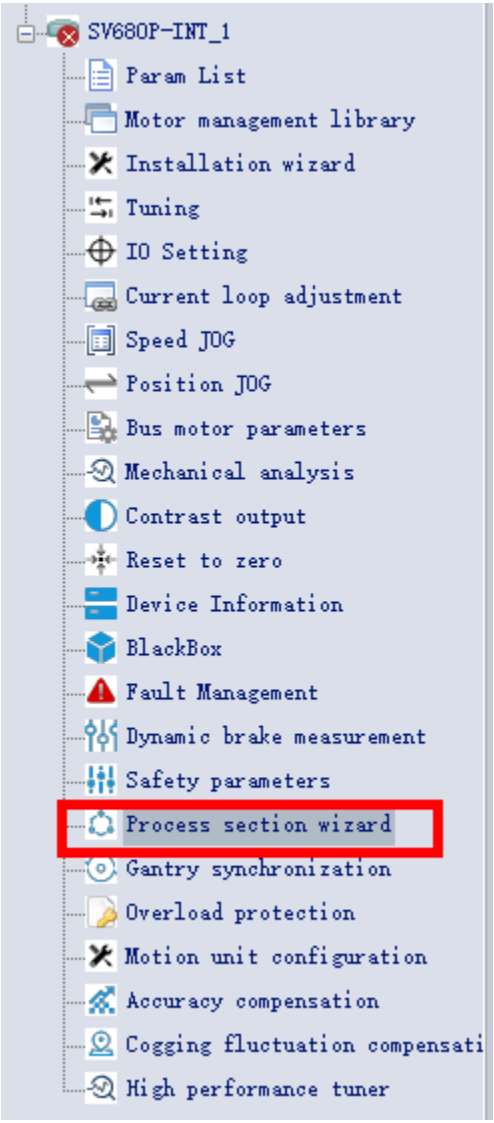
Table making segments: (1m-0.1 m) ÷ 0.05 m = 18 segments

Single-segment operation increment calculation: 5 cm = 50000 μm = 50000 μm ÷ (0.1 μm ÷ pulse) = 500000pulse

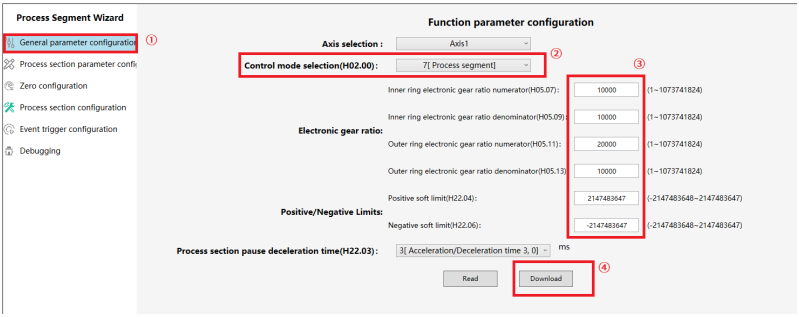


Steps of accuracy compensation table making setting

1. Complete the operation through the process segment mode.

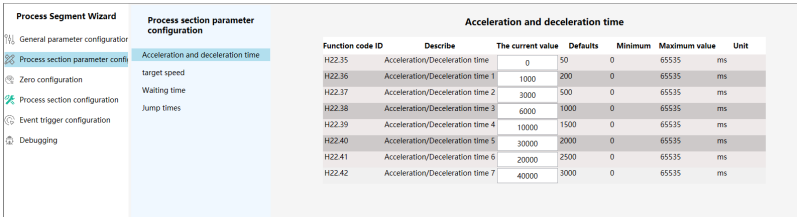


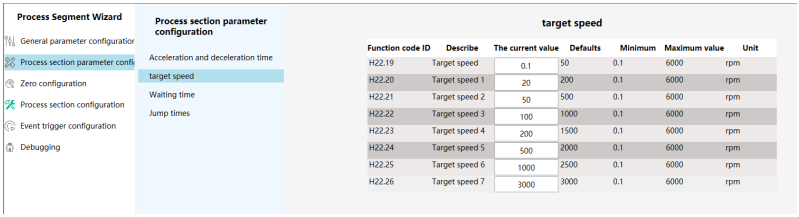
2. Set basic parameters.



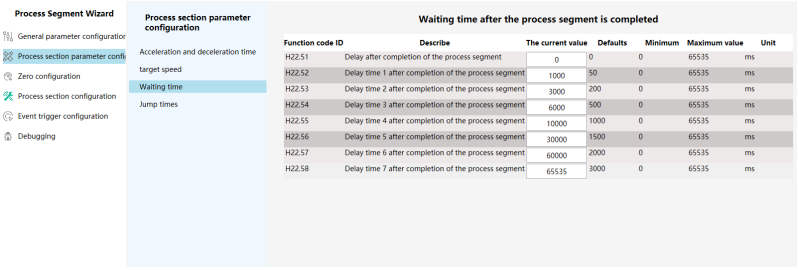
3. Set process segment parameters.

   a. Keep the default settings in **Acc./dec. Time** and **Target Speed**, and go to the settings in **Jump Count**.

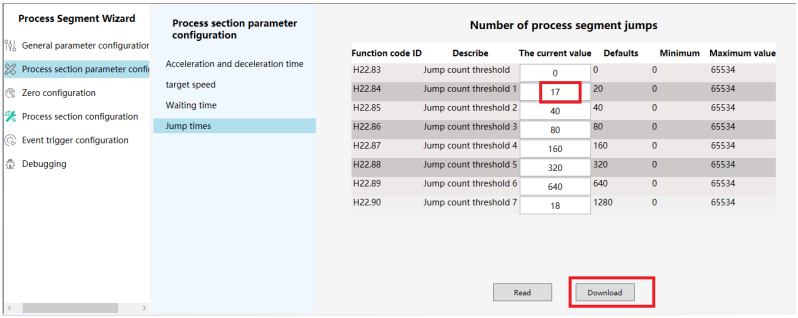




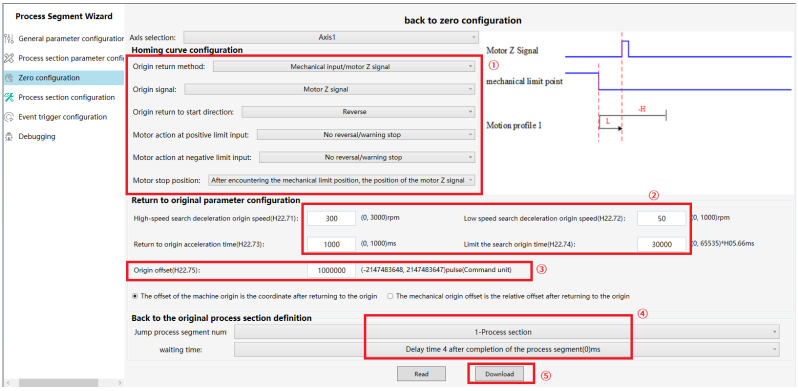
   b. The waiting time can be modified. You can set the waiting time for a single segment to 10s.



   c. The number of segments is 18, and the last jump is also counted, so the jump count should be set to 17. When the parameters are modified, click **Download**.

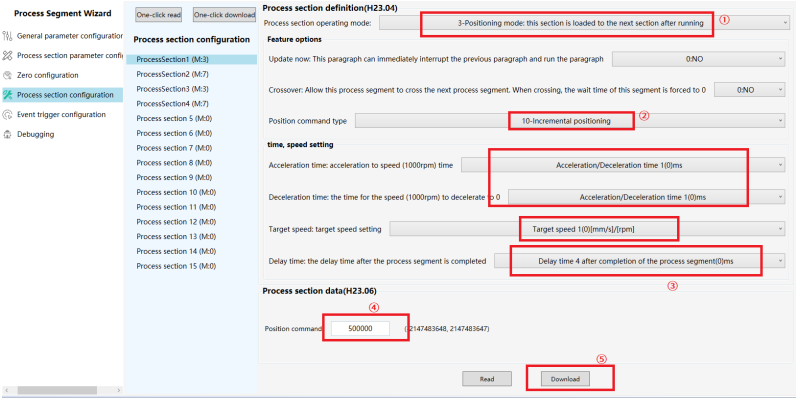


4. Configure the homing parameters. Because the left limit switch is the home, you need to configure the reverse search limit switch and homing speed, set the homing offset to 1000000 (the home offset calculated above), the jump process segment to process segment 1, and delay waiting time to 10s. Download the parameters. Note: The waiting position here is the first meter ???point of the laser interferometer.

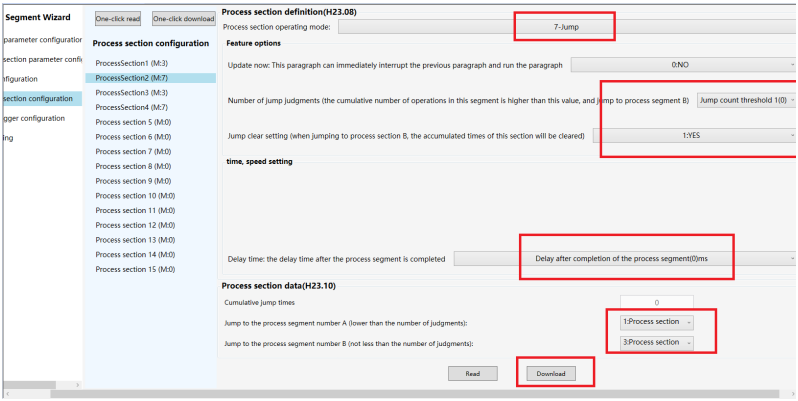


5. Configure the process segment parameters.

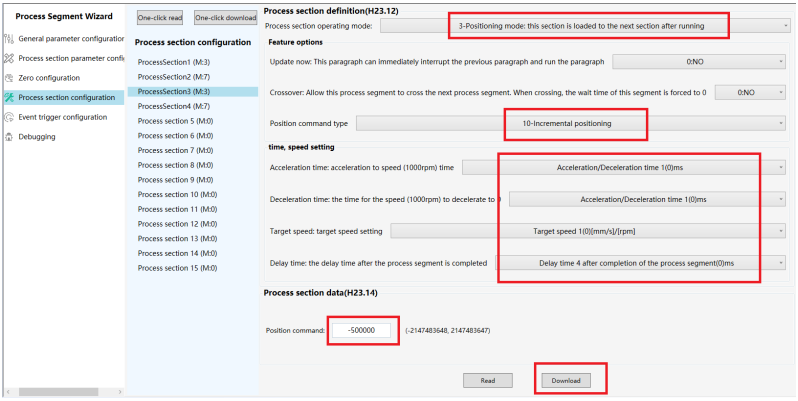
   a. Select Mode 3 for process segment 1, select incremental mode for position command, set target speed, set waiting time to 10s, and set position command to 50000pulse (single-segment operation increment calculated above). Click **Download**.



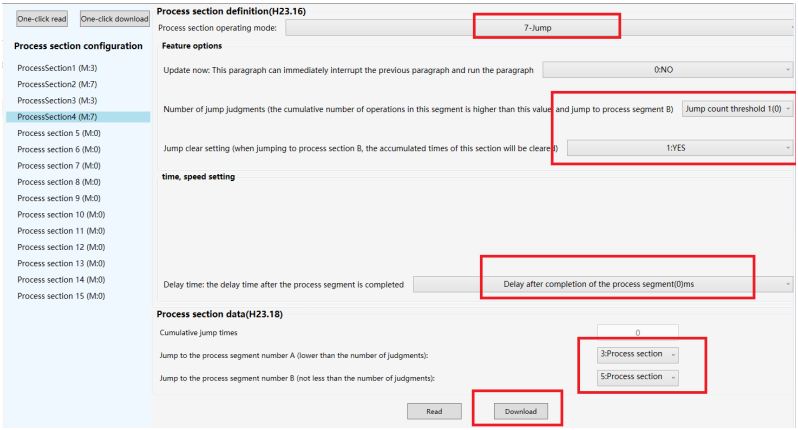
b. Set process segment 2 to mode 7 jump. Set jump evaluation count to 17. Set **Clear jump** to "YES". Set the jump delay time to 0 ms. Set **Jump to process segment A** to process segment 1 and **Jump to process segment B** to process segment 3. Click **Download**.



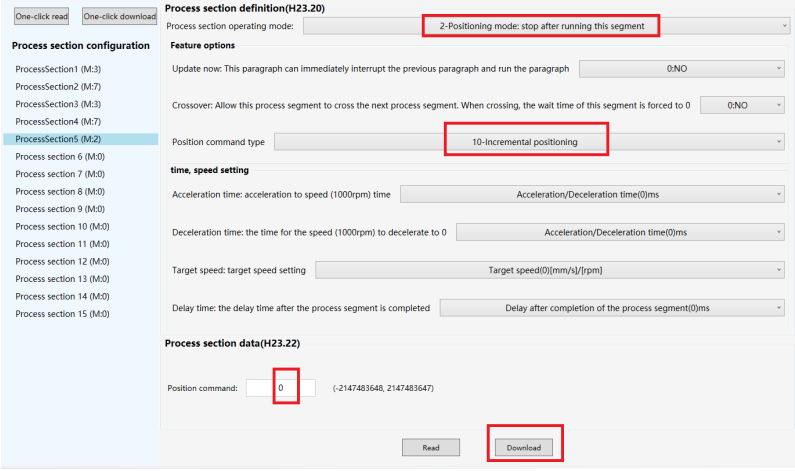
c. Set process segment 3 according to process segment 1, except that the position command is set to-500000.



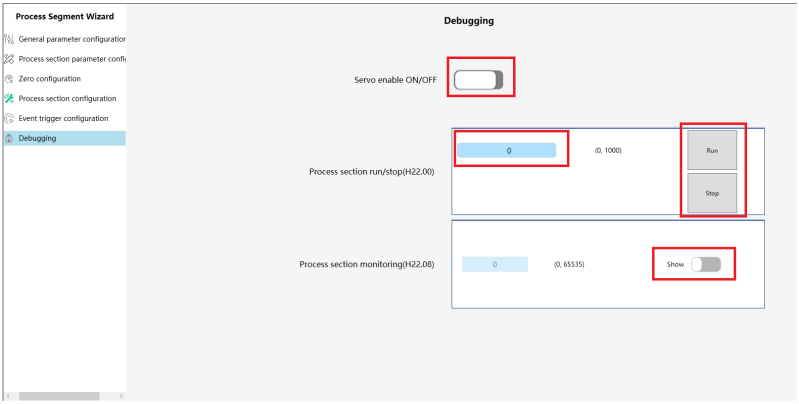
d. Process segment 4 is set as follows. Note that the jump condition is not the same as process segment 2.



e. Process segment 5 is set to **positioning mode: stop at current segment??**?, the position type is incremental positioning, and the command is 0. Click **Download**.

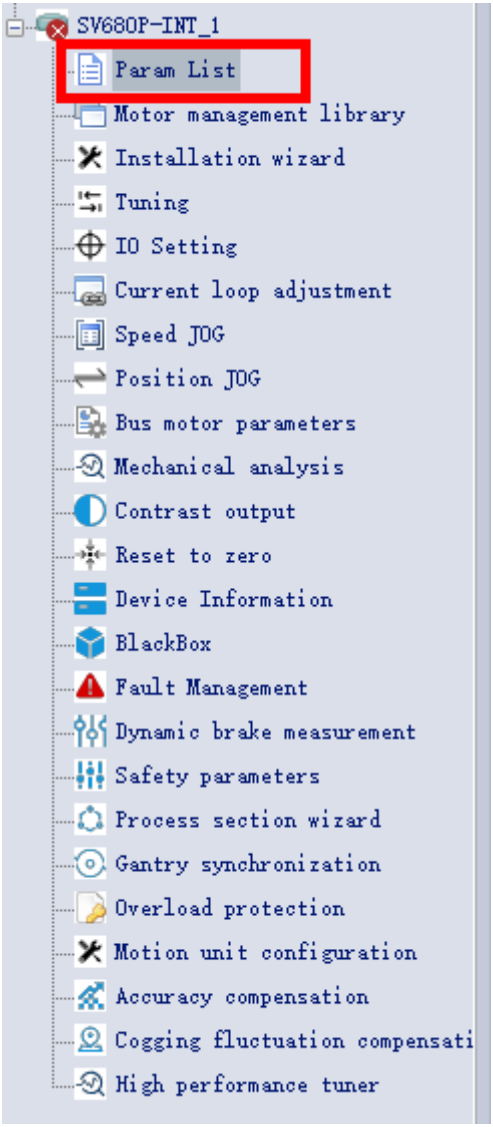


6. Commissioning

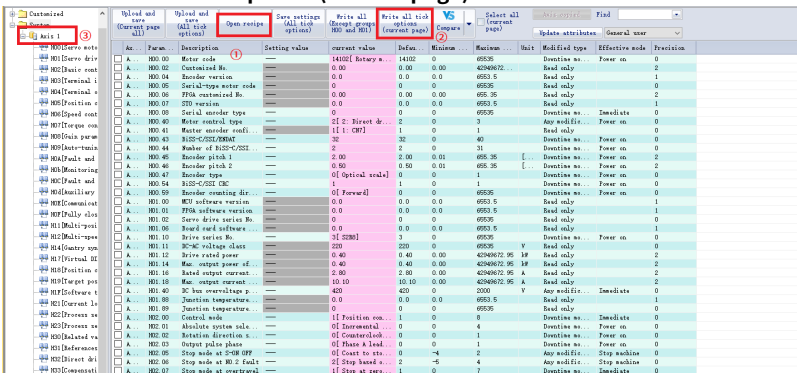


Steps for setting accuracy compensation table making

1. Click **Parameter List**.

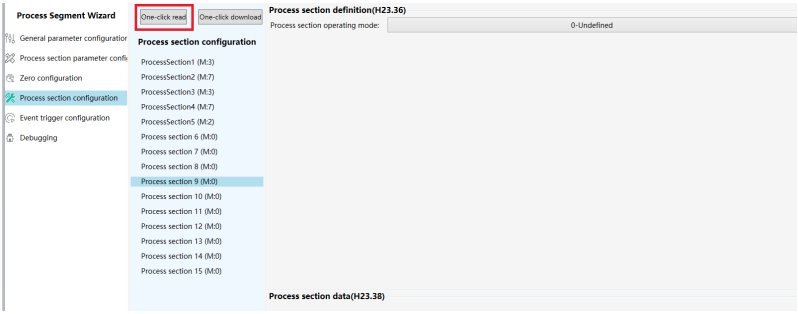

SV680P-INT_1
Param List
Motor management library
Installation wizard
Tuning
IO Setting
Current loop adjustment
Speed JOG
Position JOG
Bus motor parameters
Mechanical analysis
Contrast output
Reset to zero
Device Information
BlackBox
Fault Management
Dynamic brake measurement
Safety parameters
Process section wizard
Gantry synchronization
Overload protection
Motion unit configuration
Accuracy compensation
Cogging fluctuation compensati
High performance tuner

2. Click **Open recipe** and select the parameter recipe below. Click **Axis 1** on the left, and click **Write all tick options (current page)**.



Parameters are provided as follows. All parameters can be used for commissioning directly after being downloaded into the drive.

3. Enter the **Process Segment** page and click **One-click read** to add all parameters.



4. Carry out your testing.



SV680-INT precision compensation table-making process segment case 1.inoparam

Case 2

Suppose there is a linear motor, whose mover has an effective travel of 1m. It comes with a BISSC absolute encoder, with a resolution of 0.1 μm/pulse. There is no home. The direction from left to right is the positive direction. The start point of table making is 1000000 away from the absolute position, and the remaining length is 0.9 m. You must make a table every 5cm from the table making position.

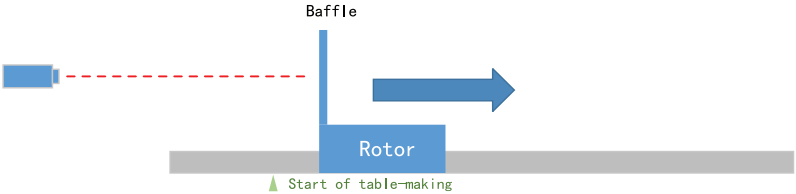
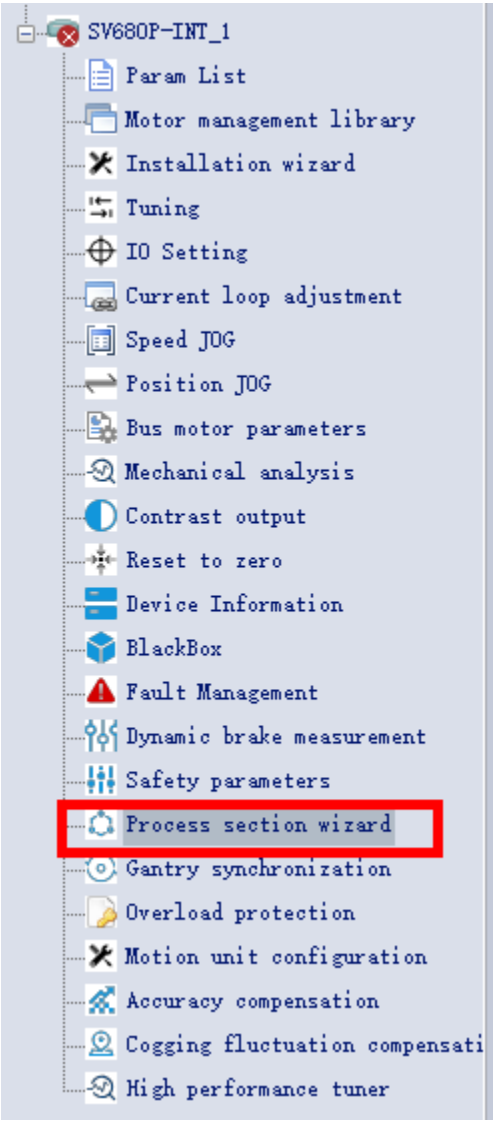


Table making segmentation: 0.9 m ÷ 0.05 m = 18 segments

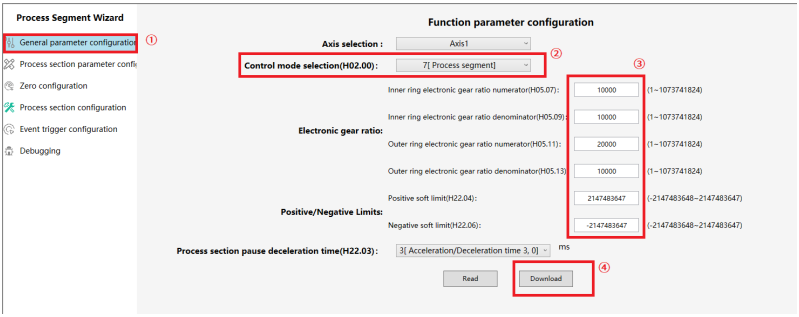
Calculation of single-segment operation increment: 5cm = 50000μm = 50000μm ÷ （0.1μm ÷ pulse） = 500000pulse

Steps of accuracy compensation table making setting

1. Complete the operation through the process segment mode.

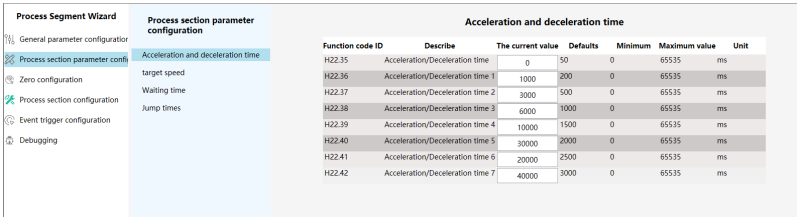


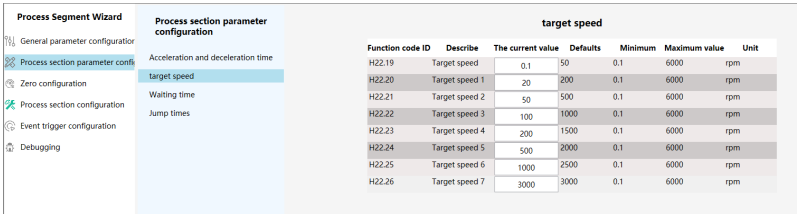
2. Set basic parameters.



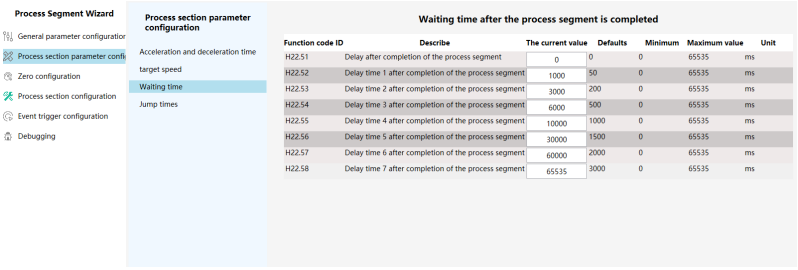
3. Set process segment parameters.

   a. Keep the default settings in **Acc./dec. Time** and **Target Speed**, and go to the settings in **Jump Count**.

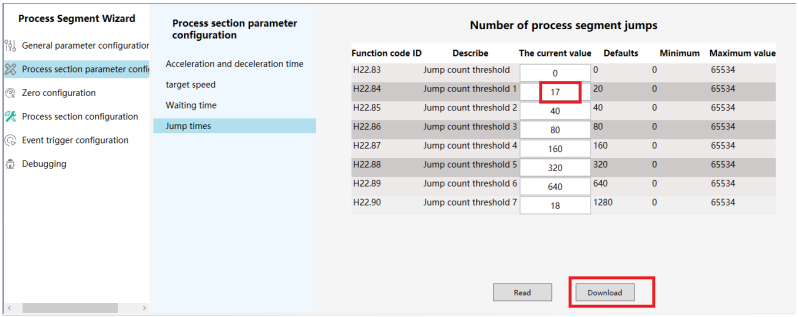




   b. The waiting time can be modified. You can set the waiting time for a single segment to 10s.

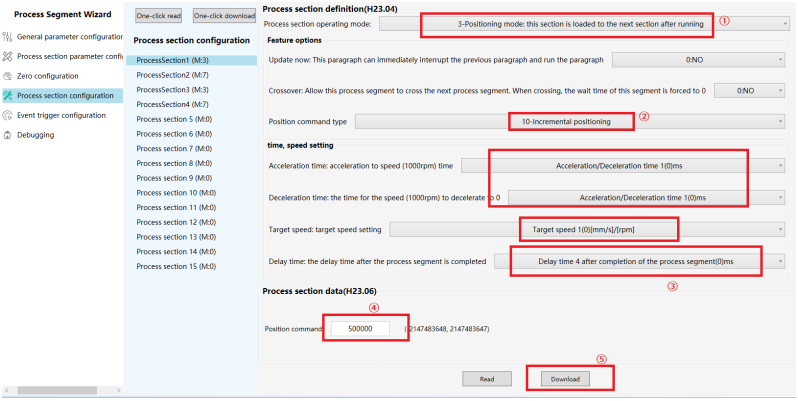


   c. The number of segments is 18, and the last jump is also counted, so the jump count should be set to 17. When the parameters are modified, click **Download**.

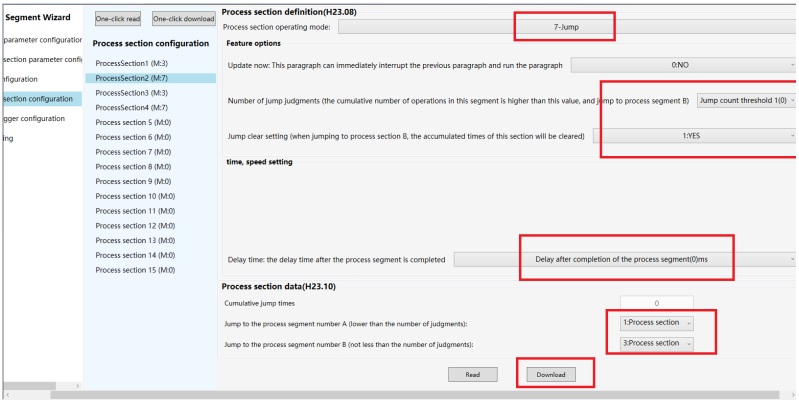


4. Configure the process segment parameters.
   Configure process segments 1 to 5 by using the preceding configured parameters.

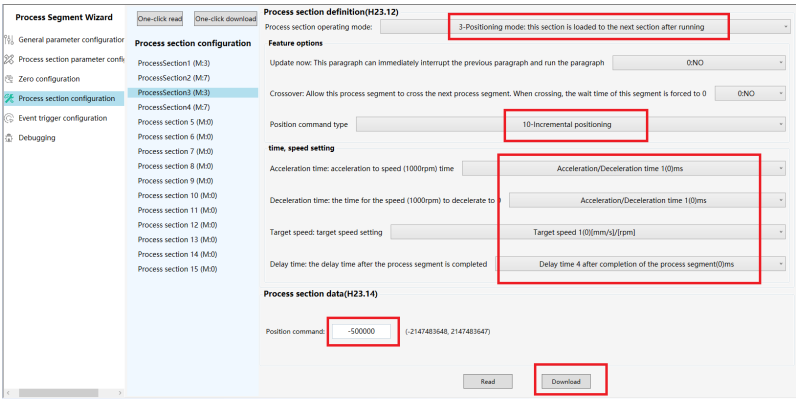
   a. Select Mode 3 for process segment 1, select incremental mode for position command, set target speed, set waiting time to 10s, and set position command to 50000pulse (single-segment operation increment calculated above). Click **Download**.



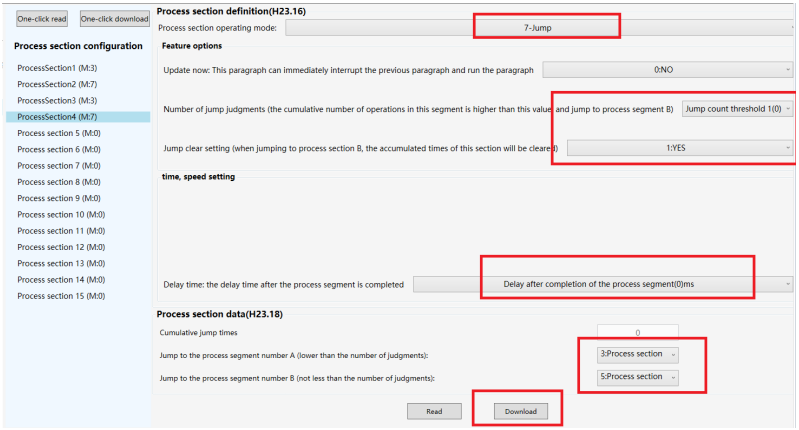
   b. Set process segment 2 to mode 7 jump. Set jump evaluation count to 17. Set **Clear jump** to "YES". Set the jump delay time to 0 ms. Set **Jump to process segment A** to process segment 1 and **Jump to process segment B** to process segment 3. Click **Download**.



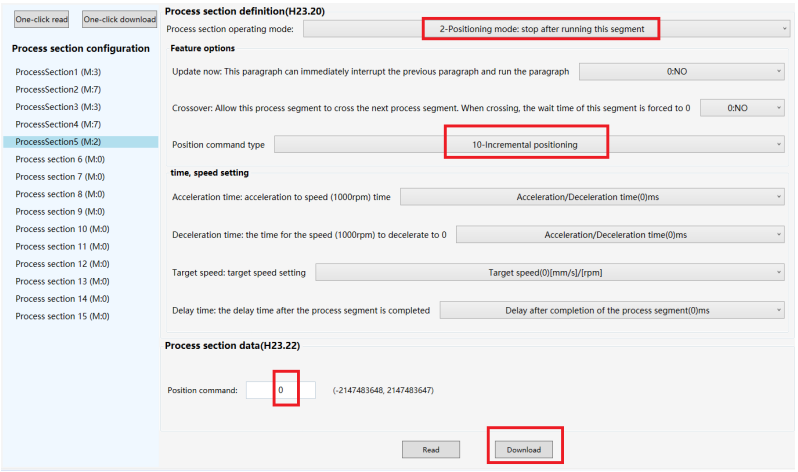
c. Set process segment 3 according to process segment 1, except that the position command is set to-500000.



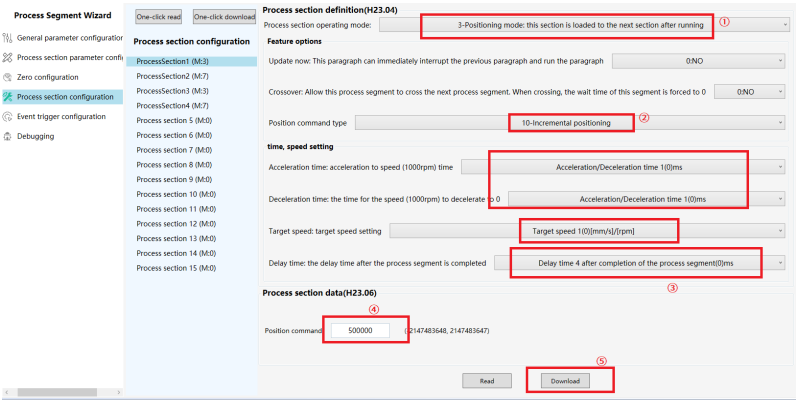
d. Process segment 4 is set as follows. Note that the jump condition is not the same as process segment 2.



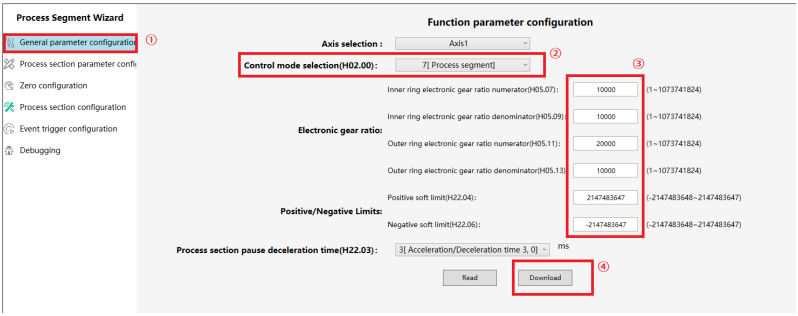
e. Process segment 5 is set to **positioning mode: stop at current segment??**?, the position type is incremental positioning, and the command is 0. Click **Download**.



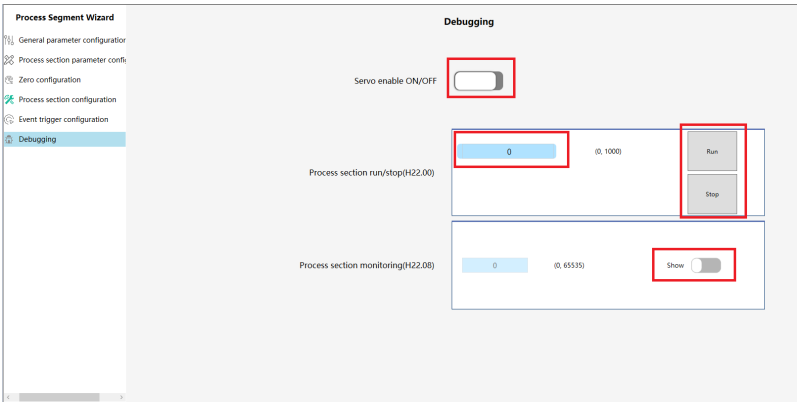
f. Configure process segment 6.



g. Configure process segment 7.

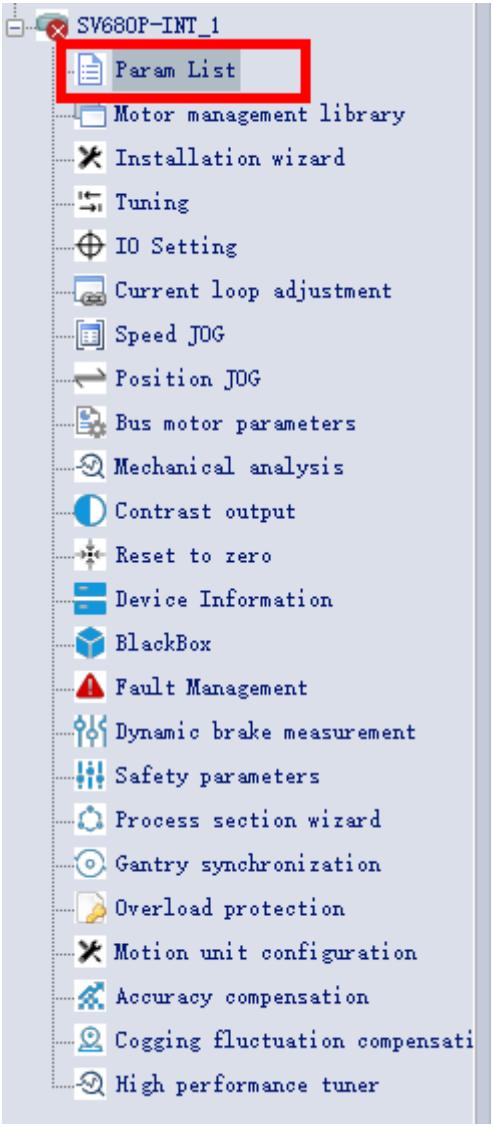


5. Carry out your testing.

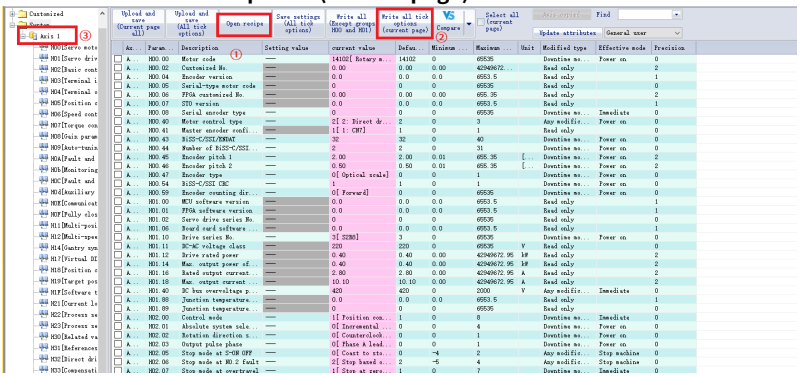


Steps for setting accuracy compensation table making

1. Click the parameter list.


SV680P-INT_1
Param List
Motor management library
Installation wizard
Tuning
IO Setting
Current loop adjustment
Speed JOG
Position JOG
Bus motor parameters
Mechanical analysis
Contrast output
Reset to zero
Device Information
BlackBox
Fault Management
Dynamic brake measurement
Safety parameters
Process section wizard
Gantry synchronization
Overload protection
Motion unit configuration
Accuracy compensation
Cogging fluctuation compensati
High performance tuner

2. Click **Open recipe** and select the parameter recipe below. Click **Axis 1** on the left, and click **Write all tick options (current page)**.



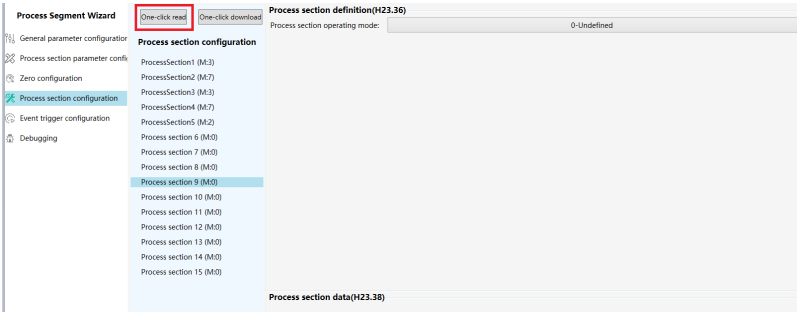
Parameters are provided as follows. All parameters can be used for commissioning directly after being downloaded into the drive.

3. Enter the **Process Segment** page and click **One-click read** to add all parameters.



SV680-INT precision compensation table-making process segment case 1.inoparam

4. Carry out your testing.



15.15Gantry Synchronization

In the industrial production field, gantry synchronization is widely applied to high-end technology devices. The gantry structure provides a stable motion platform for high-precision and highly-coordinated motion. Gantry synchronization enables high-response co-ordinated control.

15.15.1Wiring

As shown in *"Figure 15–12 " on page 724* , X1 axis is connected to X1 drive, X2 axis is connected to X2 drive, beam axis is connected to Y drive, and X1 communicates with X2 through an RS485 bus. The motor and drive models of X1 axis and X2 axis should be consistent.

X1 axis is the master axis, which receives the control signal from the host controller. Gantry synchronization obtains the encoder feedback of the paired axis through RS485 and use the information for internal loop compensation calculation.

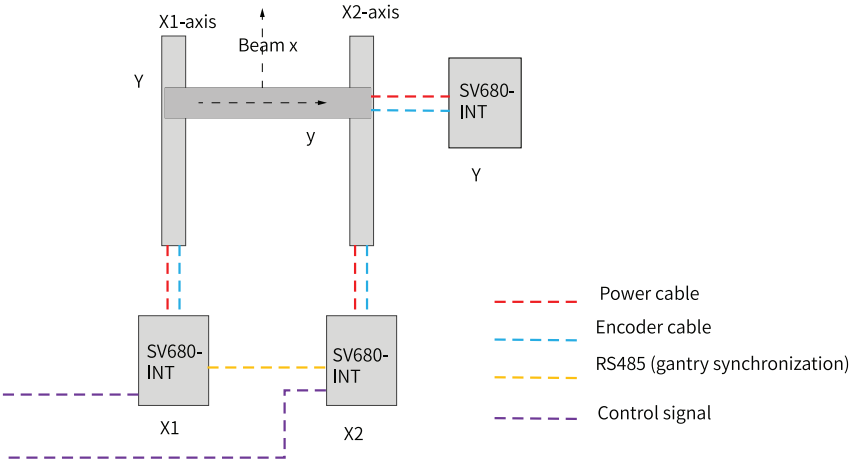
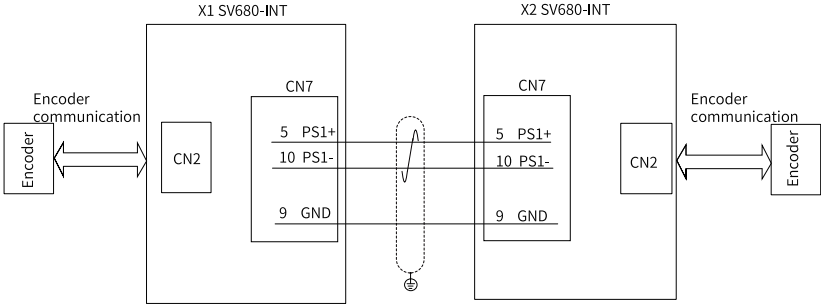


Figure 15-12 Wiring of gantry synchronization

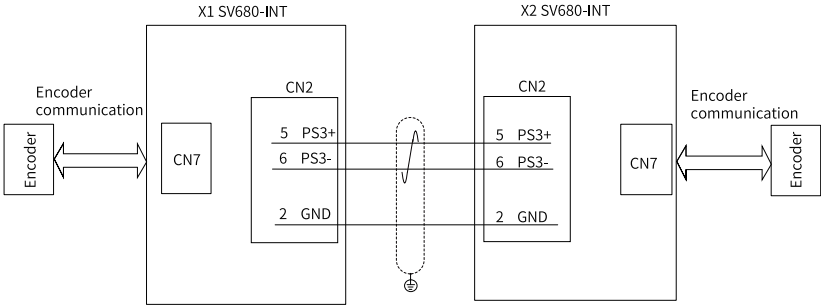
When the SV680-INT is equipped with a direct drive or third-party motor, the default interface of the main encoder is CN7. When it is equipped with an Inovance servo motor, the main encoder is connected to CN2 by default. You can switch it by setting H32.01=1 (the default value of H32.01 is 0).

The gantry communication interface is opposite to the main encoder interface, that is, when the main encoder is connected to CN2, gantry communication must be connected to CN7, and vice versa.

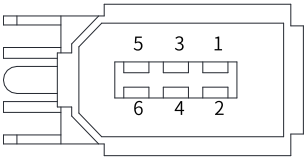
- When the main encoder is connected to CN2, the pins required for gantry communication are as follows:



- When the main encoder is connected to CN7, the pins required for gantry communication are as follows:



Pin assignment of CN2 and CN7 for gantry communication:



Encoder signal terminal CN2

Figure 15-13 CN2 terminal pin layout

Table 15–8 Pin definitions of the CN2 terminal

Pin No.	Pin Assignment	Pin Description
1	5 V	5 V power supply
2	GND	5V power ground
3	PS4+/CLK+	1. PS± signal of the second encoder; 2. CLK± signal of the communication-type encoder
4	PS4-/CLK-	
5	PS3+/DATA+	1. PS± signal of the first encoder;
6	PS3-/DATA-	

Pin No.	Pin Assignment	Pin Description
		2. DATA± signal of the communication-type encoder; 3. Gantry synchronization signal
Shell	PE	Shield



Figure 15-14 CN7 terminal pin layout

Pin No.	Terminal Definition	Description	Pin No.	Terminal Definition	Description
1	A+	Encoder pulse phase A±	9	GND	Power supply reference ground
2	A–		10	PS1-/DATA-	1. PS- signal of the first encoder; 2. DATA- signal of the communication-type encoder; 3. Gantry synchronization signal
3	B+	Encoder pulse phase B±	11	HALL_U+	Hall signal U
4	B–		12	HALL_V+	Hall signal V
5	PS1+/DATA+	1. PS+ signal of the first encoder; 2. DATA+ signal of the communication-type encoder; 3. Gantry synchronization signal	13	HALL_W+	Hall signal W
6	Z+	Encoder pulse phase Z±	14	PS2+/CLK+	1. PS± signal of the second encoder; 2. CLK± signal of the
7	Z-		15	PS2-/CLK-	

Pin No.	Terminal Definition	Description	Pin No.	Terminal Definition	Description
					communication-type encoder
8	+5 V	Encoder 5 V power supply (load current lower than 200 mA)	Shell	PE	Shield

15.15.2Gantry Commissioning Schemes

Gantry structure types and gantry synchronization control scheme

Table 15–9 Gantry structure types

Structure type	Description
Stiff gantry	The two axes are connected by a rigid beam frame, which does not allow large gantry synchronization deviation. Large deviation will cause "stuck axis".
Flexible gantry	The two axes are connected by a flexible beam frame, which allows certain synchronization deviation between the two axes.
Virtual gantry	Two axes are independent of each other, and not connect by any beam frame. Gantry synchronization deviation is allowed between them. Runout axis control is supported.

The SV680-INT provides the following *"Table 15–10 Gantry synchronization control scheme" on page 728*two gantry control schemes applied to different gantry structures.

Table 15–10 Gantry synchronization control scheme

Gantry synchronization control scheme	Description	Scope
Scheme 1	The master axis receives external position commands, and the master and slave axes perform position command following control respectively. In addition, the slave axis performs synchronization deviation elimination control to keep alignment with the master axis.	Stiff gantry Flexible gantry Virtual gantry
Scheme 2[1]	The master axis receives external position commands and performs position command following control. The slave axis performs synchronization deviation elimination control to keep alignment with the master axis. The slave axis can receive position commands, which are used for differential control of two axes to make the two axes run in opposite directions.	Only for stiff gantries

Note

[1]: The display value of master axis H0b.17 (6064) of gantry scheme 2 is (master axis position feedback + slave axis position feedback) ÷ 2, and the display value of slave axis H0b.17 (6064) is (master axis position feedback - slave axis position feedback) ÷ 2.

Application restrictions

The application of SV680-INT gantry synchronization control has the following constraints.

No.	Requirements	Principles
1	Motor models and specifications must be consistent.	In principle, differentiated gantry axis control structure is not supported.
2	Encoder models and specifications must be consistent.	
3	A Hall sensor is required.	
4	Drive models and specifications must be consistent.	

Commissioning precautions

1. Different from single-axis servo commissioning, you must ensure that the key parameters of two axes are consistent during the commissioning, otherwise malfunctions may occur. The following is a list of parameters that must be consistent between two axes. When you need to change the parameter of one axis, make sure the change is propagated to the paired axis. For details, see chapter 7 "Motion Control" on page 448. *"Table 15–11 Parameter settings" on page 729*

Table 15–11 Parameter settings

Precautions	Parameter Type	Corresponding parameter
Parameters	Motor and encoder	Parameters in group H00
	Drive	Parameters in group H01
	Basic function	Control mode: H02.00 Absolute system selection: H02.01 Stop mode: H02.05–H02.08, H02.17–H02.18 DB action delay: H02.20 Electronic gear ratio: H05.02, H05.07, H05.09, H05.11, H05.13, 6091h Brake parameters: H02.09 to H02.12, H02.16 Ramp stop: 6084h, 6085h
	Command limit	Speed limit: H07.17, H06.08, H06.09 Torque limit: H07.07, H07.09–H07.12
	Gain	Loop gain: H08.00, H08.01, H08.02, H08.62 Loop feedforward: H08.18, H08.19, H08.20, H08.21
	Filter	Position command filter: H05.04, H05.06, H05.70 Speed feedforward smoothing filter: H06.13 Torque command low pass filter H07.05, H07.06, H07.37, H07.38, H07.36 Speed measurement method and speed feedback filter: H08.25, H08.22, H08.23

2. Unlike single-axis servo commissioning, the ease-of-use functions can not be used. That is internally restricted by the drive. The following is a description of support for the ease-of-use functions after opening the gantry synchronization function. See *"Table 15–12 Scheme 1 Support for ease-of-use functions" on page 729 "Table 15–13 Scheme 2 Support for ease-of-use functions" on page 731*.

Table 15–12 Scheme 1 Support for ease-of-use functions

No.	Unsupported Function	Supported by Master Axis	Axis Setting Consistency	Supported by Slave Axis
1	<Standard rigidity table> adjustment H09.00 = 1	1, 2 [3, 4, 5, 6 are not supported]	Consistent with the master axis	1, 2 [3, 4, 5, 6 are not supported]
2	Positioning mode adjustment H09.00 = 2			
3	<Interpolation mode + Online inertia auto-tuning> adjustment H09.00 = 3			

No.	Unsupported Function	Supported by Master Axis	Axis Setting Consistency	Supported by Slave Axis
4	<Normal mode + Online inertia auto-tuning> adjustment H09.00 = 4			
5	Stune5 mode adjustment H09.00 = 5			
6	Stune6 mode adjustment H09.00 = 6			
7	Speed feedforward control	Supported	Consistent with the master axis	Supported
8	Speed feedforward source	H05.19=2, 3 are not supported	-	H05.19=2, 3 are not supported
9	Torque feedforward control	Supported	Consistent with the master axis	Supported
10	Torque feedforward source	H06.11= 2 is not supported	-	H06.11= 2 is not supported
11	PDFF control	Supported	Consistent with the master axis	Supported
12	Gain switchover	Not recommended	-	Not recommended
13	Model control	Supported	Consistent with the master axis	Supported
14	QFC control	Supported	Consistent with the master axis	Supported
15	Speed Observer	Supported	Consistent with the master axis	Supported
16	Disturbance observer	Supported	Recommended to be consistent	Supported
17	Cogging torque ripple compensation	Supported	Not required	Supported
18	Encoder scale spacing ripple suppression	Supported	Not required	Supported
19	Adaptive notch	Supported	Recommended to be consistent	Supported
20	Online Inertia Auto-tuning	Not supported	-	Not supported
21	Offline Inertia Auto-tuning	Not supported	Both axes are recommended to be (a-1) ÷ 2 after single axis auto-tuning is completed	Not supported
22	Gravity compensation	Supported	Not required	Supported
23	Friction Compensation	Supported	Not required	Supported
24	End low-frequency resonance suppression 1	Supported	Consistent with the master axis	Supported
25	End low-frequency resonance suppression 2/ 3	Supported	Consistent with the master axis	Supported
26	Field weakening	Supported	Consistent with the master axis	Supported

Table 15–13 Scheme 2 Support for ease-of-use functions

No.	Description	Supported by Master Axis	Supported by Slave Axis
1	<Standard rigidity table> adjustment H09.00 = 1	Supported	Not supported (only H09.00 = 0 is supported)
2	Positioning mode adjustment H09.00 = 2		
3	<Interpolation mode + Online inertia auto-tuning> adjustment H09.00 = 3		
4	<Normal mode + Online inertia auto-tuning> adjustment H09.00 = 4		
5	Stune5 mode adjustment H09.00 = 5		
6	Stune6 mode adjustment H09.00 = 6		
7	Speed feedforward control	Supported	Not supported
8	Torque feedforward control	Supported	Not supported
9	PDFF control	Supported	Not supported
10	Gain switchover	Supported	Not supported
11	Model control	Supported	Not supported
12	QFC control	Supported	Not supported
13	Speed Observer	Not supported	Not supported
14	Disturbance observer	Not supported	Not supported
15	Cogging torque ripple compensation	Not supported	Not supported
16	Encoder scale spacing ripple suppression	Not supported	Not supported
17	Adaptive notch	Supported	Supported
18	Online Inertia Auto-tuning	Supported	Not supported
19	Offline Inertia Auto-tuning	Supported	Not supported
20	Gravity compensation	Supported	Supported
21	Friction Compensation	Not supported	Not supported
22	End low-frequency resonance suppression 1	Supported	Not supported
23	End low-frequency resonance suppression 2/3	Supported	Not supported
24	Field weakening	Not supported	Not supported

15.15.3Gantry Commissioning Process

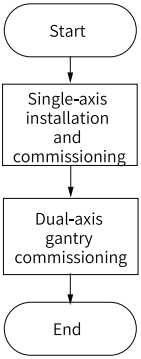


Figure 15-15 Flow chart

15.15.4Single-axis Installation and Commissioning

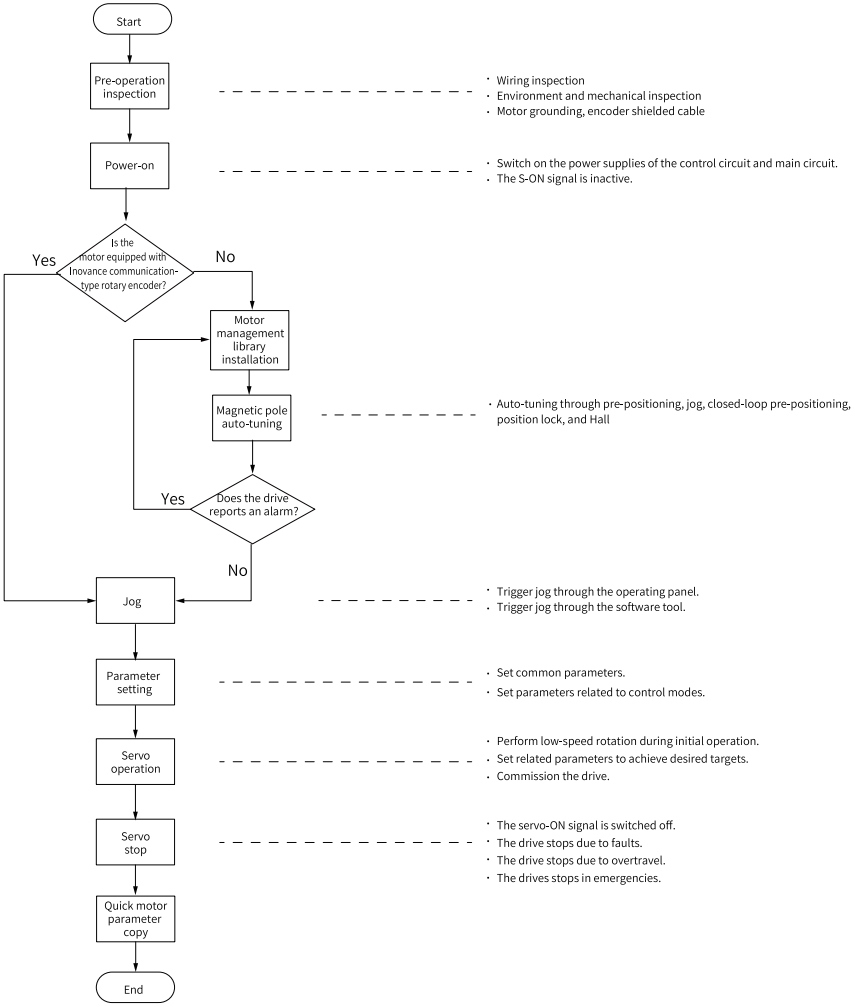


Figure 15-16 Commissioning flowchart of the drive

Perform installation and commissioning of the master/slave axis according to the flow chart, and make sure that the two axes can run smoothly.

15.15.5 Commissioning of 2-axis Gantry

The commissioning process varies with different gantry synchronization control schemes.



Before initial commissioning under gantry scheme 2, it is recommended to set the gain parameters of axis circuit control (H08.00, H08.02) to 0 and the integral time constant (H08.01) to 512. After setting H09.00 to 1 during commissioning, increase the stiffness level of slave axis (H09.01) gradually from 0. If the stiffness is too high, runaway may occur.

15.15.5.1 Commissioning Process of Gantry Sync Control Scheme 1

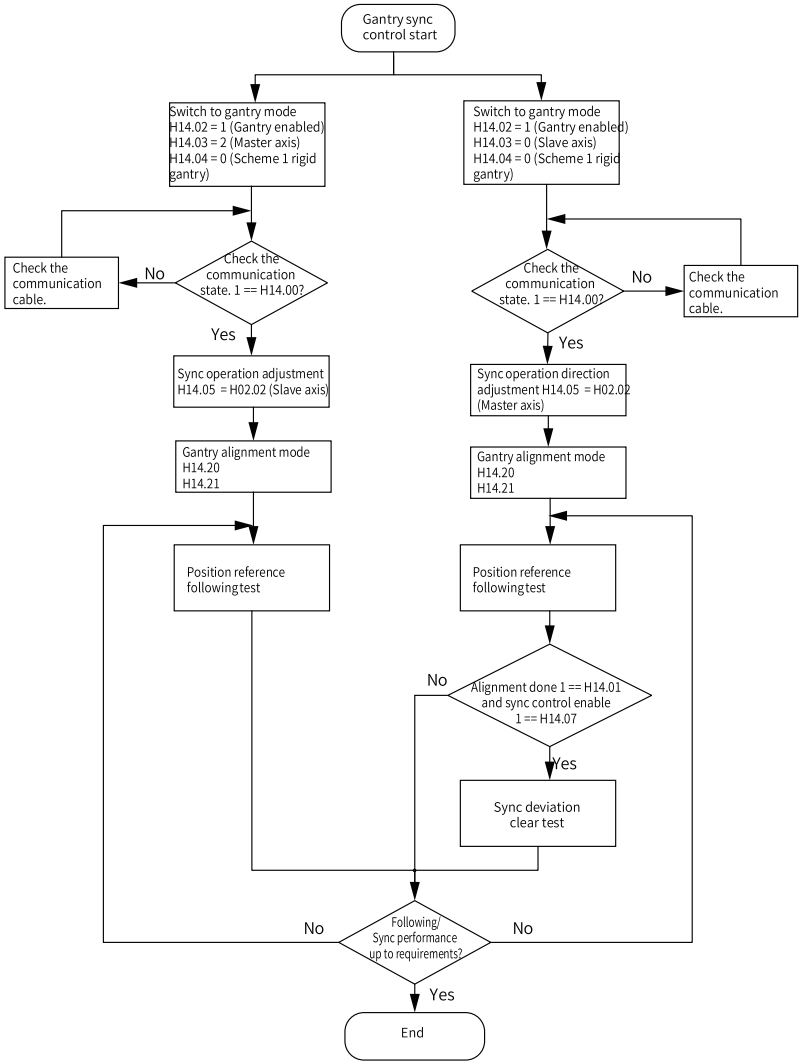


Figure 15-17 Commissioning process of gantry sync control scheme 1

Gantry sync direction

The setting of single-axis running direction has been completed through single-axis installation and commissioning. Now you need to complete the direction setting of communication data between two axes of gantry to ensure the directions of gantry synchronization control data of both axes are the same. The

setting rule can be simplified as: H14.05 (master axis) = H02.02 (slave axis), H14.05 (slave axis) = H02.02 (master axis).

Gantry alignment

Before gantry synchronization function and position deviation alarm function can take effect, gantry alignment must be completed. Gantry alignment is configured according to H14.21. When two axes are aligned and both are in run state, the slave axis can carry out synchronization deviation elimination control and move to the alignment position with the master axis, and the alarm monitoring of excessive synchronization deviation takes effect at this time.

If H14.20 is set to 1, before the gantry meets the alignment condition, the position after both axes are powered on is the zero point.

- For scenarios where photoelectric sensors are used only on a single axis, the alignment is as follows:
  - **Align against the position where both axes are powered on**: Set H14.20 to 1 for both axes. Both axes are synchronized against the position of two axes where they are powered on. When there is deviation after the two axes are powered on, the slave axis will run after the first enabling to eliminate the deviation between the two axes. This mode has no gantry alignment DO and can be used in combination with other alignment modes. H14.01 and its corresponding DO will not be set to 1 only when this condition is met.
  - **Align against the position where both axes are enabled**: Set H14.21 to 3 for both axes. Both axes are synchronized against the position of two axes where both axes are in Run state. The gantry alignment state is exited after both axes are disabled.
  - **Torque oblique alignment:** Set H14.21 to 2 for both axes. Set the H14.26 to **DI enabled** or **Enabled when both axes are in Run state**. Relevant parameters are H14.26–H14.33.
- For scenarios where photoelectric sensors are used on both axes, the alignment is as follows:
  - **For a non-absolute encoder**: Set H14.21 to 0 for both axes. Align against the home of both axes. Or set H14.71 to 1, and set the offset with H14.72. The offset can be identified by H14.25. See Homing Alignment (H14.21=0).
  - **For an absolute encoder**: not supported.

The gantry alignment mode (H14.21) is described below.

1. **Homing alignment (H14.21=0)**
   Description

   During gantry homing, limit switches (photoelectric and hard limit) of master and slave axes are responded.

- Rigid gantry: Support all the originally supported homing modes. the homing path of the master axis is the same as the original planned path. For rigid gantry homing trajectory, see the related section.
- Flexible gantry: Only the following homing modes are supported. For flexible gantry homing trajectory, see the related section.
  - 402 homing: -2,-1, 1, 2, 7, 11, 23, 24, 25, 26, 27, 28, 29, 30 (SV680N-INT)
  - Local homing: 0, 1, 8, 9, 12, 13 (SV680P-INT)

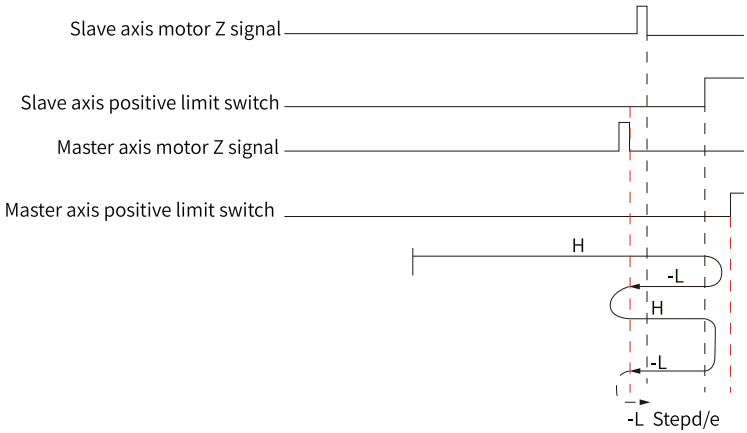
Note

If a homing mode other than the above-mentioned ones is set, starting homing will trigger E601.4 (gantry homing mode error).

- Homing steps for flexible gantry
  Flexible gantry limit or home switch must be installed on both axes, and the operation steps are as follows.

  a. Flexible gantry homing starts. If both axes are not aligned, auto torque alignment is turned on (H14.18), and the homing path is executed after the alignment is completed, otherwise, homing is directly executed.
  b. When both axes move at the same time, the home of the master axis is searched for first. At this time, the path planning is consistent with the original planned path. After the master axis home is found, the axis moves in reverse direction at high speed until encountering the deceleration point or limit. Then it moves backward and searches for the home of the slave axis.
  c. After the home of the slave axis is found, the two axes move to the home of the master axis. If gantry homing positioning is not enabled for the slave axis (H14.71 is 0), the homing is completed. If it is enabled, and if the gantry deviation compensation value of the slave axis (H14.72) is zero, step d is executed, and if it is not zero, step e is executed.
  d. The slave axis moves to its home position.
  e. The slave axis moves to the corresponding position according to the set deviation (H14.72 = Slave home position – Master home position).

  Take SV680-INT -2 homing trajectory 1 as an example, and the path is as follows:



- Torque alignment and deviation auto-tuning of gantry homing
  - Torque alignment
    For the flexible gantry, enable the torque pre-alignment before homing (H14.18 = 1). After homing is triggered, the slave axis automatically carry out torque pre-alignment. After that, H14.18 is reset to start normal homing operation.
  - Deviation auto-tuning
    - For the flexible gantry, enable homing deviation torque alignment auto-tuning for both axes (H14.25 is 1 and H14.71 is 0). After flexible gantry homing is completed, the slave axis automatically performs torque alignment. After that, the home deviation value is auto-tuned, the gantry deviation compensation value (H14.72) is written, and H14.25 is reset.
    - For the flexible gantry, enable homing deviation position auto-tuning for both axes (H14.25 is 2 and H14.71 is 0). After flexible gantry homing is completed, the home deviation value is auto-tuned, the gantry deviation compensation value (H14.72) is written, and H14.25 is reset.

2. **Torque alignment (H14.21=2)**
   Gantry torque alignment:

   The master axis keeps stationary, and the slave axis moves back and forth after torque is limited. The alignment reference is obtained through dichotomy according to the limit position of the back and forth movement.

   Steps:

   a. Set H14.21 to 2. The master axis remains stationary, and the slave axis moves back and forth after torque is limited.

b. Gantry torque alignment enable should be set according to H14.26 of the master axis. If H14.26 is set to direct enable, you must enable the drive first, and then set H14.26=1 before torque alignment enabling can take effect.

c. Alignment torque, alignment times and alignment speed of gantry torque can be through H14.27 to H14.33 of the slave axis.

- H14.27 sets the maximum torque command, which is recommended to be set as large as the mechanical structure allows. The torque command is the resultant force of friction force and mechanical coupling elastic force at constant speed during measurement.
- H14.28 sets the number of forward and reverse rotations. It is recommended to perform multiple measurements to ensure the accuracy of the result.
- H14.29 sets the alignment speed.
- H14.31 sets the alignment acceleration time, which should not be set too large, so that the motor is in a uniform speed section during zero speed evaluation.
- H14.32 is the motor zero speed evaluation threshold, which is used to evaluate the mechanical limit to reach the current torque command during the alignment process. It must be greater than the speed ripple value when the drive is enabled and both axes stay stationary.

3. **Enable alignment (H14.21=3)**
   The enabling signal is the alignment reference for both axes. When H14.21 is set to 3, every time both axes are re-enabled, their position where they enter the state is taken as the alignment reference.

4. **DI alignment (H14.21=4)**
   The gantry establishes or cancels alignment reference through the DI signal of the master axis. When parameter H14.21 is set to DI alignment, the gantry alignment reference is based on the position of two axes when the master axis receives a DI signal. The gantry axes can cancel the alignment reference by another DI signal.

5. **Power-on initial alignment (H14.20=1)**
   The alignment reference is the position where both axes are powered on. After H14.20 is set to 1, the alignment reference is the position where both axes are powered on. When there is deviation after the two axes are powered on, the slave axis will eliminate the deviation after the first enabling. Exit the alignment reference when the alignment state of H14.21 is met.

Alarm of large gantry synchronization deviation

To prevent machinery failures due to the asynchronization between axis positions or torques, two alarm modes: one for large position deviation and the other for large torque deviation, are provided.

- You can set H14.47=1 to enable the alarm for large gantry position deviation, and set H14.45 and H14.44 to configure the deviation threshold and how long the threshold can be exceeds. When the position deviation between the master and slave axes exceeds the threshold and lasts for a certain period of time, the axes raise an alarm on the large gantry position deviation.
- You can set H14.50=1 to enable the alarm for large gantry torque deviation, and set H14.48 and H14.49 to configure the deviation threshold and how long the threshold can be exceeds. When the master/slave torque deviation exceeds the threshold and lasts for a certain period of time, the axes raise an alarm for the large torque deviation.

Gantry sync deviation elimination

Gantry synchronization is in the master-slave mode, and synchronization deviation elimination control master axis compensation is not effective. It is only set by H14.07 of the slave axis to **enabled by default** or **by DI** (59), with which setting the slave axis follows the master axis. See the following for details.

- When the gantry alignment flag is 1, after the two axes enter enabled state from disabled state, the slave axis moves to align with the master axis. When both axes are enabled, and the gantry alignment flag bit changes from 0 to 1, the slave axis moves to align with the master axis. The alignment velocity and acceleration are H14.13 and H14.14.
- By adjusting the synchronization deviation elimination gain H14.08–H14.11, the synchronization deviation can be eliminated to ensure the synchronization of two axes.

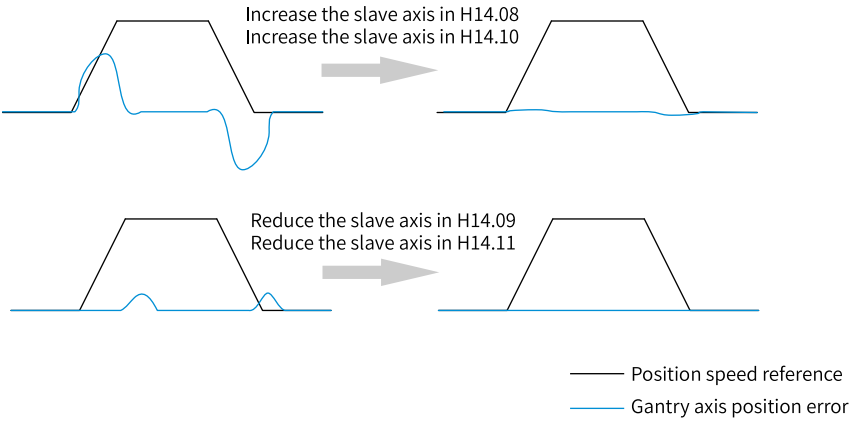


Figure 15-18 Curve change before and after commissioning

15.15.5.2 Commissioning Process of Gantry Sync Control Scheme 2

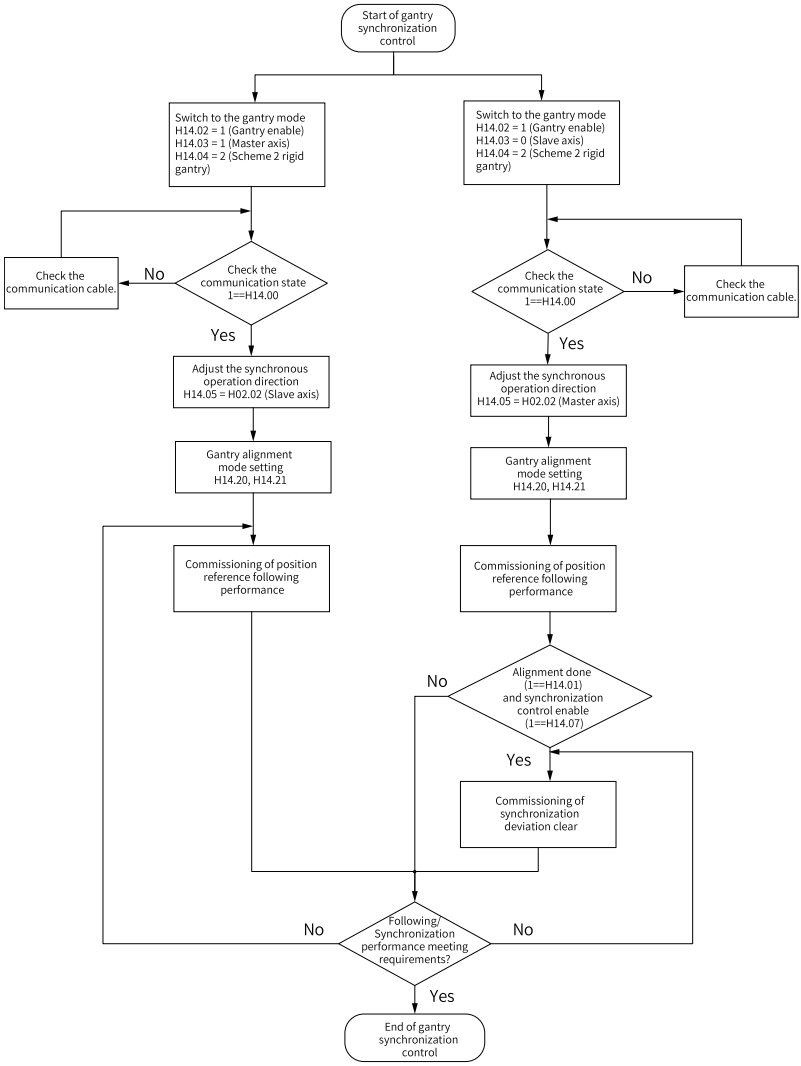


Figure 15-19 Commissioning Process of Gantry Sync Control Scheme 2

Gantry sync direction

For details, see the related section.

Gantry alignment

For details, see the related section.

Note

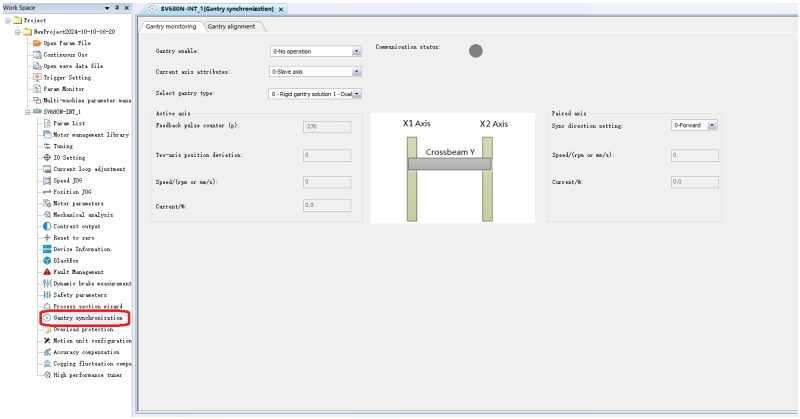
- Torque alignment mode (including torque oblique alignment mode) is not supported.
- Flexible gantry 2-axis homing alignment mode is not supported.

Gantry sync deviation elimination

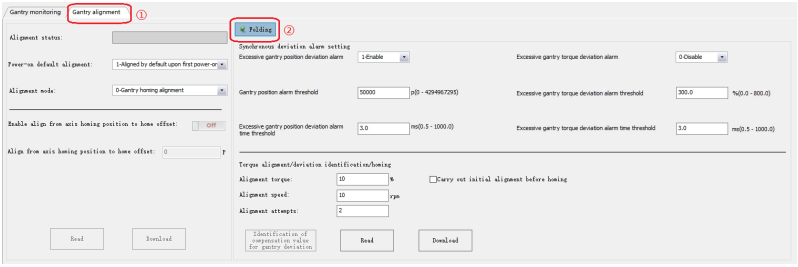
Scheme 2 is effected by slave axis control, that is, synchronization deviation is eliminated through the slave axis following the master axis. Synchronization deviation control must be set in H14.07 of the slave axis and activated in H08.00 to H08.02. When H08.00=H08.02=0 and H08.01=512, sync deviation elimination control is disabled.

Commissioning the host controller gantry

1. Click **Gantry Synchronization** in the workspace. Enable the gantry function, configure the gantry axis property, and select the gantry control type. Observe the communication state to ensure that the communication function of the gantry is active and monitor the state of the active axis and paired axis.



2. In the gantry alignment interface, select the alignment mode (homing alignment, torque alignment, enable alignment, or DI alignment), and set the torque alignment/deviation identification/homing pre-alignment parameters setting (alignment torque, alignment speed, and alignment attempts). You can also change settings for synchronization position deviation and torque deviation alarm.



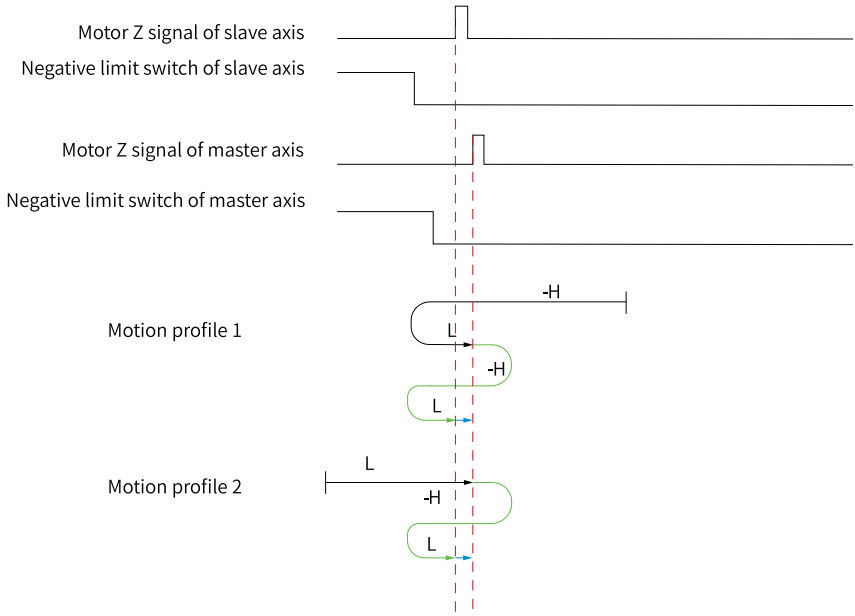
15.15.6Flexible Gantry Homing Trajectory

- The black trajectory is generated by looking for the master axis home signal. The green trajectory is generated by looking for the slave axis home signal. The blue trajectory is returning to the home position of the master axis.
- When the master axis home signal is found, it begins looking for the slave axis home signal in the reverse direction at high speed.
- After the slave axis home signal is found, it continue to move to the home position of the master axis.

6098 = 1

Home: Z signal

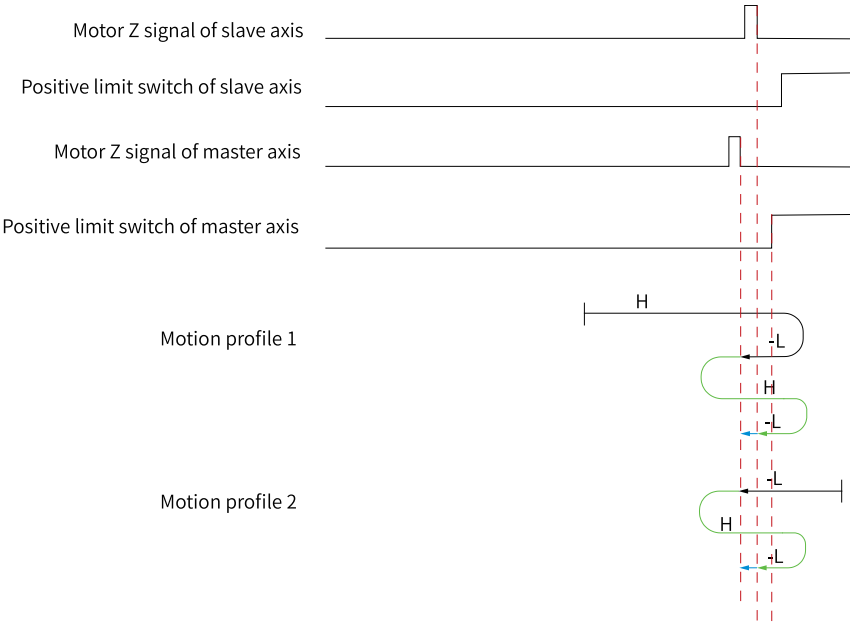
Deceleration point: negative limit switch



6098 = 2

Home: Z signal

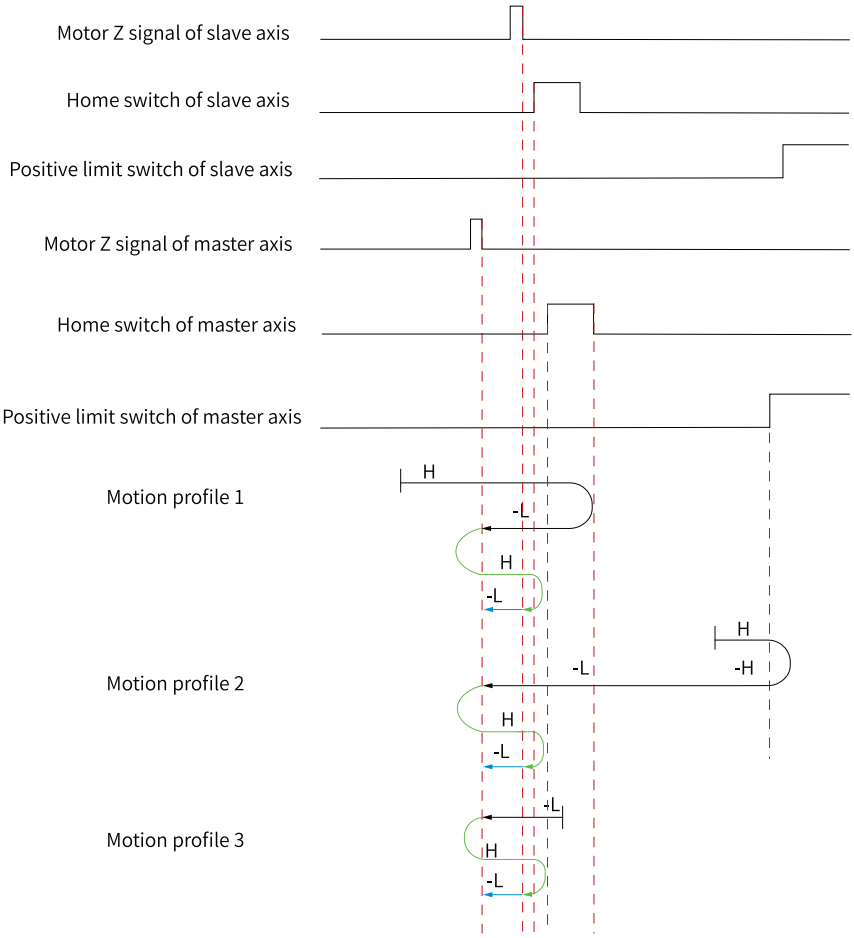
Deceleration point: positive limit switch



6098 = 7

Home: Z signal

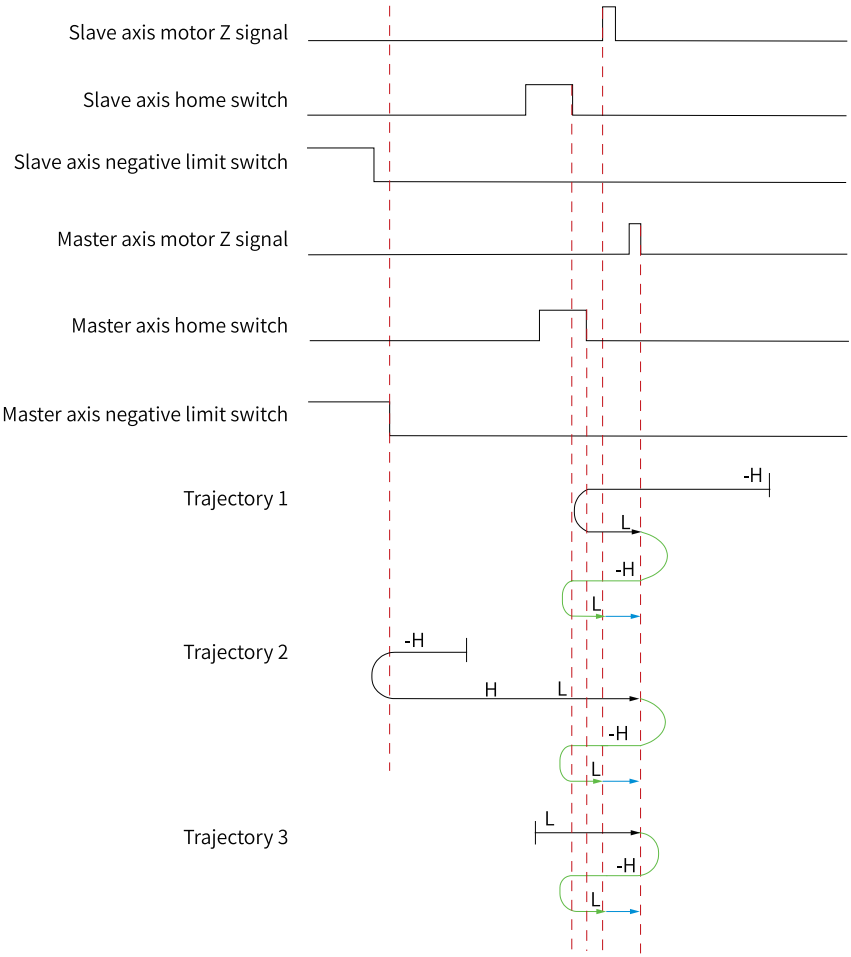
Deceleration point: home switch (HW)



6098 = 11

Home: Z signal

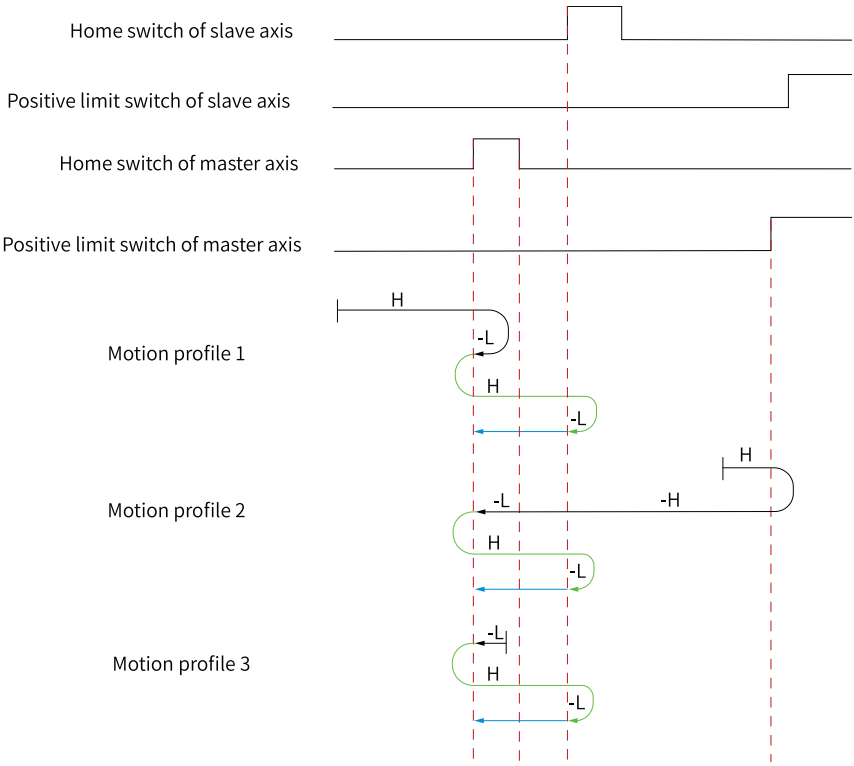
Deceleration point: home switch (HW)



6098 = 23

Home: home switch (HW)

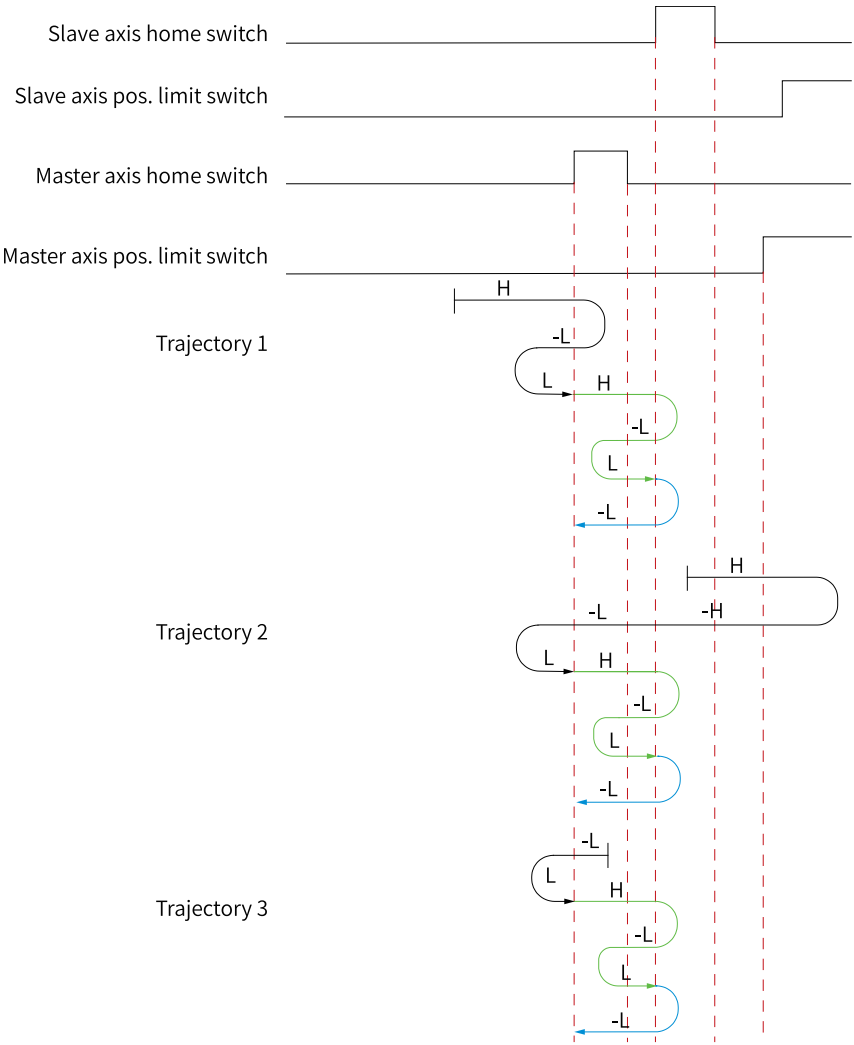
Deceleration point: home switch (HW)



6098 = 24

Home: home switch (HW)

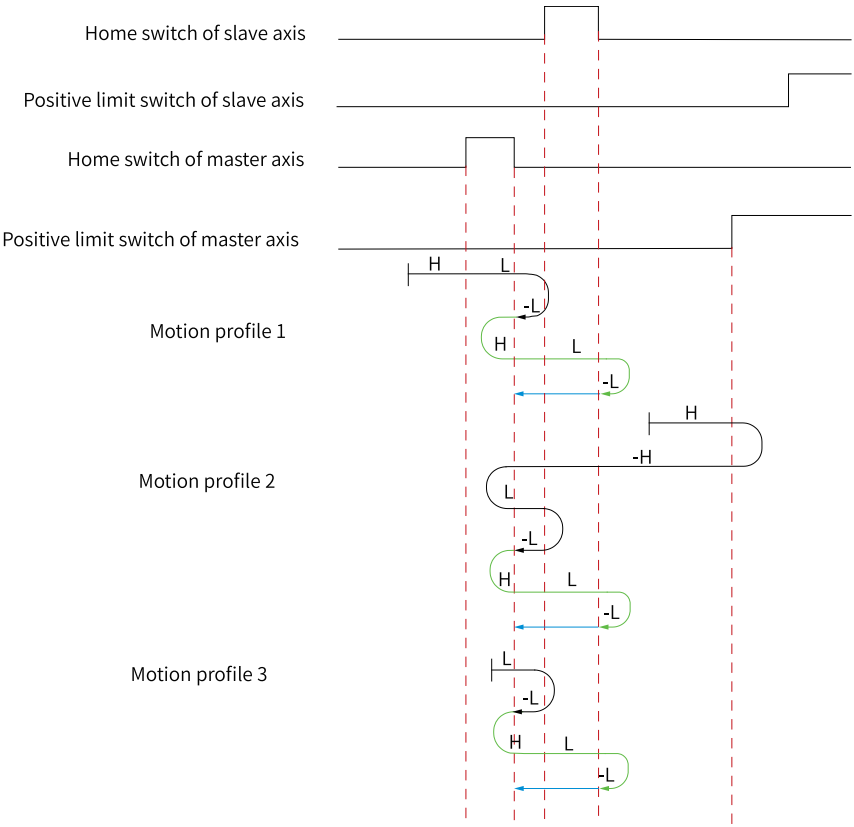
Deceleration point: home switch (HW)



6098 = 25

Home: home switch (HW)

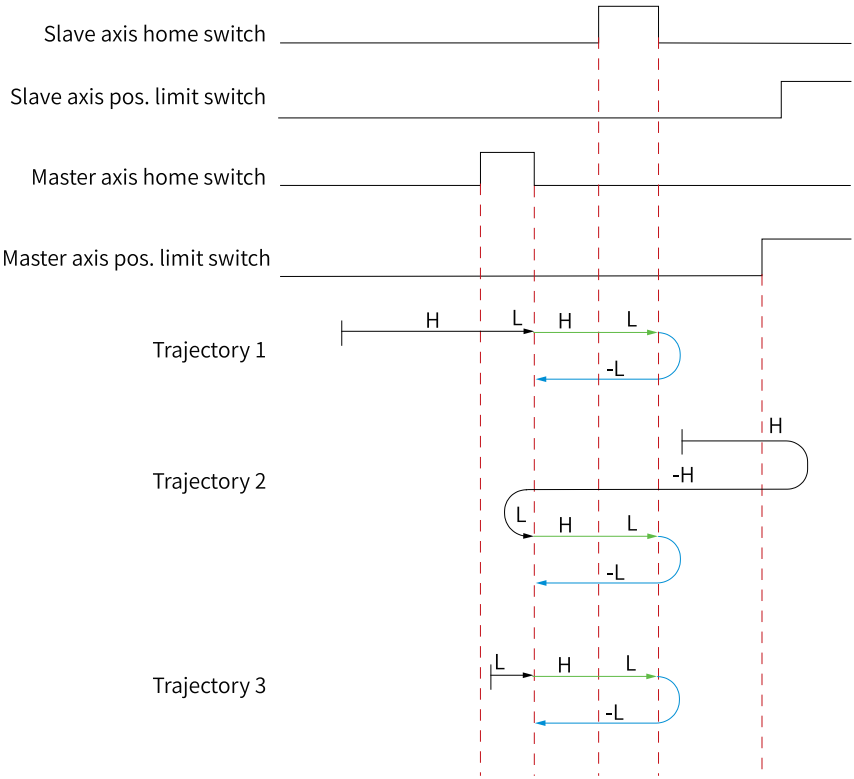
Deceleration point: home switch (HW)



6098 = 26

Home: home switch (HW)

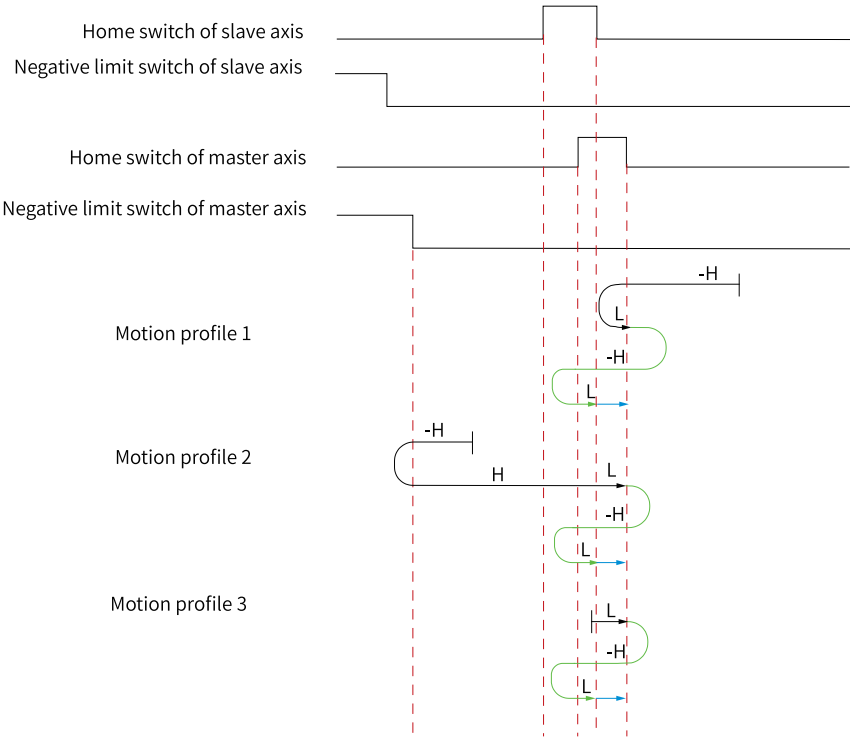
Deceleration point: home switch (HW)



6098 = 27

Home: home switch (HW)

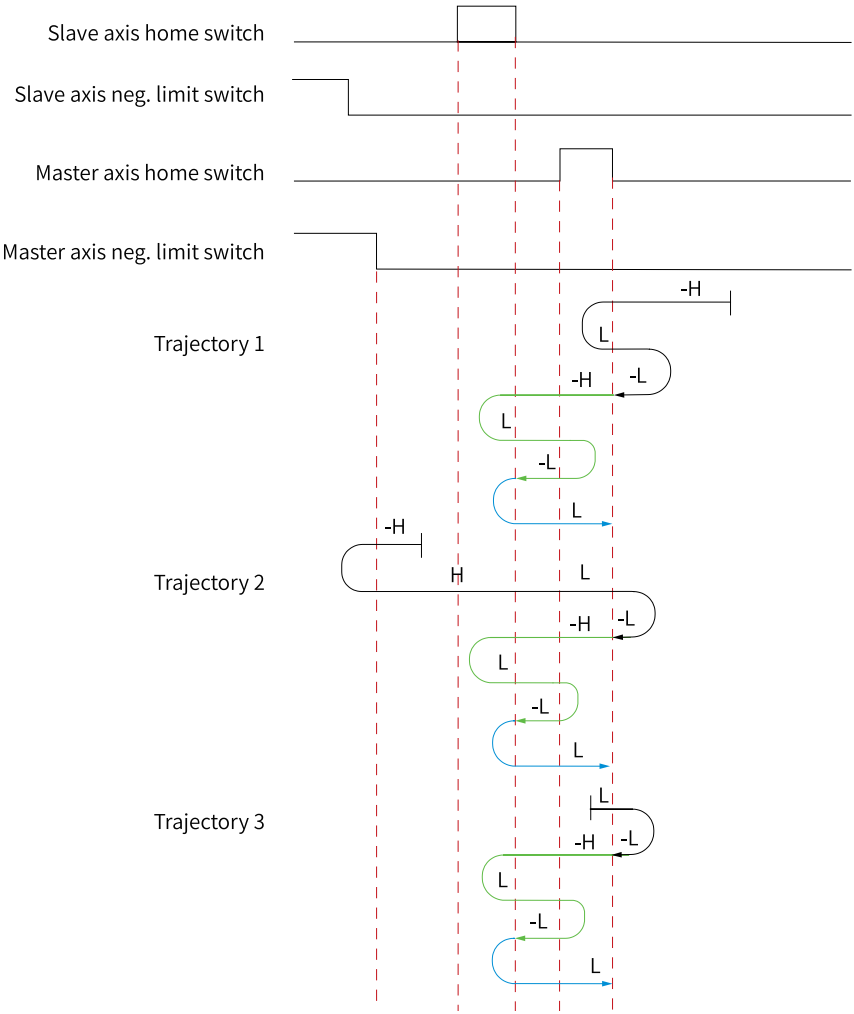
Deceleration point: home switch (HW)



6098 = 28

Home: home switch (HW)

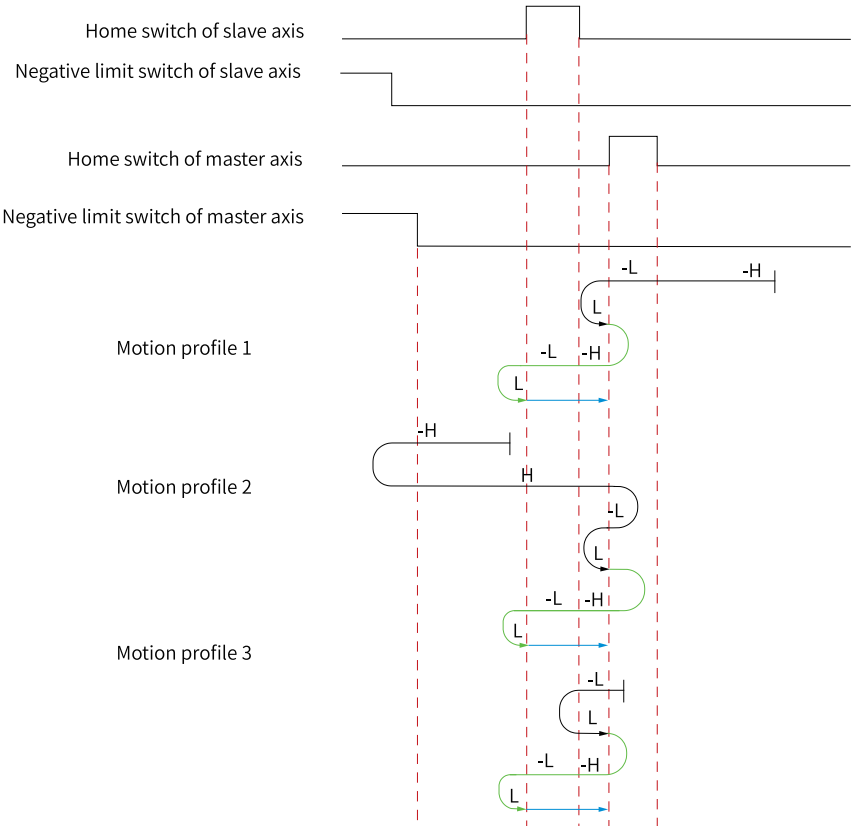
Deceleration point: home switch (HW)



6098 = 29

Home: home switch (HW)

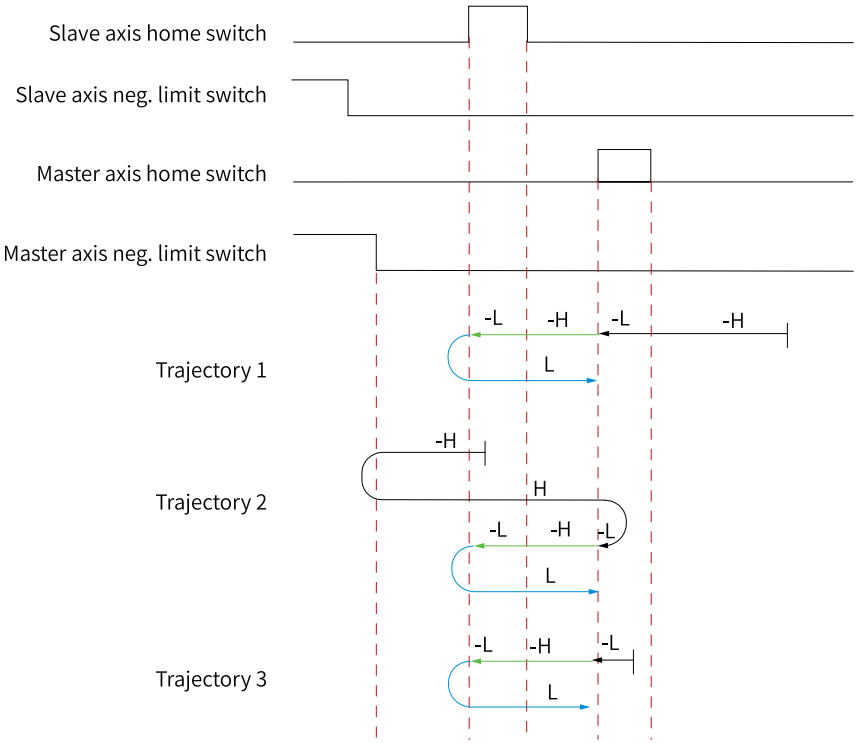
Deceleration point: home switch (HW)



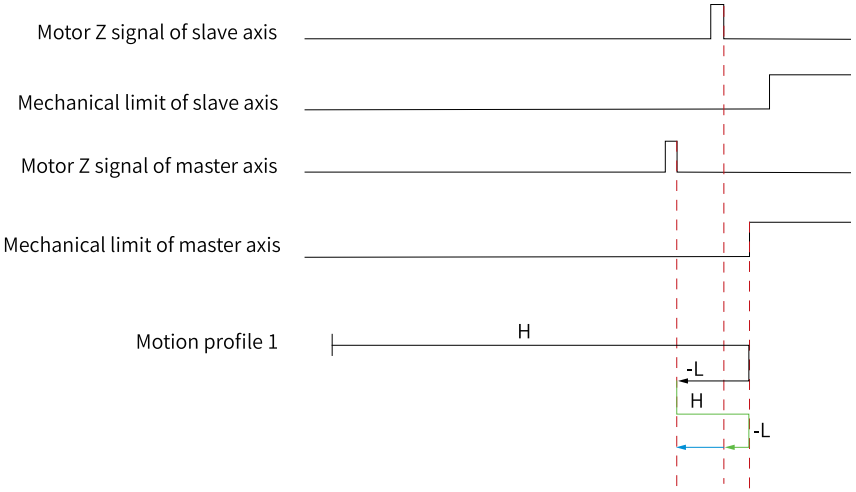
6098 = 30

Home: home switch (HW)

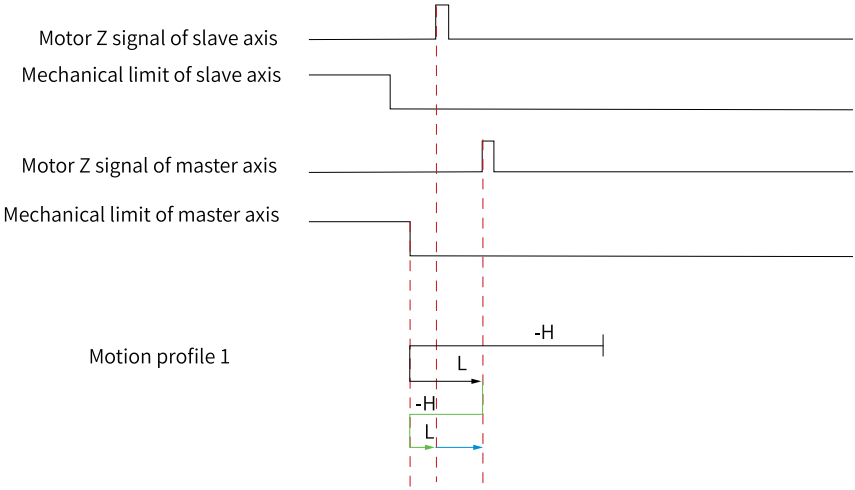
Deceleration point: home switch (HW)


Slave axis home switch
Slave axis neg. limit switch
Master axis home switch
Master axis neg. limit switch
Trajectory 1
-L
-H
-L
-H
L
Trajectory 2
-H
H
-L
-H
-L
L
Trajectory 3
-L
-H
-L
L

6098 = -2

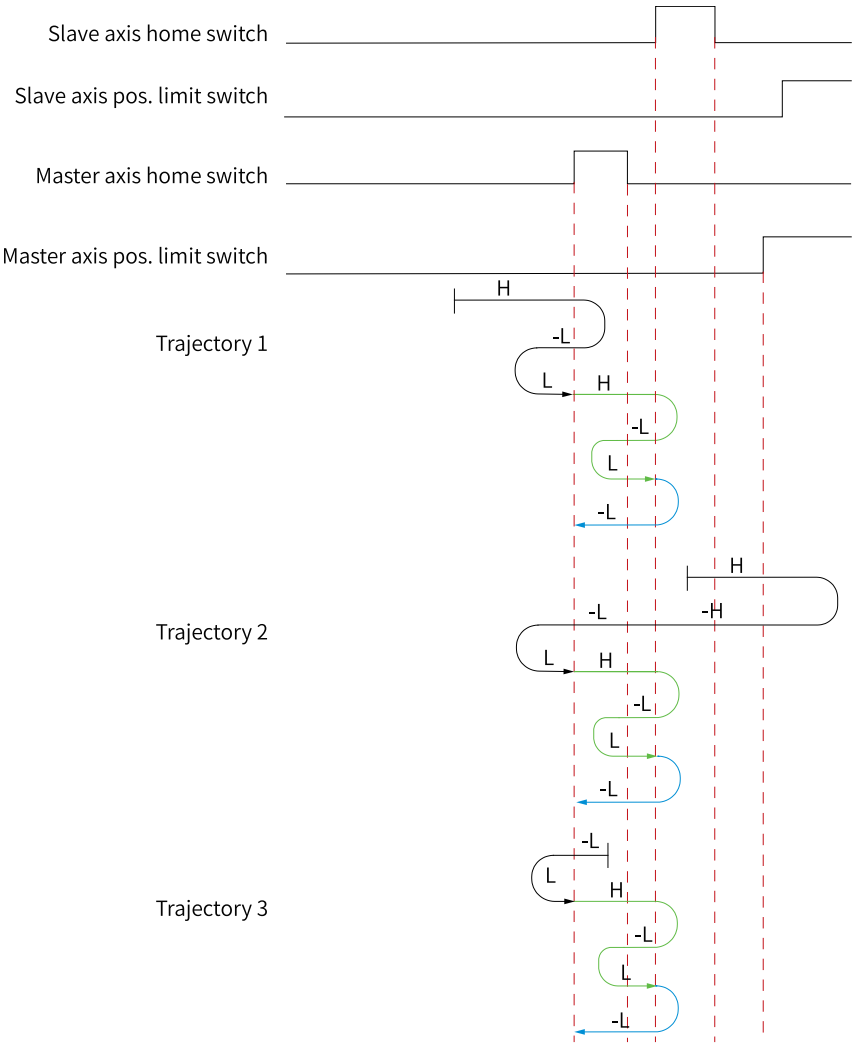

Motor Z signal of slave axis
Mechanical limit of slave axis
Motor Z signal of master axis
Mechanical limit of master axis
Motion profile 1
H
-L
H
-L

6098 = -1



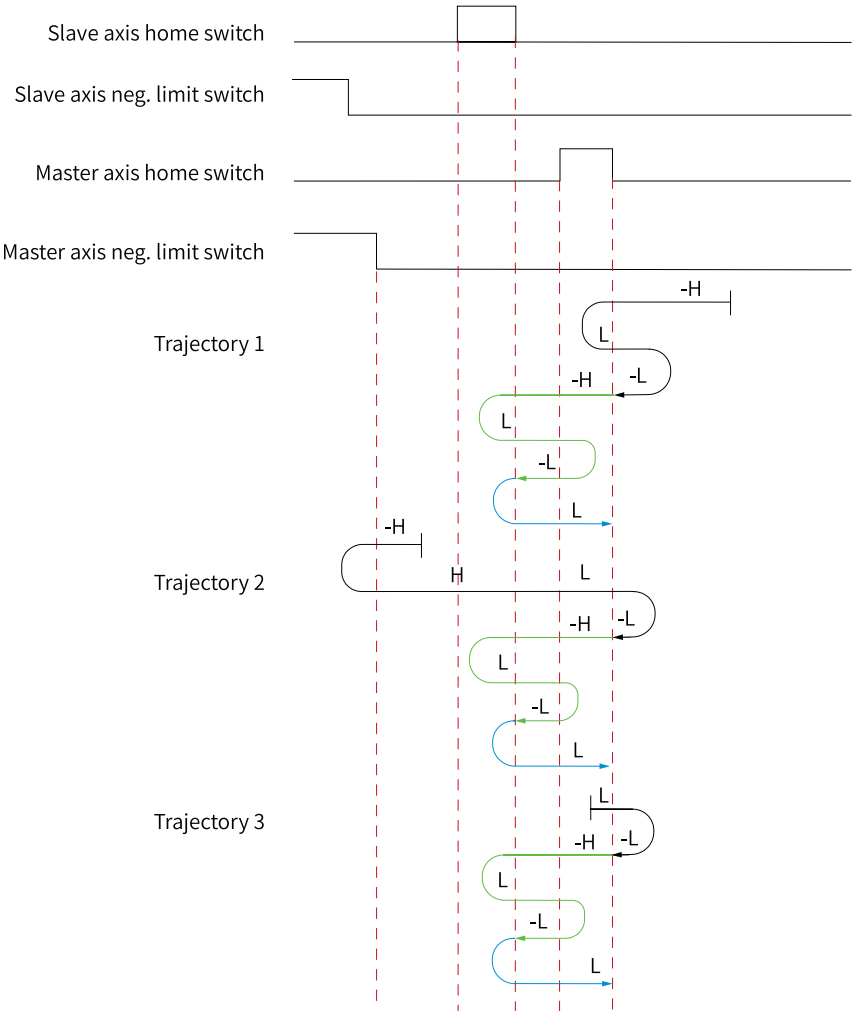
H05.31 = 0

Forward homing, home switch as deceleration point and home



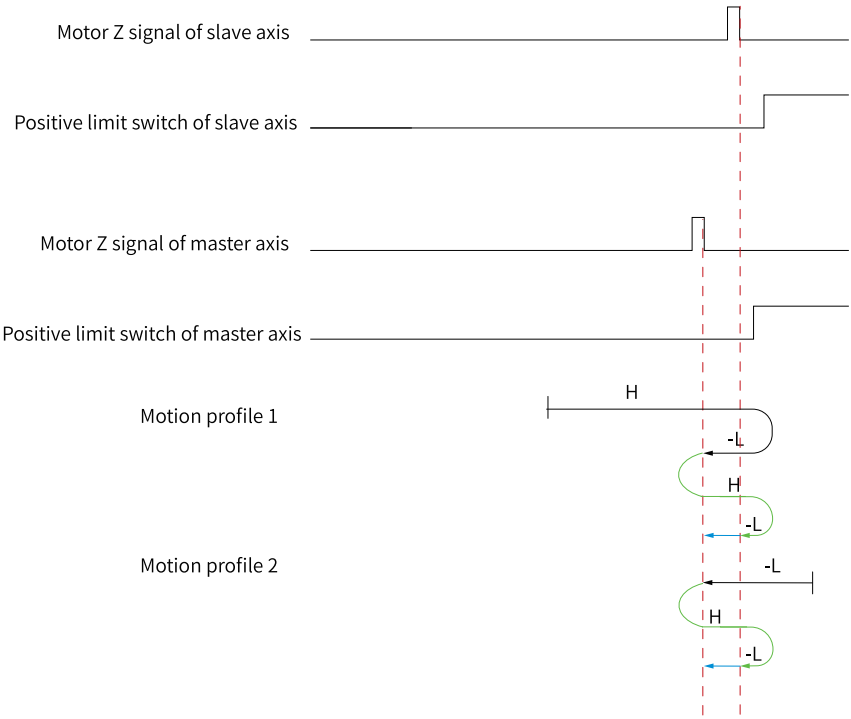
H05.31 = 1

Reverse homing, home switch as deceleration point and home



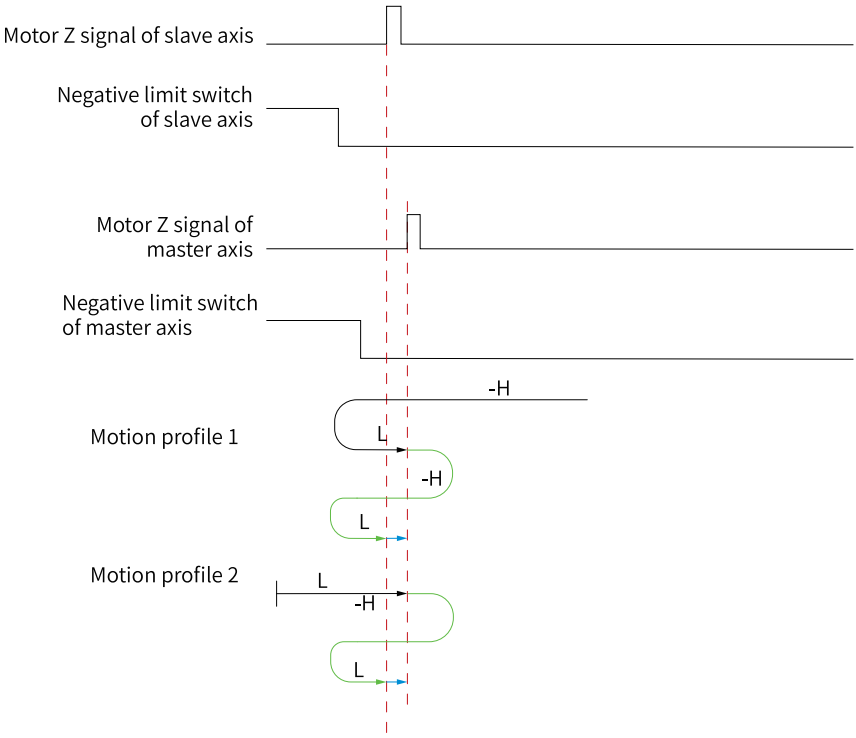
H05.31 = 8

Forward, positive limit switch as deceleration point and Z signal as home



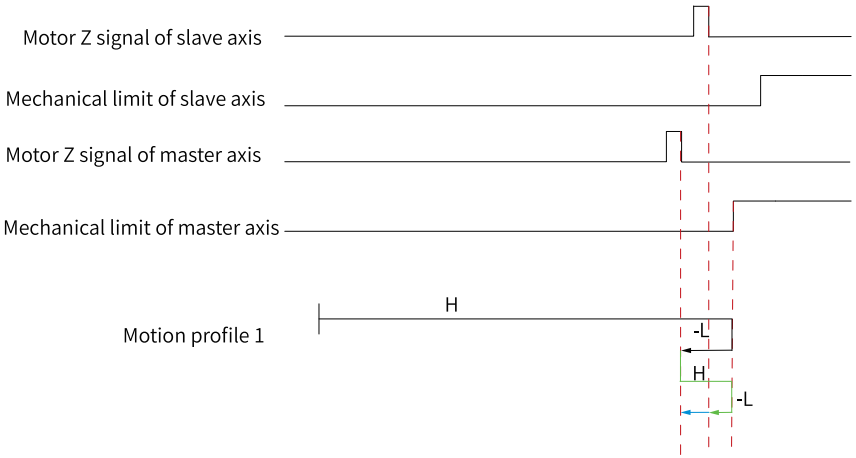
H05.31 = 9

Reverse, negative limit switch as deceleration point signal and Z signal as home



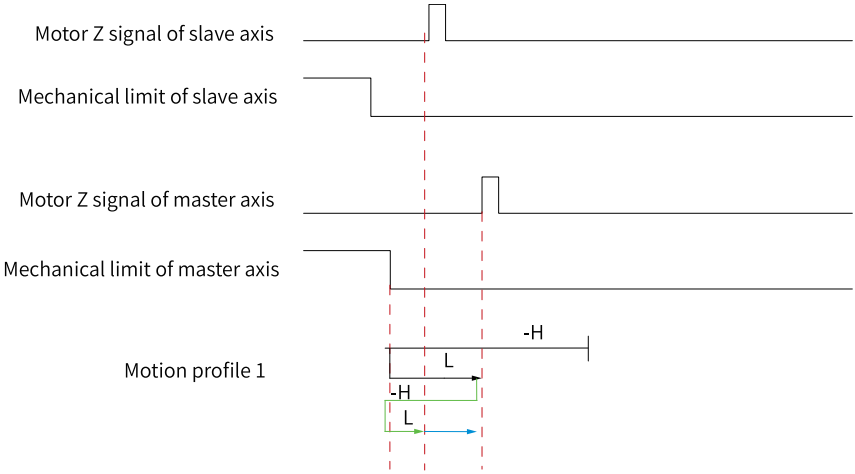
H05.31 = 12

Forward, mechanical limit as deceleration point and Z signal as home



H05.31 = 13

Reverse, mechanical limit as deceleration point and Z signal as home



16 Extended Safety Functions [functional safety]

16.1 General

16.1.1 List of Safety Functions

Different from a standard drive, a safety-integrated drive can run without additional external components.

The functional safety drive can use the following safety functions

- Safe torque off (STO)
  The STO function immediately shuts off the torque or force output of the motor based on an input signal from an external device. This function corresponds to stop category 0 of IEC/EN 60204-1. If the motor is running when the STO function is activated, it coasts to a stop.
- Safe brake control (SBC)
  The SBC function provides a safe output for controlling external brakes.
- Safe stop 1 (SS1)
  The SS1 function starts deceleration based on an input signal from an external device. After a preset period of time elapses or zero speed is achieved, the STO function will be triggered. This function corresponds to stop category 1 of IEC/EN 60204-1.
  - SS1-t time-monitored SS1
    The motor decelerates to stop according to the input signal of the external device. Then STO is executed after the designated delay time elapsed.
  - SS1-r ramp-monitored SS1
    The motor decelerates to stop according to the input signal of the external device. The deceleration slope is monitored against the specified range. STO is executed when the motor speed is lower than the set limit.
- Safe stop 2 (SS2)
  The SS1 function starts deceleration based on an input signal from an external device. After a preset period of time elapses or zero speed is achieved, the SOS function will be triggered. This function corresponds to stop category 2 of IEC/EN 60204-1.
- Safe operating stop (SOS)
  The SOS function monitors whether the motor stops within the prescribed range for the stop position. The drive is in the closed-loop control mode, and can therefore withstand external forces.
- Safely-limited speed (SLS)

The SLS function monitors whether the motor speed exceeds a preset speed limit. When the speed is over the limit, torque of the motor will be shut off immediately.

- Safe direction (SDI)
  The SDI function prevents the motor shaft from moving in an unintended direction. If the motor rotates in an impermissible direction, the drive stops the motor as quickly as possible.
- Safe speed monitor (SSM)
  The SSM function provides a safe output signal to indicate whether the motor speed is below a prescribed limit to identify, for example, a standstill. The servo provides a safe output signal for further processing.

Safety function characteristics

- The expansion safety functions are controlled by an external device through DI or a safety bus.
  The combination of safety module, SV680N-INT series servo drives, and safety motor supports safety functions (SS1-r/SS1-t/SS2/SOS/SLS/SDI/SSM) in compliance with PL e/Cat.3 and SIL3. The SS1-r/SS2/SOS/SLS/SDI/SSM features are not available when the safety motor is not used.
- Integrated STO can be triggered by the CN6 terminal on the panel of the drive.
- Controlling safety functions using a safety bus reduces wiring.



Safety functions SS1-r/SS2/SOS/SLS/SDI/SSM require the use of a safety motor, That does not apply to basic safety functions (STO/SBC/SS1-t).

16.1.2Terms and Abbreviations

Terms and Abbreviations	Description
Cat.	Safety category It includes B, 1, 2, 3, and 4.
CCF	Common cause failure
DCavg	Average diagnostic coverage (%)
DTI	Diagnostic test interval time
SFF	Safe failure fraction
HFT	Hardware fault tolerance
PFH_D	Probability of a dangerous Failure per Hour
PL	Performance Level

Terms and Abbreviations	Description
SC	Systematic capability
SIL	Safety integrity level
T_1	Test interval
DI	Digital inputs
DO	Digital output
PCB	Printed circuit board
MCU	Micro computer unit
FPGA	Field programmable gate array
MTTFd	Mean time to dangerous failure
STO	The safe torque off (STO) function brings the machine safely into a no-torque state and prevents it from unexpected start. When the STO function is activated, the servo drive stops according to the preset stop mode (H02.08).

16.1.3Safety Standards

Standards compliance

- EC directives and standards
  Low Voltage Directive 2014/35/EU Standard EN 61800-5-1

  EMC Directive 2014/30/EU Standard EN 61800-3: 2018

  Machinery Directive 2006/42/EC (Safety Functions) Standard IEC 61800-5-2
- Safety standard

Safety standard	Reference
Functional safety	IEC 61508: 2010 ISO 13849-1: 2015 ISO 13849-2: 2012 IEC 62061: 2021 EN 61508: 2010 EN ISO 13849-1: 2015 EN ISO 13849-2: 2012 EN IEC 62061: 2021 IEC 60204-1: 2016 (in extracts) EN 60204-1: 2018 (in extracts)
EMC	IEC 61800-5-2: 2016 IEC 61800-3: 2017 IEC 61326-3-1: 2017 IEC 61000-6-7: 2014 EN 61800-5-2: 2017 EN IEC 61800-3: 2018 EN 61326-3-1: 2017 EN 61000-6-7:2015
LVD	IEC 61800-5-1:2007/AMD1:2016 EN 61800-5-1:2007/A1:2017

- Safety data

Item	Safety data
SIL	SIL3, IEC61508 Maximum SIL3, EN IEC62061
PFH_D	$PFH_D \leqslant 1.1\times10^{-9}$ [1/h] (1.1% of SIL3)
Cat.	3, EN ISO 13849-1
PL	e, EN ISO 13849-1
MTTFd	904 years (high)
DCavg	⩾90% (medium)
T_1	20 years
HFT	1
SC	SC3
λ_S	2.2×10^{-7} /h
λ_{DD}	1.3×10^{-7} /h
λ_{DU}	2.7×10^{-9} /h
MTTR	0 hour
MRT	0 hour
Application mode	High demand or continuous mode
Device type	Type B
Safe speed accuracy	2197.98 rpm

λ_S means the failure rate of safe failure which brings the system into safe state.

λ_{DD} means the failure rate of dangerous failure but can be diagnosed by the diagnosis subsystem.

λ_{DU} means the failure rate of dangerous failure and can't be diagnosed by the diagnosis subsystem.

Note

- See ISO13849-2: 2012 for failure modes of devices.
- Failure sharing of different failure modes of each device.
- See SN29500 for failure rate of each device.

16.1.4Precautions for Use

General Safety Instructions

The chapter contains the warning symbols used in this manual and the safety instructions which you must obey when you install or connect an option module to a drive or inverter. If you ignore the safety instructions, injury, death or damage can occur. Read this chapter before you start the installation.

Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.

The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual.

Table 16–1 Warnings, Cautions and Notes

Pictogram	Signal word	Meaning	Consequences in case of disregard
Example:  DANGER  Hazardous voltage e.g. electric shock	DANGER	DANGER	Indicates that failure to comply with the notice will result in death or severe personal injuries
	WARNINGS	Warning	Indicates that failure to comply with the notice may result in death or severe personal injuries
	CAUTION	Note	Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage
	STOP	Prohibit	Indicates that failure to comply with the notice will result in equipment or environmental damage

Caution

- High attention is required for electrical installation and at the system design to avoid hazards either in normal operation or in the event of equipment malfunction.
- System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read the operating instruction and this safety information.

It is the responsibility of the machine builder/OEM/system integrator to make sure that the essential health and safety function requirements specified in the Machinery Directive are met. Risk analysis and risk assessment is needed before using a product. Make sure that adequate measures are taken to eliminate/reduce the relating risks and components chosen must meet the safety requirements.

This section describes the information that needs to be noted before starting operation. Read the following safety precautions, risk assessment information, and limitations before starting operation.

Safety function: Use the safety function after properly understanding all of these information. Incorrect use of safety functions or use of safety functions that are not sufficient to meet the safety requirements of the site may result in personal injury.

Safety Precautions

Carefully read the following important precautions and observe them when using the safety function.

- STO function is not intended as a replacement for the emergency stop function (E-stop). If only the STO function is triggered, with no extra measures taken, the power supply cannot be cut off in emergencies and high-current parts of the motor and drive are still energized, incurring the risk of electric shock or other risks result in electric energy. Therefore maintenance work on electrical parts of the drive or motor can only be carried out after isolating the drive system from the main supply.
- Depending on the standards and requirements for a particular application, it may be possible to use STO as an integral part of an E-stop system. However, its main purpose is for use in a dedicated safety control arrangement whose purpose is to prevent any hazard from occurring, without the use of an E-stop.
- An E-stop is often provided in a machine to allow for unexpected situations where an operator sees a hazard and can take action to prevent an accident.
- The design requirement for an E-stop differs from that of a safety interlock. Generally, the E-stop is required to be independent from any complex or "intelligent" control. It may use purely electromechanical devices to either disconnect the power or initiate a controlled rapid stop using other means such as dynamic or regenerative braking.

Note

- The design of safety-related systems requires specialist knowledge. To ensure that a complete control system is safe, it is necessary for the whole system to be designed according to recognized safety principles. The use of individual sub-systems such as drives with STO function, which are intended for safety-related applications, does not in itself ensure that the complete system is safe.
- The STO function can be used to stop the drive in emergency stop situations.
- In processes without personnel protection, it is recommended not to stop the drive by using the STO function. If a drive running is stopped by using STO, the drive performs a coast-to-stop. If this is not acceptable, the system should be stopped using the correct mode instead of the STO function.
- This publication is a guide to the application of Inovance SV660 series safety functions, and also on the design of safety-related systems for machinery control.
- It is the responsibility of the designer of the end product or application to ensure that it is safe and in compliance with the relevant regulations.

Risk Assessment

- When using the safety functions, perform risk assessment on the servo system in advance. Make sure that the safety integrity level of the standards is met.

- The following residual risks can be present even when the safety functions operate. Therefore, safety must always be given consideration during risk assessment.
- If external forces (such as gravitational force with a vertical axis) are applied when the safety functions are operating, the motor will rotate due to the action of these external forces. Therefore, you must use a separate mechanical brake to secure the motor.

Note

- In the case of failure of multiple IGBTs, regardless of whether the STO function is enabled, the servo drive can generate an alignment torque. This torque can cause the motor shaft to rotate within a range of up to 180÷p (for a synchronous reluctance motor, the range is 180÷2p).
- p: Number of motor pole pairs.

To ensure safety, users should decide all the risk assessments and residual risks in the entire machine equipment. A company and individual who constructed the safety related system must take full responsibility for installation and commissioning of the system. Additionally, when complying with a European machinery directive, the system must acquire safety standards certification as a whole.

Perform all risk assessments and safe level certification to the machine or the system as a whole. It is recommended that a Certification Body final safety certification of the system be used.

The following shows residual risks concerning the safety function of this product.

Common residual risks

- At the shipment to end-users, check the settings of safety related components with programming tools and monitored/displayed contents on display and record and save the setting data concerning the safety observation function and the programming tools you used. Perform them using a check sheet, etc.
- The safety will not be ensured such as in assembling machine until installing, wiring, and adjustment are completed properly. Install, wire, and adjust your system referring to installation guide for each unit.
- Only qualified personnel are authorized to install, start-up, repair or adjust the machines in which these components are installed. Only trained engineers should install and operate the equipment.
- Separate the wiring for safety observation function from other signal wiring.
- Protect the cables with appropriate ways (routing them in a cabinet, using a cable guard, etc.).

- We recommend using a switch, relay, sensor, etc. which comply with safety standards. When using a switch, relay, sensor, etc. which do not comply with safety standards, perform a safety confirmation.
- Keep the required clearance/creepage distance depending on voltage you use.

Residual risks in each function

- **Safe torque off (STO)**
  This function only cuts off the torque of the motor, and does not cut off the power supply of the servo/inverter. Before servicing the servo/inverter, cut off the power supply and ensure that the servo/inverter are not energized.

  You must conduct STO diagnosis every three month by powering off and powering on the drive once, or running the STO function once.

Note

There are two ways to perform STO diagnosis:

- Power off and restart;
- Trigger and then cancel STO.

You can use either of them.

- **Safe brake control (SBC)**
  This function guarantees only that power to mechanic break is properly supplied and abrasion of the brake cannot be detected. Check this function regularly that the mechanic brake can operate. Evaluate whether the holding force of the mechanical brake meets the application requirements. Incorrect use may result in abrasion of brake and personal injury.
- **Safely-limited speed (SLS)**
  - Speed monitoring function guarantees the servo motor speed, but it does not guarantee the actual machine safety speed. Set parameters so that the safe speed of the machine is the same as the safety speed of the specified motor.
  - Check if the speed of the monitored servo axis is the same as the actual speed by using a tachometer, etc. considering the speed includes an error caused by the command and encoder resolution.
  - The defect of the mechanical section such as slid of shaft and wanting of a timing belt, etc. is not covered. Be sure to eliminate the risk of mechanical section before operation.
  - After speed is over the limit, safety observation error (shut-off signal off) does not occur during the speed error detection time set by the parameter. Make sure that safety can be ensured during this period.

- Adjust the speed limit considering the risk of speed acceleration from an acceptable safe speed to an unacceptable speed due to the system response time.

- **Safe operating stop (SOS)**
  This function is used in applications with external force loads such as vertical axis applications. Servo drive failure can cause axis position hold failure. Evaluate the impact on the system and take hazard reduction or control measures such as mechanical braking.

- **Safe speed monitor (SSM)**
  - Speed monitoring function guarantees the servo motor speed, but it does not guarantee the actual machine safety speed. Set parameters so that the safe speed of the machine is the same as the safety speed of the specified motor.
  - Check if the speed of the monitored servo axis is the same as the actual speed by using a tachometer, etc. considering the speed includes an error caused by the command and encoder resolution.
  - The defect of the mechanical section such as slid of shaft and wanting of a timing belt, etc. is not covered. Be sure to eliminate the risk of mechanical section before operation.
  - After speed is over the limit, safety observation error (shut-off signal off) does not occur during the speed error detection time set by the parameter. Make sure that safety can be ensured during this period.
  - Adjust the speed limit considering the risk of speed acceleration from an acceptable safe speed to an unacceptable speed due to the system response time.

16.2 General

The combination of the safety module, SV680N-INT drive and safety motor can achieve the following safety functions:

Safety Function	Function
STO	The STO function immediately shuts off the torque or force output of the motor based on an input signal from an external device. This function corresponds to stop category 0 of IEC/EN 60204-1. If the motor is running when the STO function is activated, it coasts to a stop.
SBC	The SBC function provides a safe output for controlling external brakes.
SS1	The SS1 function starts deceleration based on an input signal from an external device. After a preset period of time elapses or zero speed is achieved, the STO function will be triggered. This function corresponds to stop category 1 of IEC/EN 60204-1.

Safety Function	Function
SS2	The SS1 function starts deceleration based on an input signal from an external device. After a preset period of time elapses or zero speed is achieved, the SOS function will be triggered. This function corresponds to stop category 2 of IEC/EN 60204-1.
SOS	The SOS function monitors whether the motor stops within the prescribed range for the stop position. The drive is in the closed-loop control mode, and can therefore withstand external forces.
SLS	The SLS function monitors whether the motor speed exceeds a preset speed limit. When the speed is over the limit, torque of the motor will be shut off immediately.
SDI	The SDI function prevents the motor shaft from moving in an unintended direction. If the motor rotates in an impermissible direction, the drive stops the motor as quickly as possible.
SSM	The SSM function provides a safe output signal to indicate whether the motor speed is below a prescribed limit to identify, for example, a standstill. The servo provides a safe output signal for further processing.

Different from other functions, the SS1-t function in STO, SBC, and SS1 can be used with a non-safety motor.

You can choose to trigger the safety functions either locally or through FSoE by setting parameter H20.01. The FSoE mode is only applicable to the SV680N-INT servo drive. For a pulse servo drive, you must choose the local mode.

Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode
H20.01	2020-02h	Safety function trigger selection	0: Local trigger 1: FSoE trigger	0	-	At stop

When the local mode triggers the safety function, you can configure the safety DI to a safety function (such as STO, SS1 or SS2) and control the function through on and off of the safety DI. You can also configure the DO to a safety function (such as STO, SOS, or SSM). The DO output is active when the corresponding safety function is triggered.

When you choose to trigger the safety functions through FSoE, you need to configure the PDO mapping. The RPDO transfers data from the master to the slave. You can control the triggering of a safety function by setting the bit in RPDO corresponding to the safety function. The TPDO feeds back data from the slave to the master. The safety module feeds back the current safety function state to the host controller through TPDO.

Note

- When the safety functions are configured to be locally triggered, the TPDO does not update.
- When the safety functions are triggered through FSoE, the DI and DO functions of CN9 and CN10 are not available, but the STO terminal (CN6) can be used normally.

Priority of safety functions

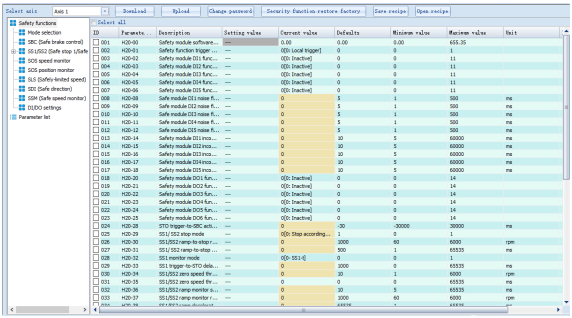
When several safety functions are activated simultaneously, the following priority applies:

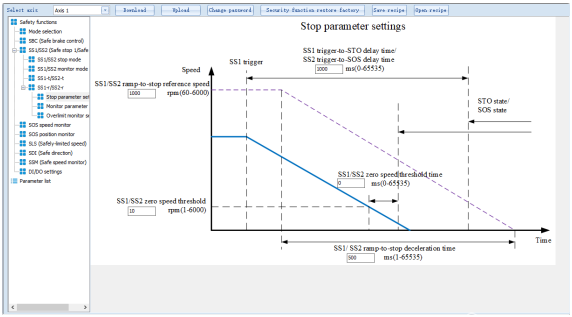
- STO has priority over SS1 and SS2.
- SLS/SDI/SSM are independent of each other.

When a safety function overrides another, this does not cancel the request for the overridden safety function. Therefore, the overridden safety function is restarted after other safety functions are completed.

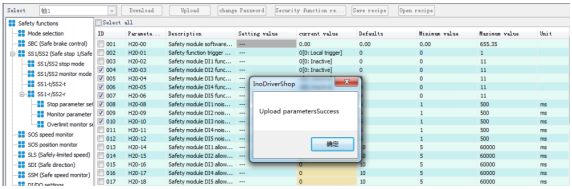
16.3 Software Parameter Configuration

You can configure the safety parameters in "InoDriverShop" tool on the parameter list or on the graphic user interface of corresponding safety function. The object dictionary cannot be configured.



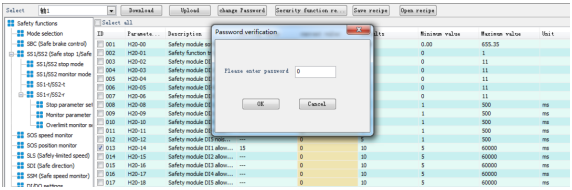


1. On the parameter list, select a parameter you want to configure and then click Upload to read the value of the selected parameter.

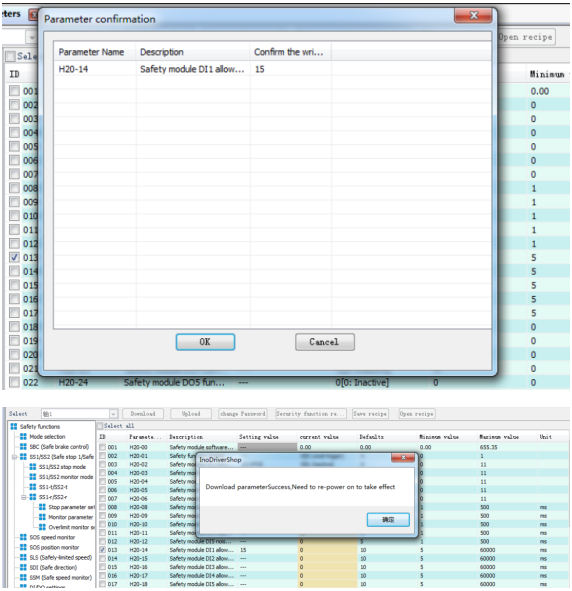


Any changes to any safety parameters take effect only at next power-on.

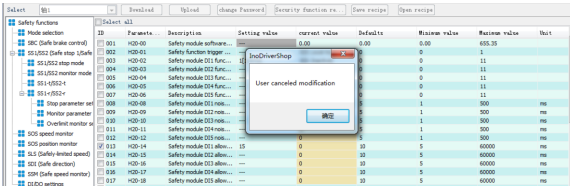
2. Enter a value for the safety parameter and click Download. A password verification dialog pops up. In the pop-up dialog, enter the password (Default:11111).



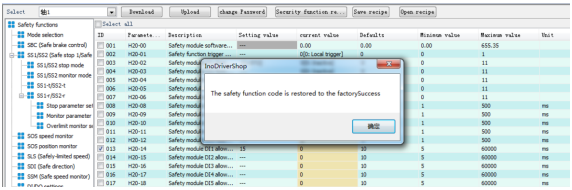
3. A confirmation dialog pops up. Make sure the value entered is correct and click OK. The value is written into the safety module.



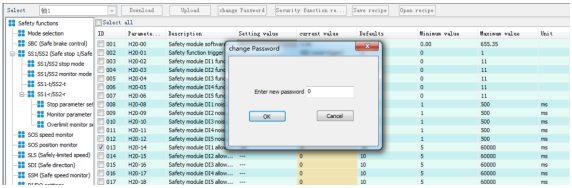
4. If you click Cancel, or fail to click OK within 10 seconds, you are prompted that the modification is canceled. The value will not be written into the safety module.



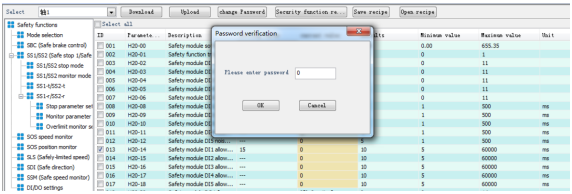
5. To reset the safety parameters, click **Safety function restore factory**.



6. To change the safety password, click **Change password**. In the pop-up password verification dialog, enter the current password. The verification is passed. Then in the pop-up new password dialog, enter the new password (range: 1 to 65535).



7. The confirm password dialog pops up and then enter the new password again. Make sure the new password and the confirm password are the same. If they are different, the password change fails.



16.4 Safety DIDO Function

16.4.1Safety DI Function

DI Function Selection

The safety module includes five DIs. Each DI is configured to receive two input signals through two channels A and B, and default to 0 (OFF). You can assign each DI with a logic function using the software tool.

Table 16–2 Logic function selection of DI1 to DI5

Pin No.	Name	Pin No.	Name	Configure parameters.
CN9		CN10		
12	DI1A	12	DI1B	You can configure the logic function of DI1 by setting parameter H20.02.
11	DI2A	11	DI2B	You can configure the logic function of DI2 by setting parameter H20.03.
10	DI3A	10	DI3B	You can configure the logic function of DI3 by setting parameter H20.04.
9	DI4A	9	DI4B	You can configure the logic function of DI4 by setting parameter H20.05.
8	DI5A	8	DI5B	You can configure the logic function of DI5 by setting parameter H20.06.

Note

The logical function configuration of each DI must be unique.

DI Input Filtering

To avoid false triggering of safety functions caused by external noise interference, five DI input filter parameters are added to the safety module. Only when the DI input signal is 0 (OFF) and lasts for a period of time exceeding the DI noise rejection filter time, the safety module performs the corresponding safety function.

Table 16–3 Noise Rejection Filter Time of DI1 to DI5

Configure parameters.	Name
H20.08	Safety module DI1 noise rejection filter time, in 1 ms
H20.09	Safety module DI2 noise rejection filter time, in 1 ms
H20.10	Safety module DI3 noise rejection filter time, in 1 ms
H20.11	Safety module DI4 noise rejection filter time, in 1 ms
H20.12	Safety module DI5 noise rejection filter time, in 1 ms

For example, DI1 is assigned with the STO function. The filtering time from when the DI1 receives an input 0 (OFF) to when the STO function is triggered is set by the parameter H20.08.

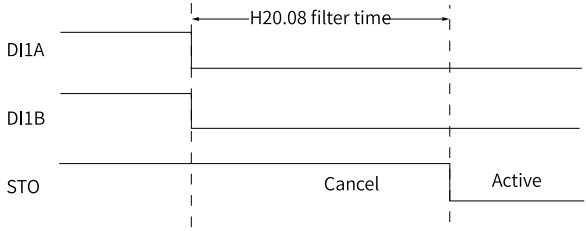


Figure 16-1 Diagram of DI1 noise rejection filter time H20.08

Note

- OFF (0): The 24V voltage of the corresponding DI is off.
- ON (1): The 24V voltage of the corresponding DI is off.

Input Discrepancy Detection

When the function assigned to the DI is active, the safety module monitors whether the signals input to the DI are consistent. If discrepancy exists between the input signals and the discrepancy lasts for a period of time exceeding the allowable discrepancy time, the servo drive issue an alarm E134.x, with x indicating the DI number.

You can configure the following parameters to monitor the discrepancy at input signals of the five DIs.

Table 16–4 Parameter for monitoring discrepancy at input signals of DI1 to DI5

Configure parameters.	Name
H20.14	Safety module DI1 allowable discrepancy time, unit: 1 ms
H20.15	Safety module DI2 allowable discrepancy time, unit: 1 ms
H20.16	Safety module DI3 allowable discrepancy time, unit: 1 ms
H20.17	Safety module DI4 allowable discrepancy time, unit: 1 ms
H20.18	Safety module DI5 allowable discrepancy time, unit: 1 ms

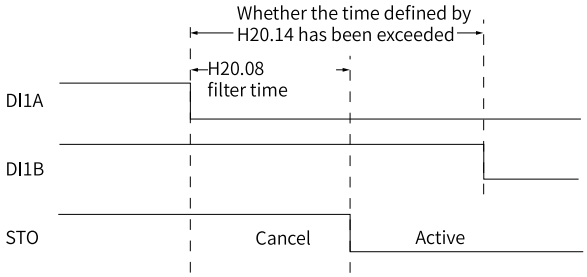


Figure 16-2 Checking for discrepancy at input signals of DI1

Note

The safety DI is mainly used together with the safety DO. For wiring of the safety DI function, see the related section.

16.4.2Safety DO Function

DO Function Selection

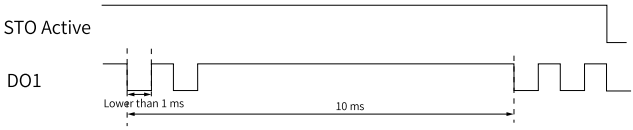
The safety module has six DO terminals, which are all set to 0-Disabled by default. DO3 and DO6 are non-safe DO circuits and cannot be used to configure SSM. You can assign each DI with a logic function using the software tool.

terminals	Pin No.	Name	Configure parameters.
CN9	4	DO1	You can configure the logic function of DO1 by setting parameter H20.20.
	3	DO2	You can configure the logic function of DO2 by setting parameter H20.21.
	1&2	DO3	You can configure the logic function of DO3 by setting parameter H20.22.
CN10	4	DO4	You can configure the logic function of DO4 by setting parameter H20.23.
	3	DO5	You can configure the logic function of DO5 by setting parameter H20.24.
	1&2	DO6	You can configure the logic function of DO6 by setting parameter H20.25.

DO output diagnosis

To ensure that the DO circuit is able to output the signal properly, the safety module will diagnose the DO circuit. To perform DO circuit diagnosis, you need to input 24 V voltage signals to pins 5 and 6 of the CN9 and CN10 terminals.

The following figure shows that when DO1 is configured to STO, the safety module will diagnose the DO1 output circuit when STO is active. The width of the diagnostic pulse is less than 1 ms. When the pulse diagnosis feedback signal is abnormal, the servo drive issues an E125.x alarm, where x is the DO serial number.



Note

- For safety DOs (DO1, DO2, DO4, DO5), the maximum DO output voltage is 2.6 V when the DO does not output, that is, the DO output is in an off state. To prevent malfunction, pay attention to the operation voltage threshold of the external electrical device at the load side of the safety DO.
- The safety DO cannot be used as an EDM signal in the STO function.
  The safety DO is mainly used together with the safety DI. For wiring of the safety
- DO function, see the related section.

16.5 FSoE [functional safety N]

16.5.1Overview

The EtherCAT safety technology was developed according to IEC 61508, is approved by TÜV Süd Rail, and is standardized in IEC 61784-3. The protocol is suitable for safety applications with a safety integrity level up to SIL 3. FSoE data communication is performed in a question-and-answer manner. All data exchanges are initiated by the safety master, and additional data are incorporated to ensure integrity. During each safety cycle, the safety connection between the FSoE master and the FSoE slave is fully monitored. The security check, connection ID and watchdog time of every FSoE frame transmission will be checked.

The SV680N-INT servo drive with FSoE functional safety consists of a drive control part (main unit) and an extended part (functional safety module). The FSoE master communicates with the FSoE slave through the EtherCAT bus. The internal safety data of the FSoE slave is exchanged through a black channel. After the FSoE data embedded in the EtherCAT process data reaches the main unit of the servo drive, it is transmitted to the functional safety module through internal communication.

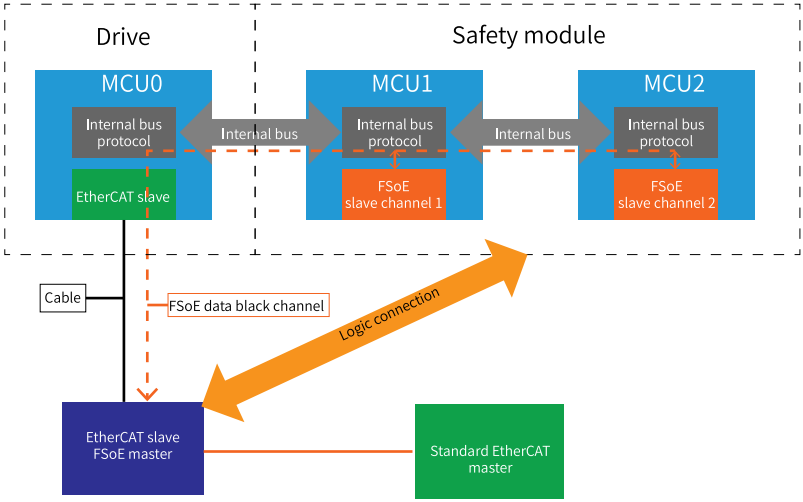


Figure 16-3 FSoE data transmission

16.5.2Fixed Safety PDO Setting

- **PDO mapping for FSoE reception (170Ah)**

Index	Sub-index	Length (bit)	Name	Data type
E700h	1	8	FSoE master command	USINT
6640h	0	1	STO	BOOL
6650h	0	1	SS1 command	BOOL
6670h	0	1	SS2 command	BOOL
6668h	1	1	SOS1 command	BOOL
0000h	0	1	Reserved	BOOL
66D0h	0	1	SDIp command	BOOL
66D1h	0	1	SDIn command	BOOL
6632h	0	1	Error response	BOOL
6630h	0	1	Reset response	BOOL
6660h	0	1	SBC command	BOOL
6690h	1	1	SLS1 command	BOOL
6690h	2	1	SLS2 command	BOOL
6690h	3	1	SLS3 command	BOOL
6690h	4	1	SLS4 command	BOOL
0000h	0	1	Reserved	BOOL
0000h	0	1	Reserved	BOOL

Index	Sub-index	Length (bit)	Name	Data type
E700h	3	16	FFSoE master CRC_0	UINT
E700h	2	16	FSoE master connection ID	UINT

- **PDO mapping for FSoE transmission (1B0Ah)**

Index	Sub-index	Length (bit)	Name	Data type
E600h	1	8	FSoE slave command	USINT
6640h	0	1	STO activation	BOOL
66E0h	0	1	SSM state	BOOL
0000h	0	1	Reserved	BOOL
6668h	1	1	STO activation	BOOL
0000h	0	1	Reserved	BOOL
66D0h	0	1	SDIp activation	BOOL
66D1h	0	1	SDIn activation	BOOL
6632h	0	1	INCORRECT	BOOL
6630h	0	1	Reset	BOOL
6660h	0	1	SBC activation	BOOL
6690h	1	1	SLS1 command activation	BOOL
6690h	2	1	SLS2 command activation	BOOL
6690h	3	1	SLS3 command activation	BOOL
6690h	4	1	SLS4 command activation	BOOL
0000h	0	1	Reserved	BOOL
E601h	1	1	Safety connection state	BOOL
E600h	3	16	FFSoE slave CRC_0	UINT
E600h	2	16	FSoE slave connection ID	UINT

16.6 Safe Torque Off (STO)

16.6.1Overview

For the STO function integrated in the drive, please refer to the corresponding function manual and hardware manual. This chapter only introduces the STO function of the safety module.

The STO function cuts off the input current of the motor to stop it according to an input signal from the safety controller.

When the STO function is triggered, the servo drive turns off the S-RDY signal and enters the safe state.

The safety module can be configured to trigger the STO function in either of the following ways.

Remember to power off and on the drive every three months or trigger the STO through the safety module, so that STO can be reset periodically.

16.6.2STO Triggered by Local Mode

In order to use the input signal function of the safety module properly, the DI cable must be connected correctly.

Set H20.01 to 0: Local DI triggers the safety function and EtherCAT communication trigger is no longer effective.

Table 16–5 Description of function No.

Code	Name	Function Name	Function
FunIN.1	STO command	STO trigger command	0: STO active 1: STO deselected
FunIN.11	ACK command	ACK trigger command	0: ACK deselected 1: ACK trigger
FunOUT.1	STO Active	STO active	0: Normal state 1: STO state

ACK function not selected for DI: STO status exits automatically when the STO command is canceled.

ACK function is selected for DI: Two DI terminals are used, one configured as STO and one configured as ACK. You can exit the STO state only when the STO command is canceled, and the ACK command is triggered.

See the section on SBC for the sequence of STO and SBC.

Note

- OFF (0): The 24V voltage of the corresponding DI is disconnected.
- ON (1): The 24V voltage of the corresponding DI is connected.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.02	2020-03h	Safety module DI1 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: ACK	0	-	At stop
H20.03	2020-04h	Safety module DI2 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: ACK	0	-	At stop
H20.04	2020-05h	Safety module DI3 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: ACK	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.05	2020-06h	Safety module DI4 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: ACK	0	-	At stop
H20.06	2020-07h	Safety module DI5 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: ACK	0	-	At stop
H20.20	2020-15h	Safety module DO1 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.21	2020-16h	Safety module DO2 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active			
H20.22	2020-17h	Safety module DO3 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.23	2020-18h	Safety module DO4 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.24	2020-19h	Safety module DO5 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.25	2020-1Ah	Safety module DO6 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop

16.6.3STO Triggered by Bus Mode [functional safety N]

The safety bus of the safety module currently only supports EtherCAT.

To use the STO function through EtherCAT communication, you need to set the network connection, EtherCAT master, and safety CPU unit.

Set the value of parameter H20.01 to “1: FSoE trigger”. In this case, the safety functions are no longer triggered by safety input signals.

When 6641h is set to "0", the drive automatically exits the STO state when the STO command is canceled.

When 6641h is set to "1", exiting the STO state not only requires canceling the STO command, but also triggering the Ack signal.

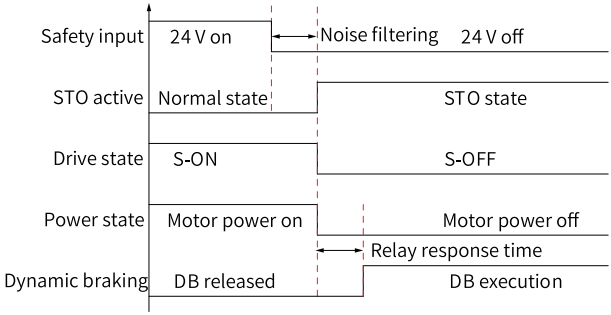
Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6630h	6630h	Restart Ack signal	0 to 1	0	-	Real-time
6640h	6640h	STO signal	0 to 1	0	-	Real-time
6641h	6641h	STO reset mode selection	0 to 1	0	-	Real-time

16.6.4Sequence Diagram

Operation sequence to enter safe state

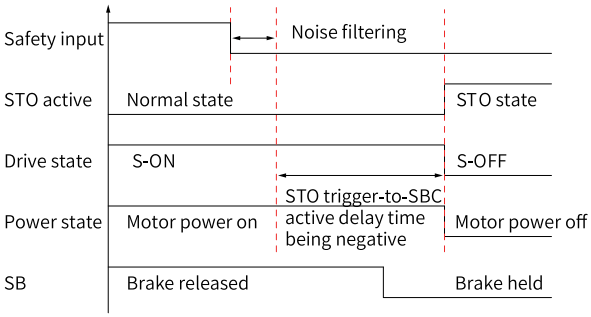
- SBC is not enabled



The safety module starts to shift to STO status when any of the STO inputs 1 and 2 is turned into OFF.

The STO stop mode reuses the stop mode for No. 1 faults. Dynamic braking will operate based on the setting of H02.08.

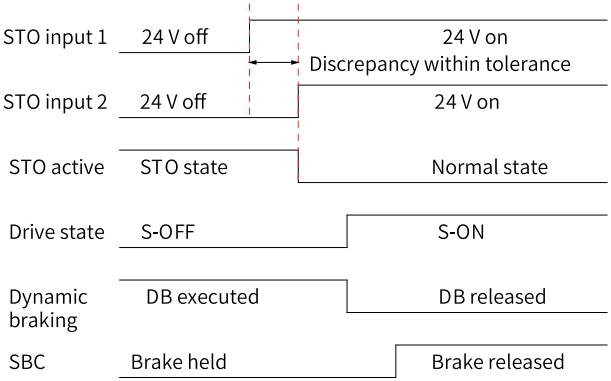
- SBC is enabled
  When you set H20.28 to a negative value, the sequence of STO operations is shown in the following figure.



When SBC is activated before STO and the STO input command is effective, perform S-OFF first as set by H02.05. After the delay of H20.28 elapsed, trigger the No.1 fault stop mode.

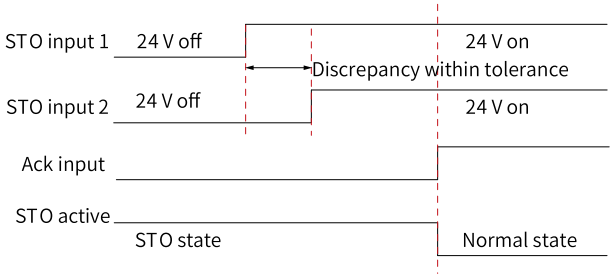
Reset sequence to exit STO safe state

- Ack signal is not required



When the Ack signal is not required, the STO state can exit automatically as long as the 24 V DI input signal of two STOs are restored. After STO status exits, the S-ON operation can be performed normally.

- Ack signal is required



When an Ack signal is required, exiting the STO state not only needs the recovery of the 24V voltage, but also a trigger for an Ack signal. The S-ON operation can only be performed properly after STO state exits normally.

Note

The STO function is triggered even if the safety module is in faulty state. After the fault cause is eliminated and the fault reset is performed, the safety module automatically exits the STO state without requiring an Ack input signal.

16.7 Safe Brake Control (SBC)

16.7.1Overview

For models coming with a safety module, SBC needs not an external relay to control the on and off of the 24 V voltage of the brake motor. The BK+ and BK- pins of the brake motor can be respectively connected to Pin3 and Pin4 of the CN8 terminal on the drive, as shown in the following figure.

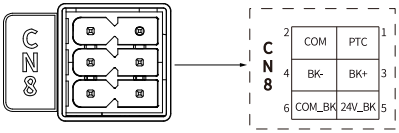


Figure 16-4 Description of CN8 pins

Pin No.	Description	Description	Pin No.	Description	Description
1	PTC	Motor temperature feedback input	2	COM–	Onboard 24 V COM
3	BK+	Brake+	4	BK-	Brake–
5	24V_BK	External power supply for the brake	6	COM_BK	Brake 24 V COM

The safety module can directly control the on and off of the 24 V voltage connected to Pin5 and Pin6 of CN8.

The SBC applies to situations where the servo drive must remain in a safe position even if the motor is not energized. The SBC prevents the droop of suspended or stretched loads (for example, a hoist). No external relay or switch is required, as the feature is integrated in the drive.

Note

- The SBC function cannot detect mechanical wear or damage to the motor brake.
- When the SBC function is enabled or a safety brake motor is installed, Pin5 and Pin6 of CN8 need to be connected to an external 24V±10% voltage; otherwise, the servo drive reports E631.0.

16.7.2SBC Triggered by Local Mode

When you choose to trigger the safety function locally, DI: FunIN2 is SBC command, DO: FunOUT.2 is SBC active, and DO: FunOUT.2 is SBC active.

Table 16–6 Description of function No.

Code	Name	Function Name	Function
FunIN.2	SBC command	SBC trigger command	0: SBC active 1: SBC deselected
FunOUT.2	SBC Active	SBC active	0: Normal state 1: SBC state

Note

- OFF (0): The 24V voltage of the corresponding DI is disconnected.
- ON (1): The 24V voltage of the corresponding DI is connected.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.03	2020-04h	Safety module DI2 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop
H20.04	2020-05h	Safety module DI3 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop
H20.05	2020-06h	Safety module DI4 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop
H20.06	2020-07h	Safety module DI5 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.20	2020-15h	Safety module DO1 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.21	2020-16h	Safety module DO2 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.22	2020-17h	Safety module DO3 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.23	2020-18h	Safety module DO4 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active			
H20.24	2020-19h	Safety module DO5 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.25	2020-1Ah	Safety module DO6 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.11	2002-0Ch	Motor speed threshold at brake output OFF in rotation state	20 rpm to 3000 rpm	30	rpm	Real-time
H02.12	2002-0Dh	Delay from S-ON OFF to brake output OFF in rotation state	1 ms–65535 ms	500	ms	Real-time

16.7.3SBC Triggered by Bus Mode [functional safety N]

To avoid damage to the motor caused by brake operation during high-speed rotation, the safety module SBC command does not trigger brake action immediately after it is enabled, but executes S-OFF stop first.

When the motor speed is lower than the SBC zero speed threshold or the SBC delay is reached, the safety module will trigger the brake operation.

Related parameters:

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.11	2002-0Ch	Motor speed threshold at brake output OFF in rotation state	20 rpm to 3000 rpm	30	rpm	Real-time
H02.12	2002-0Dh	Delay from S-ON OFF to brake output OFF in rotation state	1 ms–65535 ms	500	ms	Real-time
6660h	6660h	SBC signal	0 to 1	0	-	Real-time

16.7.4Sequence Diagram

The response sequence of the SBC function execution is shown below.

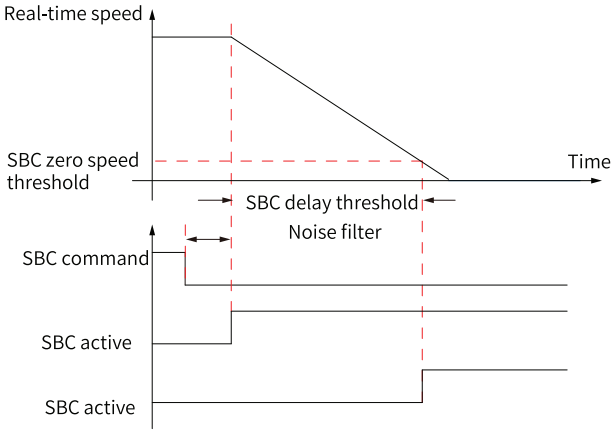


Figure 16-5 Response sequence of SBC function execution

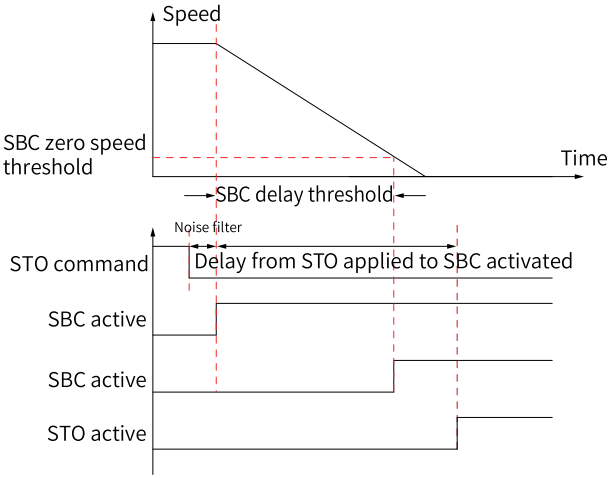
When the SBC command is determined as a valid signal after noise filtering, the S-ON OFF stop is executed. When the SBC zero speed threshold set by H02.11 is reached or the SBC delay threshold set by H02.12 expires, the safety module triggers the motor to brake. The motor rotor is held and the safety module outputs SBC active state.

In addition to being triggered by the SBC command, the SBC function can also be triggered by the STO function.

The sequence of STO and SBC functions can be configured considering the application conditions of STO in different situations.

For example, for the vertical axis application, you may that the load will not drop abnormally when the STO function is triggered. In this case, you can configure the SBC function to take effect before STO is activated.

SBC taking effect before STO

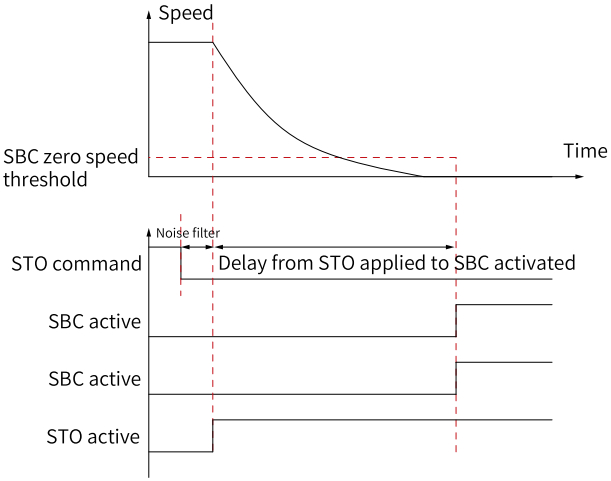


The negative value of H20-28 indicates that the STO takes effect after the SBC. The positive value indicates that the STO takes effect before the SBC. After the safety module receives the STO-triggered command, the servo drive decelerates first.

When the delay time or the SBC zero speed threshold is reached, the SBC brake takes effect and the motor rotor is held.

The value of H20.28 needs to consider the time required for the motor to decelerate from the maximum speed to 0 rpm, so as to avoid that the STO takes effect before SBC takes effect.

SBC taking effect after STO



When the delay time H20.28 from STO activation to SBC activation is positive, after the safety module receives the STO trigger command, the drive cuts off the S-ON signal and performs coast-to-stop, and triggers the SBC function when the delay time is reached.

16.8 1: Safe Stop 1 (SS1)

16.8.1 Overview

SS1 is used to activate motor deceleration stop. It triggers STO after a certain delay or the speed is lower than a certain threshold. The SS1 stop mode includes ramp stop and host controller planned stop, which can be selected through parameter H20.29.

- When you select ramp stop, the servo drive will plan the stop command and stop the motor at the planned speed.
- When you select host controller planned stop, stop command planning does not occur inside the servo drive, but the host controller.
- When the pulse-type servo drive is used, you can only select ramp stop. When you select the host controller planned stop, the stop mode is forced to ramp stop.

If you choose to trigger safety function locally, you can set parameters H20.02 to H20.06 and set DI function to 3-SS1 to trigger SS1 through DI. When you choose to trigger safety function by FSoE, you can trigger SS1 by controlling the bits in the RPDO corresponding to the SS1 command.

SS1 stop monitoring includes two modes: SS1-t and SS1-r, which can be selected through parameter H20.32. When SS1-r is selected, the safety motor must be used.

When SS1-t is selected, the drive is switched to STO status regardless of the motor speed after the delay time between SS1 is triggered and the drive enters STO state elapsed. A safety motor is not required. When the safety motor is used, the drive is switched to STO status when the speed feedback is lower than the zero speed threshold and the duration exceeds the zero speed time window.

When SS1-r is selected, since it contains SS1-t, the drive is switched to STO status after the delay time elapsed or when the speed feedback is lower than the zero speed threshold and the duration exceeds the zero speed time window. At the same time, the deceleration process is monitored, and the minimum deceleration speed is set. The actual deceleration must be larger than the monitoring threshold. If the actual deceleration is smaller than the set monitoring ramp range, a fault is reported and the STO status is activated.

The response mode for certain faults can be set to SS1-t. If the fault is triggered, the drive is switched to the SS1 stop state and then enters STO sate if the SS1-t status switching condition is met.

16.8.2SS1 Triggered by Local Mode

SS1 trigger-related parameters

When you choose to trigger the safety function locally, DI: FunIN.3 is SS1 command, DO: FunOUT.3 is SS1 active, and DO: FunOUT.13 is SS1-r active.

Table 16–7 Description of function No.

Code	Name	Function Name	Function
FunIN.3	SS1 command	SS1 trigger command	0: SS1 active 1: SS1 deselected
FunOUT.3	SS1 Active	SS1 active	0: SS1 inactive 1: SS1 stop state
FunOUT.13	SS1-r Active	SS1-r active	0: SS1-r inactive 1: SS1-r active state

When any DI in DI1 to DI5 is configured to FunIN.11-Ack and after the DI corresponding to SS1 is triggered and recovered, the drive recovers from STO state to normal operational state only if the DI corresponding to the Ack function is triggered.

When no DI is configured to Ack function, the drive returns to normal operation state after the corresponding DI is triggered and recovered.

Note

- OFF (0): The 24V voltage of the corresponding DI is disconnected.
- ON (1): The 24V voltage of the corresponding DI is connected.

SS1 stop-related parameters

You can select the SS1 stop mode through H20.29.

- When you select ramp stop, the servo drive will plan the stop command and stop the motor at the planned speed.
- When you select host controller planned stop, stop command planning does not occur inside the servo drive, but the host controller.
- When the pulse-type servo drive is used, you can only select ramp stop. When you select the host controller planned stop, the stop mode is forced to ramp stop.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.29	2020-1Eh	SS1/SS2 stop mode	0: Stop according to ramp 1: Stop by host controller	1	-	At stop

When the stop mode is selected as ramp stop, set the ramp stop reference speed through parameter H20.30 and the ramp stop deceleration time through H20.31. The motor speed decreases from H20.30 to 0 after the time set by H20.31, as shown in the figure.

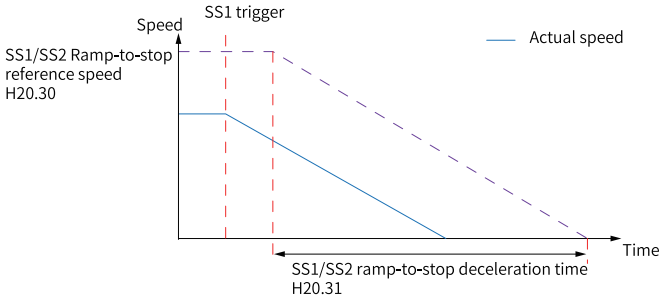


Figure 16-6 Motor speed during ramp stop

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.30	2020-1Fh	SS1/SS2 ramp-to-stop reference speed	60 rpm to 6000 rpm	1000	rpm	At stop
H20.31	2020-20h	SS1/ SS2 ramp-to-stop deceleration time	1 ms–65535 ms	500	ms	At stop

When the safety function is triggered in the local mode, you can set the delay time between SS1 is triggered and the drive enters STO state through parameter H20.33, set SS1 zero speed threshold by H20.34 and set SS1 zero speed window time by H20.35. When the delay time after SS1 is triggered reaches the setpoint of H20.33, the drive is switched to STO state regardless of the motor speed.

When the safety encoder is used, the drive is switched to the STO state if the delay time does not reach the setpoint of H20.33, but the motor speed is lower than the setpoint of H20.34, and the duration reaches the setpoint of H20.35.

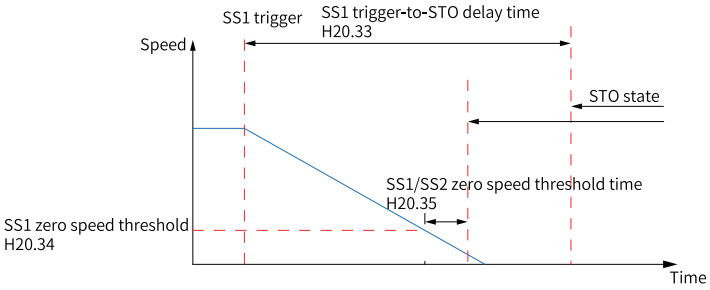


Figure 16-7 Safety function triggered locally, motor speed change

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.33	2020-22h	SS1 trigger-to-STO delay time/SS2 trigger-to-STO delay time	0 ms–65535 ms	1000	ms	At stop
H20.34	2020-23h	SS1/ SS1 zero speed threshold	1 rpm to 6000 rpm	10	rpm	At stop
H20.35	2020-24h	SS1/SS2 zero speed threshold time	0 ms–65535 ms	0	ms	At stop

SS1 monitoring-related parameters

You can select the SS1 monitoring mode through H20.32.

- The speed ramp during deceleration is not monitored when "0-SS1-t" is selected.
- When "1-SS1-r" is selected, the speed ramp during deceleration is monitored. The actual deceleration must be greater than the set minimum deceleration.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.32	2020-21h	SS1 monitor mode	0:SS1-t 1:SS1-r	0	-	At stop

In SS1-r monitoring mode, when the safety function is triggered in the local mode:

- You can set the delay time (starting from the time when SS1 is triggered) for ramp monitoring to be activated through parameter H20.36. Speed ramp is monitored after the delay time elapsed.
- You can set the ramp monitoring reference speed through parameter H20.37, set the ramp monitoring time by H20.38, and the ratio between H20.37 and H20.38 corresponds to the motor's minimum deceleration ramp. The actual deceleration must be greater than the minimum deceleration speed, otherwise a deceleration overrun fault is reported.
- You can set the duration from SS1 triggers ramp limit to an alarm is issued through parameter H20.41. A fault is reported when the number of deceleration overruns exceeds the setpoint of H20.41.
- You can set the speed when SS1 ramp monitoring stops through H20.42 and stop ramp monitoring when the motor speed is lower than the setpoint of H20.42.

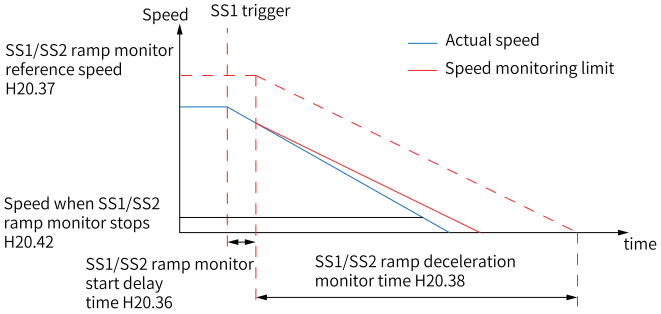


Figure 16-8 Motor speed when safety function is triggered

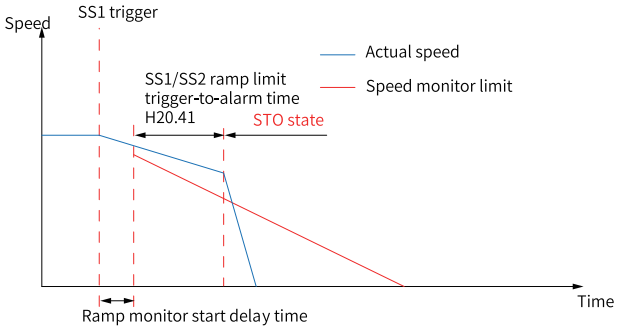


Figure 16-9 Motor speed when ramp limit is triggered

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.36	2020-25h	SS1/SS2 ramp monitor start delay time	5 ms–65535 ms	10	ms	At stop
H20.37	2020-26h	SS1/SS2 ramp monitor reference speed	60 rpm to 6000 rpm	1000	rpm	At stop
H20.38	2020-27h	SS1/SS2 ramp deceleration monitor time	1 ms–65535 ms	65535	ms	At stop
H20.41	2020-2Ah	SS1/SS2 ramp limit trigger-to-alarm time	0 ms–65535 ms	5	ms	At stop
H20.42	2020-2Bh	SS1/SS2 ramp monitor stop speed	0 rpm to 6000 rpm	1	rpm	At stop

16.8.3SS1 Triggered by Bus Mode

SS1 trigger-related parameters

To trigger the safety function in the FSoE mode, 6650h in the RPDO mapping is the SS1 trigger object dictionary, and 6650h in the TPDO mapping is the SS1 trigger object dictionary.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6650.01h	6650-01h	SS1 signal	0 to 1	0	-	Real-time

The object dictionary 6641h determines whether the Restart Ack signal is needed to restore the STO state. 6630h in RPDO mapping is the Restart Ack signal. When 6641h is configured to 1 and SS1 is triggered and then recovered, the drive recovers from STO state to normal operational state only if 1 is written to the Restart Ack signal.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6641h	6641h	STO reset mode selection	0 to 1	0	-	Real-time

SS1 stop-related parameters

You can select SS1 stop mode by setting the parameter H20.29.

When you choose "stop according to ramp", you can configure the ramp-to-stop reference speed by setting parameter H20.30 and the ramp-to-stop deceleration time by setting parameter H20.31.

When the safety function is triggered in the FSoE mode, you can set the delay time between SS1 is triggered and the drive enters STO state through object dictionary 6651h, set SS1 zero speed threshold by 6653h and set SS1 zero speed window time by 6654h.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6651.01h	6651-01h	SS1 trigger-to-STO delay time	0 ms–65535 ms	1000	ms	Real-time
6653.01h	6653-01h	SS1 zero speed threshold	1 rpm to 6000 rpm	10	rpm	Real-time
6654.01h	6654-01h	SS1 zero speed threshold time	0 ms–65535 ms	0	ms	Real-time

SS1 monitoring-related parameters

You can select SS1 monitoring mode by setting the parameter H20.32.

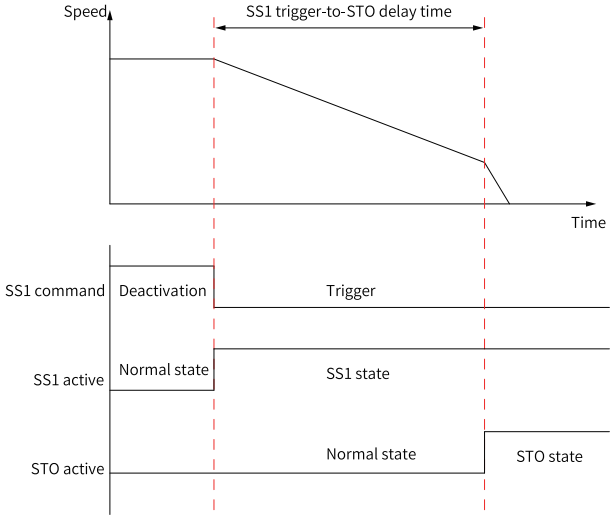
In the case of SS1-r monitoring, when you choose to trigger the safety function through FSoE, you can configure the delay time for starting the speed ramp monitoring by setting 6657h and the minimum SS1 deceleration by setting 6656h. You can configure the time from triggering of the ramp limit to issuance of the alarm by setting parameter H20.41, and the speed for stopping the ramp monitoring by setting parameter H20.42.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6656.01h	6656-01h	SS1 deceleration limit	0 encoder unit/s^2–4294967295 encoder unit/s^2	15	Encoder unit/s^2	Real-time
6657.01h	6657-01h	SS1 ramp monitor start delay time	0 ms–65535 ms	10	ms	Real-time

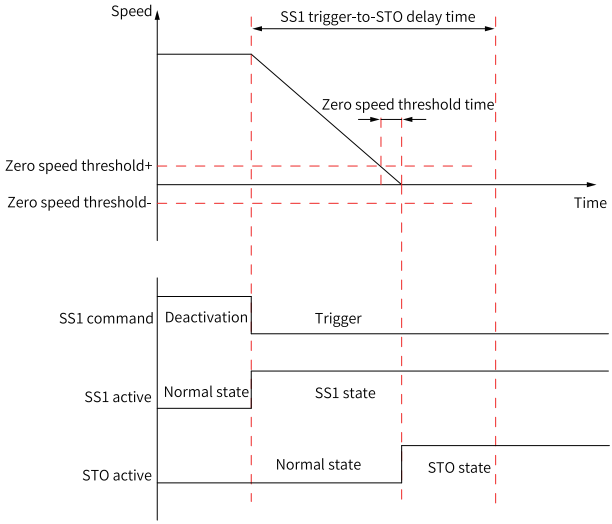
16.8.4Sequence Diagram

SS1 is triggered and the drive enters STO state after a delay time has elapsed



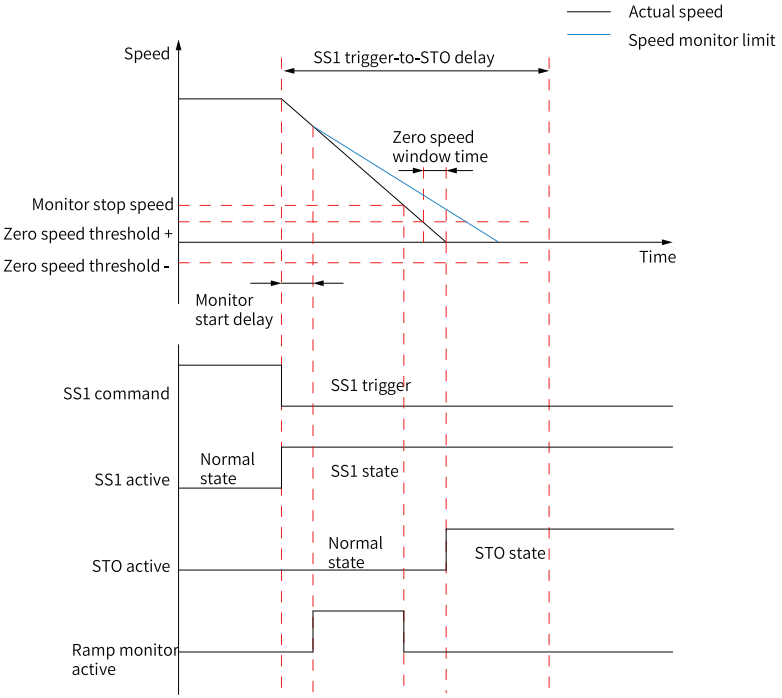
After SS1 is triggered, if you cancel an SS1 command during SS1 stop, the drive will continue to finish the stop process.

SS1 is triggered and the drive enters STO state when the speed meets zero speed conditions

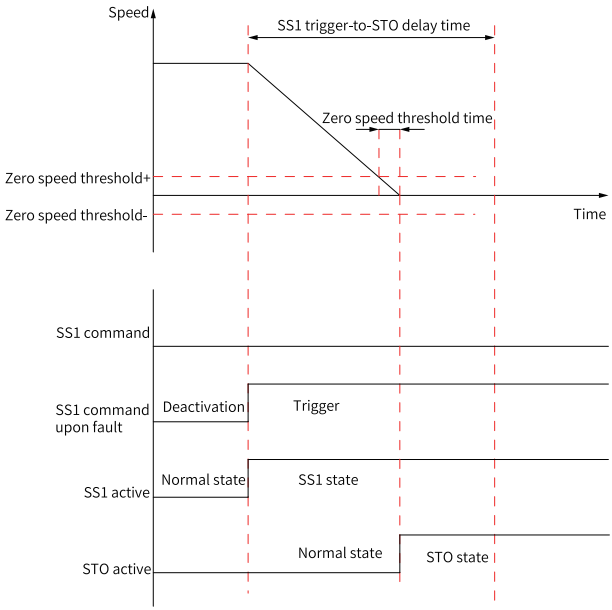


If the SS1 command is canceled after SS1 has been triggered, the drive will retain the SS1 state until the delay time has elapsed or the zero speed conditions are met.

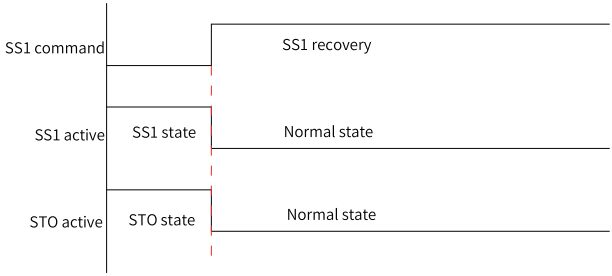
Starting SS1 speed ramp monitoring



SS1-t is triggered by fault and the drive enters STO state when the speed meets zero speed conditions



SS1 reset



16.9 2: Safe Stop 1 (SS2)

16.9.1Overview

SS2 is used to activate motor deceleration stop. It triggers SOS after a certain delay or the speed is lower than a certain threshold. The SS2 stop mode includes ramp stop and host controller planned stop, which can be selected through parameter H20.29. When you select ramp stop, the servo drive will plan the stop command and stop the motor at the planned speed. When you select host controller planned stop, stop

command planning does not occur inside the servo drive, but the host controller. When the pulse-type servo drive is used, you can only select ramp stop. When you select the host controller planned stop, the stop mode is forced to ramp stop. The SS2 function requires a safety encoder.

If you choose to trigger safety function locally, you can set parameters H20.02 to H20.06 and set DI function to 4-SS2 to trigger SS2 through DI. When you choose to trigger safety function by FSoE, you can trigger SS2 by controlling the bits in the RPDO corresponding to the SS2 command.

SS2 stop monitoring includes two modes: SS2-t and SS2-r, which can be selected through parameter H20.43.

When SS2-t is selected, the drive is switched to SOS status after the delay time between SS2 is triggered and the drive enters SOS state elapsed or when the speed feedback is lower than the zero speed threshold and the duration exceeds the zero speed time window.

When SS2-r is selected, since it contains SS2-t, the drive is switched to SOS status after the delay time elapsed or when the speed feedback is lower than the zero speed threshold and the duration exceeds the zero speed time window. At the same time, the deceleration process is monitored, and the minimum deceleration speed is set. The actual deceleration must be larger than the monitoring threshold. If the actual deceleration is smaller than the set monitoring ramp range, a fault is reported and the STO status is activated.

16.9.2SS2 Triggered by Local Mode

SS2 trigger-related parameters

When you choose to trigger the safety function locally, DI: FunIN.4 is SS2 command, DO: FunOUT.4 is SS2 active, and DO: FunOUT.14 is SS2-r active.

Table 16–8 Description of function No.

Code	Name	Function Name	Function
FunIN.4	SS2 command	SS2 trigger command	0: SS2 active 1: SS2 deselected
FunOUT.4	SS2 Active	SS2 active	0: SS2 inactive 1: SS2 stop state
FunOUT.14	SS2-r Active	SS2-r active	0: SS2-r inactive 1: SS2-r active

When any DI in DI1 to DI5 is configured to FunIN.11-Ack and after the DI corresponding to SS2 is triggered and recovered, the drive recovers from SOS state to normal operational state only if the DI corresponding to the Ack function is triggered. When no DI is configured to Ack function, the drive returns to normal operation state after the corresponding DI is triggered and recovered.

Note

- OFF (0): The 24V voltage of the corresponding DI is disconnected.
- ON (1): The 24V voltage of the corresponding DI is connected.

SS2 stop-related parameters

When you select ramp stop, the servo drive will plan the stop command and stop the motor at the planned speed. When you select host controller planned stop, stop command planning does not occur inside the servo drive, but the host controller. When the pulse-type servo drive is used, you can only select ramp stop. When you select the host controller planned stop, the stop mode is forced to ramp stop.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.29	2020-1Eh	SS1/SS2 stop mode	0: Stop according to ramp 1: Stop by host controller	1	-	At stop

When the stop mode is selected as ramp stop, set the ramp stop reference speed through parameter H20.30 and the ramp stop deceleration time through H20.31. The motor speed decreases from H20.30 to 0 after the time set by H20.31, as shown in the figure.

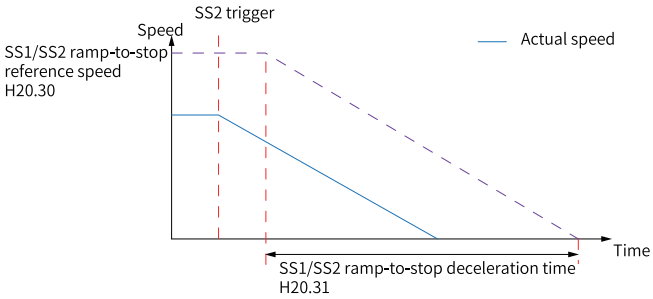


Figure 16-10 Motor speed during ramp stop

Caution

In the CSP mode, the SS2 stop mode H20.29 is set to ramp-to-stop, and SS2 state is canceled during or after stop. Note that 607A of the host controller is aligned to 6064. Otherwise, alignment to 607A can cause a high speed or even alarm B01.2 upon exiting.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.30	2020-1Fh	SS1/SS2 ramp-to-stop reference speed	60 rpm to 6000 rpm	1000	rpm	At stop
H20.31	2020-20h	SS1/ SS2 ramp-to-stop deceleration time	1 ms–65535 ms	500	ms	At stop

When the safety function is triggered in the local mode, you can set the delay time between SS2 is triggered and the drive enters SOS state through parameter H20.33, set SS2 zero speed threshold by H20.34 and set SS2 zero speed window time by H20.35. If the delay time after the SS2 function is triggered reaches the value of H20.33, the drive switches to the SOS state regardless of the motor speed. If the delay time after the SS2 function is triggered does not reach the value of H20.33 but the motor speed falls below the value of H20.34 for a period of time exceeding the value of H20.35, the drive switches to the SOS state in advance.

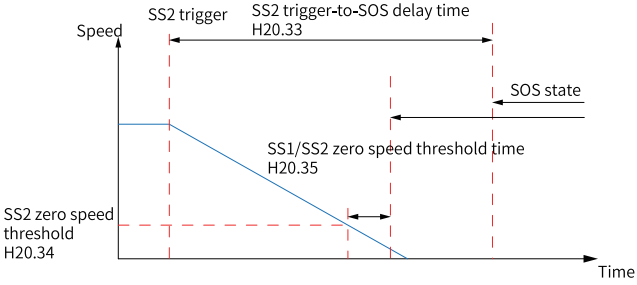


Figure 16-11 Safety function triggered locally, motor speed change

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.33	2020-22h	SS1 trigger-to-STO delay time/SS2 trigger-to-STO delay time	0 ms–65535 ms	1000	ms	At stop
H20.34	2020-23h	SS1/ SS1 zero speed threshold	1 rpm to 6000 rpm	10	rpm	At stop
H20.35	2020-24h	SS1/SS2 zero speed threshold time	0 ms–65535 ms	0	ms	At stop

SS2 monitoring-related parameters

You can configure the SS2 monitoring mode by setting parameter H20.43. If you choose “0: SS2-t”, the speed ramp will not be monitored during the deceleration process; if you choose “1: SS2-r”, the speed ramp will be monitored during the deceleration process and the actual deceleration of the motor must be larger than the preset minimum deceleration.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.43	2020-2Ch	SS2 monitor mode	0:SS2-t 1:SS2-r	0	-	At stop

In Ss2-r monitoring mode, after you choose to trigger the safety function locally, you can set the delay time (starting from the time when SS2 is triggered) for ramp monitoring to be activated through parameter H20.36. Speed ramp is monitored after the delay time elapsed.

You can set the ramp monitoring reference speed through parameter H20.37, set the ramp monitoring time by H20.38, and the ratio between H20.37 and H20.38 corresponds to the motor's minimum deceleration ramp. The actual deceleration must be greater than the minimum deceleration speed, otherwise a deceleration overrun fault is reported.

You can set the duration from SS2 triggers ramp limit to an alarm is issued through parameter H20.41. A fault is reported when the number of deceleration overruns exceeds the setpoint of H20.41. You can set the speed when SS2 ramp monitoring stops through H20.42 and stop ramp monitoring when the motor speed is lower than the setpoint of H20.42.

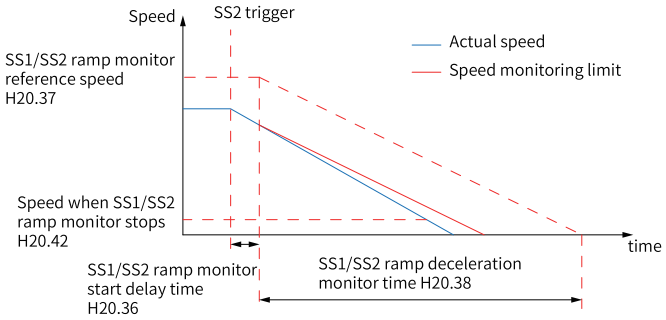


Figure 16-12 Motor speed when safety function is triggered

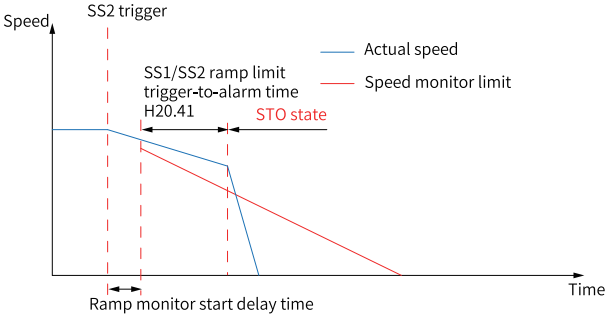


Figure 16-13 Motor speed when ramp limit is triggered

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.36	2020-25h	SS1/SS2 ramp monitor start delay time	5 ms–65535 ms	10	ms	At stop
H20.37	2020-26h	SS1/SS2 ramp monitor reference speed	60 rpm to 6000 rpm	1000	rpm	At stop
H20.38	2020-27h	SS1/SS2 ramp deceleration monitor time	1 ms–65535 ms	65535	ms	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.41	2020-2Ah	SS1/SS2 ramp limit trigger-to-alarm time	0 ms–65535 ms	5	ms	At stop
H20.42	2020-2Bh	SS1/SS2 ramp monitor stop speed	0 rpm to 6000 rpm	1	rpm	At stop

16.9.3SS2 Triggered by Bus Mode

SS2 trigger-related parameters

To trigger the safety function in the FSoE mode, 6670h in the RPDO mapping is the SS2 trigger object dictionary, and 6670h in the TPDO mapping is the SS2 trigger object dictionary.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6670.01h	6670-01h	SS2 signal	0 to 1	0	-	Real-time

The object dictionary 6676h determines whether the Restart Ack signal is needed to restore the SOS state. 6630h in RPDO mapping is the Restart Ack signal. When 6676h is configured to 1 and SS2 is triggered and then recovered, the drive recovers from SOS state to normal operational state only if 1 is written to the Restart Ack signal.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6676.01h	6676-01h	SS2 reset mode selection	0 to 1	0	-	Real-time

SS2 stop-related parameters

You can select SS2 stop mode by setting the parameter H20.29.

When you choose "stop according to ramp", you can configure the ramp-to-stop reference speed by setting parameter H20.30 and the ramp-to-stop deceleration time by setting parameter H20.31.

When the safety function is triggered in the FSoE mode, you can set the delay time between SS2 is triggered and the drive enters SOS state through object dictionary

6671h, set SS2 zero speed threshold by 666Ch and set SS2 zero speed window time by 6672h.



In the CSP mode, the SS2 stop mode H20.29 is set to ramp-to-stop, and SS2 state is canceled during or after stop. Note that 607A of the host controller is aligned to 6064. Otherwise, alignment to 607A can cause a high speed or even alarm B01.2 upon exiting.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
666C.01h	666C-01h	SOS zero speed threshold	0 rpm to 6000 rpm	10	rpm	Real-time
6671.01h	6671-01h	SS2 trigger-to-STO delay time	0 ms–65535 ms	10	ms	Real-time
6672.01h	6672-01h	SS2 zero speed threshold time	0 ms–65535 ms	0	ms	Real-time

SS2 monitoring-related parameters

You can select SS2 monitoring mode by setting the parameter H20.43.

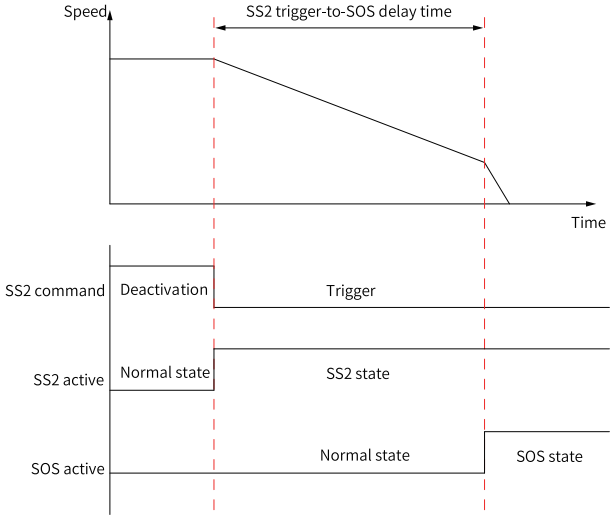
In case of SS2-r monitoring, when you choose to trigger the safety function through FSoE, you can configure the delay time for starting the speed ramp monitoring by setting 6675h and the minimum SS2 deceleration by setting 6674h. You can configure the time from triggering of the ramp limit to issuance of the alarm by setting parameter H20.41, and the speed for stopping the ramp monitoring by setting parameter H20.42.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6674.01h	6674-01h	SS2 deceleration limit	0 encoder unit/s^2–4294967295 encoder unit/s^2	15	Encoder unit/s^2	Real-time
6675.01h	6675-01h	SS2 ramp monitor start delay time	0 ms–65535 ms	10	ms	Real-time

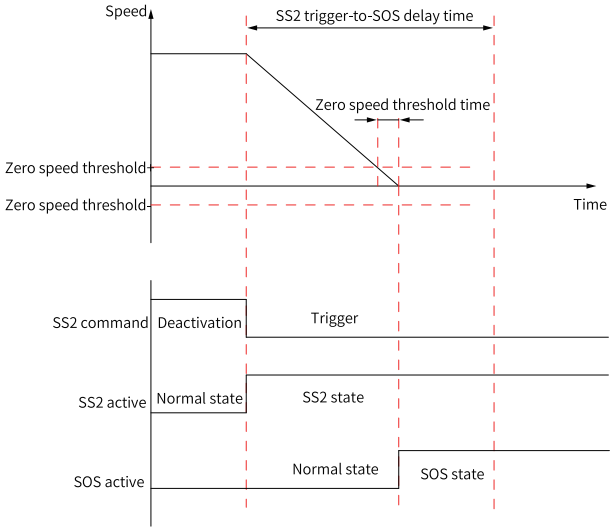
16.9.4Sequence Diagram

SS2 is triggered and the drive enters SOS state after a delay time has elapsed



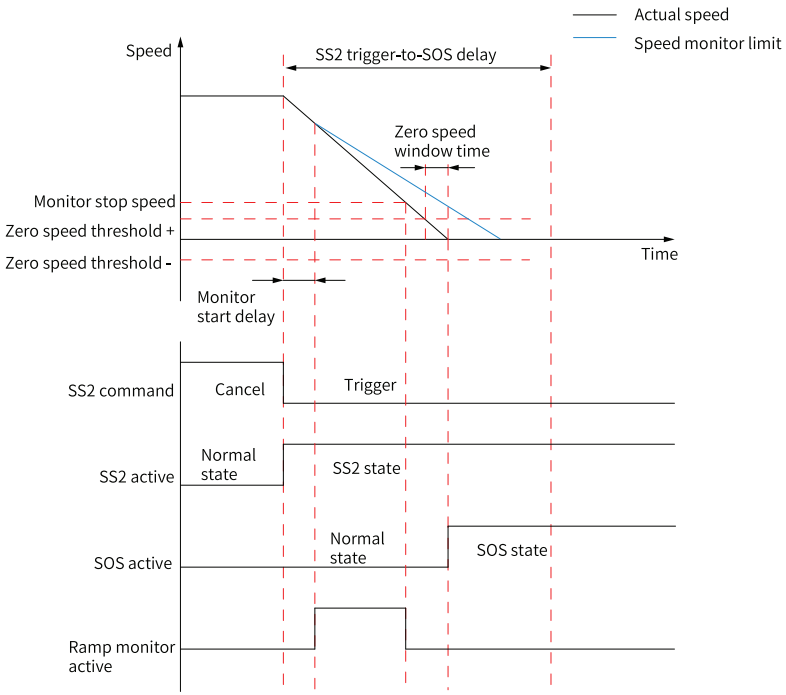
If the SS2 command is canceled after SS2 has been triggered, the drive will retain the SS2 state until the delay time has elapsed.

SS2 is triggered and the drive enters SOS state when the speed meets zero speed conditions

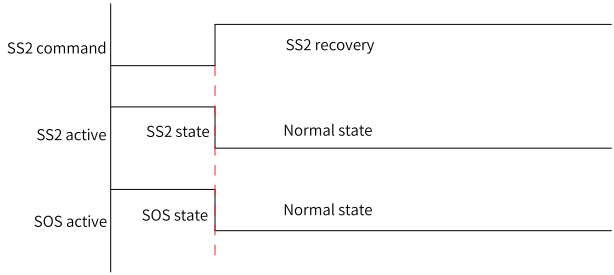


If the SS2 command is canceled after SS2 has been triggered, the drive will retain the SS2 state until the delay time has elapsed or the zero speed conditions are met.

Starting SS2 speed ramp monitoring



SS2 reset



16.10Safe Operating Stop (SOS)

16.10.1Overview

The SOS function monitors whether the speed and position of the motor in a stationary state are within thresholds, ensuring that the motor is in a safe stop state while providing the power needed to maintain the external load. After SS2 is triggered, the drive switches from the SS2 state to the SOS state when the switching conditions are met. The SOS function requires a safety encoder.

In the SOS state, the position and speed of the motor will be monitored. When the position or speed of the motor exceeds the threshold, a fault will be reported and the drive will enter the STO state.

Note

During SOS monitoring, no action commands can be sent to the drive to prevent the drive from responding to the cumulative commands sent during SOS monitoring after the SOS monitoring state is released.

16.10.2SOS Triggered by Local Mode

SOS trigger-related parameters

The parameter DO: FunOUT.11 (SOS Active) enables the DO to output that SOS function is active.

Table 16–9 Description of function No.

Code	Name	Function Name	Function
FunOUT.11	SOS Active	SOS active	0: SOS inactive 1: SOS active

When any DI in DI1 to DI5 is configured to FunIN.11-Ack and after the DI corresponding to SS2 is triggered and recovered, the drive recovers from SOS state to normal operational state only if the DI corresponding to the Ack function is triggered.

When no DI is configured to Ack function, the drive returns to normal operation state after the corresponding DI is triggered and recovered.

Note

- OFF (0): The 24V voltage of the corresponding DI is disconnected.
- ON (1): The 24V voltage of the corresponding DI is connected.

SOS-related parameters

You can configure the SOS speed change threshold by setting parameter H20.44, the SOS position change threshold by H20.45, and the SOS overthreshold-to-alarm time by H20.47.

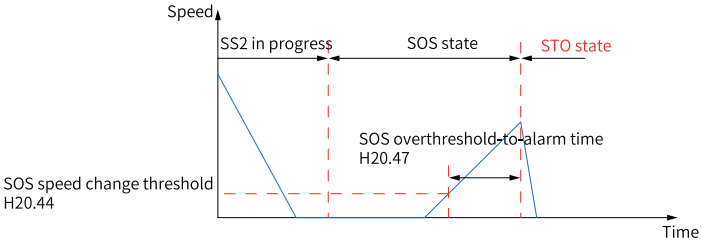


Figure 16-14 SOS speed change threshold

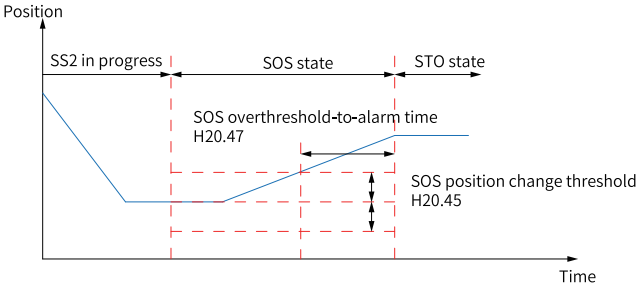


Figure 16-15 SOS position change threshold

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.44	2020-2Dh	SOS speed change threshold	1 rpm to 6000 rpm	10	rpm	At stop
H20.45	2020-2Eh	SOS position change threshold	1 to 536870912	932067	encoder unit	At stop
H20.47	2020-30h	SOS overthreshold-to-alarm time	0 ms–65535 ms	5	ms	At stop

16.10.3SOS Triggered by Bus Mode [functional safety N]

SOS trigger-related parameters

To trigger the safety function in the FSoE mode, 6668h in the TPDO mapping is the SOS trigger object dictionary.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6668.01h	6668-01h	SOS signal	0 to 1	0	-	Real-time

The object dictionary 6676h determines whether the Restart Ack signal is needed to restore the SOS state. 6630h in RPDO mapping is the Restart Ack signal. When 6676h is configured to 1 and SS2 is triggered and then recovered, the drive recovers from SOS state to normal operational state only if 1 is written to the Restart Ack signal.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6676.01h	6676-01h	SS2 reset mode selection	0 to 1	0	-	Real-time

SOS-related parameters

When the safety function is triggered in the FSoE mode, you can set the SOS zero position threshold through object dictionary 666Ah, and set SOS zero speed threshold through 666Ch. You can set the SOS overthreshold-to-alarm time through H20.47.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
666A.01h	666A-01h	SOS zero position threshold	0 to 536870912	932067	encoder unit	Real-time
666C.01h	666C-01h	SOS zero speed threshold	0 rpm to 6000 rpm	10	rpm	Real-time

16.10.4Sequence Diagram

SOS speed monitoring overrun

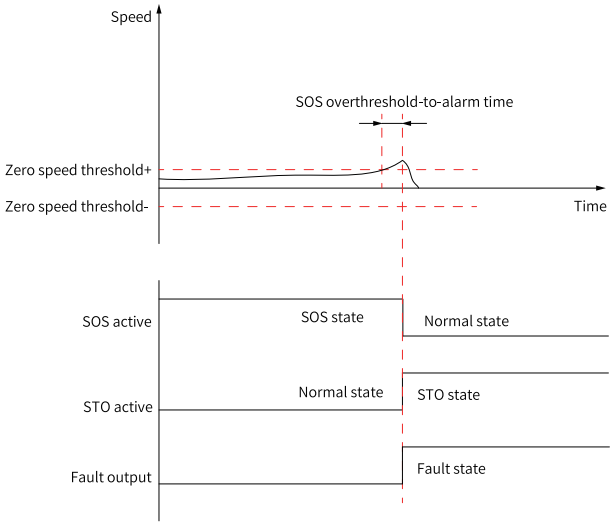


Figure 16-16 SOS speed monitoring timing diagram

SOS position monitoring overrun

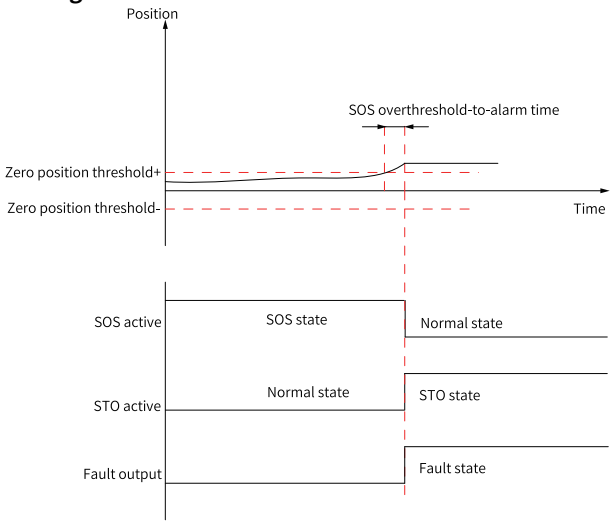


Figure 16-17 SOS position monitoring timing diagram

16.11Safety-limited Speed (SLS)

16.11.1Overview

When the SLS function is active, the safety module monitors whether the motor speed exceeds the SLS threshold. Once the allowable speed is exceeded, the servo drive responds in a preset way. You can configure the way for the servo drive to handle the SLS fault by setting the parameter H20.60.

There are four SLS thresholds and you can switch monitoring of these these thresholds during operation.

The SLS function is suitable for motors that can be dangerous due to overspeed.

16.11.2SLS Triggered by Local Mode

The parameter DI: FunIN5 (SLS1) enables the DI to trigger the SLS1 function, DI: FunIN6 (SLS2) enables the DI to trigger the SLS2 function, DI: FunIN7 (SLS3) enables the DI to trigger the SLS3 function, DI: FunIN8 (SLS4) enables the DI to trigger the SLS4 function, DO: FunOUT.5 (SLS1 Active) enables the DO to output that SLS1 is active, DO: FunOUT.6 (SLS2 Active) enables the DO to output that SLS6 is active, DO: FunOUT.7 (SLS3 Active) enables the DO to output that SLS3 is active, and DO: FunOUT.8 (SLS4 Active) enables the DO to output that SLS4 is active.

Table 16–10 Description of function No.

Code	Name	Function Name	Function
FunIN.5	SLS1 command	SLS1 trigger command	0: SS1 active 1: SS1 deselected
FunIN.6	SLS2 command	SLS2 trigger command	0: SS2 active 1: SS2 deselected
FunIN.7	SLS3 command	SLS3 trigger command	0: SS3 active 1: SS3 deselected
FunIN.8	SLS4 command	SLS4 trigger command	0: SS4 active 1: SS4 deselected
FunOUT.5	SLS1 Active	SLS1 active	0: Normal state 1: SLS1 monitoring state
FunOUT.6	SLS2 Active	SLS2 active	0: Normal state 1: SLS2 monitoring state
FunOUT.7	SLS3 Active	SLS3 active	0: Normal state 1: SLS3 monitoring state
FunOUT.8	SLS4 Active	SLS4 active	0: Normal state 1: SLS4 monitoring state

Note

- OFF (0): The 24V voltage of the corresponding DI is disconnected.
- ON (1): The 24V voltage of the corresponding DI is connected.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.02	2020-03h	Safety module DI1 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop
H20.03	2020-04h	Safety module DI2 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop
H20.04	2020-05h	Safety module DI3 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.05	2020-06h	Safety module DI4 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop
H20.06	2020-07h	Safety module DI5 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop
H20.20	2020-15h	Safety module DO1 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.21	2020-16h	Safety module DO2 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active			
H20.22	2020-17h	Safety module DO3 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.23	2020-18h	Safety module DO4 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.24	2020-19h	Safety module DO5 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			13: SS1-r Active 14: SS2-r Active			
H20.25	2020-1Ah	Safety module DO6 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.48	2020-31h	SLS1 switchover delay	0 ms–65535 ms	100	ms	At stop
H20.49	2020-32h	SLS2 switchover delay	0 ms–65535 ms	100	ms	At stop
H20.50	2020-33h	SLS3 switchover delay	0 ms–65535 ms	100	ms	At stop
H20.51	2020-34h	SLS4 switchover delay	0 ms–65535 ms	100	ms	At stop
H20.52	2020-35h	SLS1 threshold	0 rpm to 6000 rpm	1000	rpm	At stop
H20.53	2020-36h	SLS2 threshold	0 rpm to 6000 rpm	1000	rpm	At stop
H20.54	2020-37h	SLS3 threshold	0 rpm to 6000 rpm	1000	rpm	At stop
H20.55	2020-38h	SLS4 threshold	0 rpm to 6000 rpm	1000	rpm	At stop
H20.56	2020-39h	SLS1 filter time	0 ms–65535 ms	100	ms	At stop
H20.57	2020-3Ah	SLS2 filter time	0 ms–65535 ms	100	ms	At stop
H20.58	2020-3Bh	SLS3 filter time	0 ms–65535 ms	100	ms	At stop
H20.59	2020-3Ch	SLS4 filter time	0 ms–65535 ms	100	ms	At stop

16.11.3SLS Triggered by Bus Mode [functional safety N]

The SLS speed monitoring can be triggered in the following two ways.

1. You can set the delay time (6691h) from activation of the SLS command to starting of the SLS speed monitoring. When the delay time has elapsed, the safety module will turn on the speed monitoring regardless of whether the current speed of the servo motor is within the speed range.
2. You can also set the SLS filter time (6694h). It defines the filtering time for determining that the motor speed is within the SLS limit. When the SLS filter time is reached, the SLS speed monitoring will be activated regardless of whether the delay time is reached.

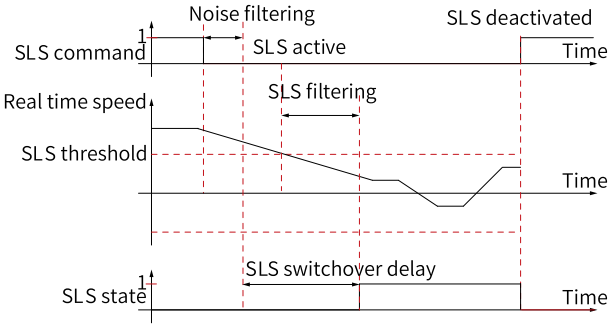
The object dictionary parameters involved in this mode are as follows.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
6690.01h	6690-01h	SLS1 signal	0 to 1	0	-	Real-time
6690.02h	6690-02h	SLS2 signal	0 to 1	0	-	Real-time
6690.03h	6690-03h	SLS3 signal	0 to 1	0	-	Real-time
6690.04h	6690-04h	SLS4 signal	0 to 1	0	-	Real-time
6691.01h	6691-01h	SLS1 switchover delay	0 ms–65535 ms	100	ms	Real-time
6691.02h	6691-02h	SLS2 switchover delay	0 ms–65535 ms	100	ms	Real-time
6691.03h	6691-03h	SLS3 switchover delay	0 ms–65535 ms	100	ms	Real-time
6691.04h	6691-04h	SLS4 switchover delay	0 ms–65535 ms	100	ms	Real-time
6693.01h	6693-01h	SLS1 threshold	0 rpm to 6000 rpm	1000	rpm	Real-time
6693.02h	6693-02h	SLS2 threshold	0 rpm to 6000 rpm	1000	rpm	Real-time
6693.03h	6693-03h	SLS3 threshold	0 rpm to 6000 rpm	1000	rpm	Real-time
6693.04h	6693-04h	SLS4 threshold	0 rpm to 6000 rpm	1000	rpm	Real-time
6694.01h	6694-01h	SLS1 filter time	0 ms–65535 ms	10	ms	Real-time
6694.02h	6694-02h	SLS2 filter time	0 ms–65535 ms	10	ms	Real-time
6694.03h	6694-03h	SLS3 filter time	0 ms–65535 ms	10	ms	Real-time
6694.04h	6694-04h	SLS4 filter time	0 ms–65535 ms	10	ms	Real-time

16.11.4Sequence Diagram

Sequence of SLS triggering

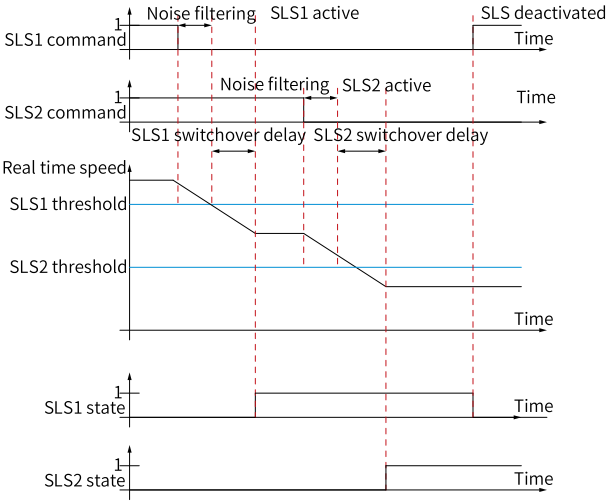


- When the SLS command is active, the speed of the servo motor must be below the SLS threshold before the SLS switchover delay expires; otherwise, the safety module will issue an SLS alarm.
- The safety module only monitors whether the motor speed and SLS switchover delay reach the thresholds. It will not actively send deceleration commands to the servo drive. To make the motor speed fall below the SLS threshold within the SLS switchover delay, the servo drive must be controlled externally for deceleration.
- When the SLS command is canceled, the SLS monitoring function is turned off, and the servo drive can immediately continue to run at a larger preset speed.
- Conditions for SLS to enter the monitoring state:

  1. The SLS switchover delay expires.
  2. SLS speed limit filter time expires.

Sequence of multiple SLS triggering

The safety module enables monitoring for four different SLS thresholds. When multiple SLS commands are all active, the motor speed must be kept below the smallest SLS threshold; otherwise, the safety module will issue an SLS alarm.



During normal operation of the servo drive, the SLS1 monitoring is triggered. Before the SLS1 switchover delay expires, the motor speed needs to be kept below the SLS1 threshold. After the SLS1 switchover delay expires, the SLS1 monitoring is turned on. During the SLS1 monitoring, the SLS2 monitoring is triggered. Before the SLS2 switchover delay expires, the motor speed needs to be kept below the SLS2 threshold. After the SLS2 switchover delay expires, the SLS2 monitoring is turned on.

In this case, both SLS1 and SLS2 monitoring are executed at the same time. The smaller one of the SLS1 and SLS2 thresholds is used. When the SLS1 command is canceled, the SLS1 monitoring is turned off.

16.12 Safe Direction (SDI)

16.12.1 Overview

The SDI function prevents the motor shaft from moving in an unintended direction.

When the SDIp input command is active, the safety module monitors whether the motor shaft moves in the prohibited forward direction; when the SDIn input command is active, the safety module monitors whether the motor shaft moves in the prohibited reverse direction.

When the motor shaft moves in an unexpected direction and exceeds the allowable threshold, the safety module triggers the corresponding stop alarm. You can configure the way for the servo drive to handle the SDI fault by setting the parameter H20.78.

The SDI function must be used with a safety motor.

16.12.2SDI Triggered by Local Mode

The SDI function controlled by the DI involve the following parameter configurations.

The parameter DI: FunIN9 (SDIp) enables the DI to trigger the SS2 function, DI: FunIN10 (SDIn) enables the DI to trigger the SDIn function, DO: FunOUT.9 (SDIp Active) enables the DO to output that SDIp is active, and DO: FunOUT.10 (SDIn Active) enables the DO to output that SDIn is active.

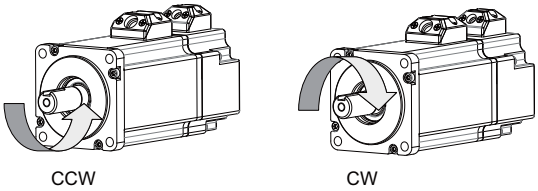
Table 16–11 Description of function No.

Code	Name	Function Name	Function
FunIN.9	SDIp command	SDIp trigger command	0: Active, forward rotation prohibited 1: Canceled, forward rotation allowed
FunIN.10	SDIn command	SDIn trigger command	0: Active, reverse rotation prohibited 1: Canceled, reverse rotation allowed
FunOUT.9	SDIp Status	SDIp state	0: Inactive, motor is not rotating forward 1: Active, motor is rotating forward
FunOUT.10	SDIn Status	SDIn state	0: Inactive, motor is not rotating reversely 1: Active, motor is rotating reversely

Note

- OFF (0): The 24V voltage of the corresponding DI is disconnected.
- ON (1): The 24V voltage of the corresponding DI is connected.

From the perspective of the motor load side, clockwise rotation of the motor is abbreviated as CW, and counterclockwise rotation is abbreviated as CCW, as shown below.



The logical relationship between SDI command and state is as follows.

SDI command		SDI state		Description
SDIp	SDIn	SDIp	SDIn	
1	1	-	-	The motor can rotate both forward and reversely.
1	0	1	0	The motor can only rotate forward.
0	1	0	1	The motor can only rotate reversely.
0	0	0	0	The motor is not allowed to rotate reversely.

Note

0: Inactive, meaning that the 24V voltage of the corresponding DI is off;

1: Active, meaning that the 24V voltage of the corresponding DI is on.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.02	2020-03h	Safety module DI1 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop
H20.03	2020-04h	Safety module DI2 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop
H20.04	2020-05h	Safety module DI3 function selection	0: Inactive 1: STO 2: SBC 3: SS1	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack			
H20.05	2020-06h	Safety module DI4 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop
H20.06	2020-07h	Safety module DI5 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop
H20.20	2020-15h	Safety module DO1 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.21	2020-16h	Safety module DO2 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.22	2020-17h	Safety module DO3 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.23	2020-18h	Safety module DO4 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.24	2020-19h	Safety module DO5 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active			
H20.25	2020-1Ah	Safety module DO6 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.74	2020-4Bh	SDI zero position threshold	1 to 536870912	932067	encoder unit	At stop
H20.76	2020-4Dh	SDI zero speed threshold	0 rpm to 3000 rpm	10	rpm	At stop
H20.77	2020-4Eh	SDI delay time	0 ms–65535 ms	0	ms	At stop
H20.78	2020-4Fh	SDI fault response mode	0: STO 1: SS1-t	0	-	At stop
H20.00	2020-01h	Safety module software version	0.00 to 655.35	0.00	-	Unchangeable
H02.02	2002-03h	Rotation direction selection	0: Counterclockwise (CCW) as forward direction 1: Clockwise (CW) as forward direction	0	-	At stop

16.12.3SDI Triggered by Bus Mode [functional safety N]

The characteristics of the SDI function triggered through FSoE are the same as those of the SDI function triggered locally. The SDI function triggered through FSoE involves the following object dictionary configuration.

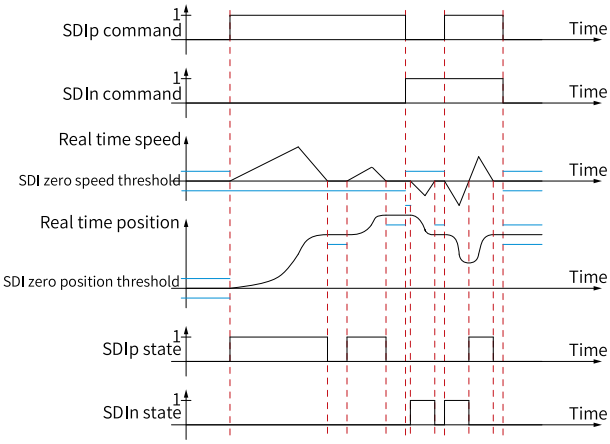
Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.02	2002-03h	Rotation direction selection	0: Counterclockwise (CCW) as forward direction 1: Clockwise (CW) as forward direction	0	-	At stop
66D0h	66D0h	SDIp signal	0 to 1	0	-	Real-time
66D1h	66D1h	SDIn signal	0 to 1	0	-	Real-time
66D3h	66D3h	SDI zero position threshold	0 to 536870912	932067	encoder unit	Real-time
66D5h	66D5h	SDI zero speed threshold	0 rpm to 3000 rpm	10	rpm	Real-time

16.12.4Sequence Diagram

SDI control bit setting

You can control rotation direction of the motor by setting the SDI control bit. The permissible rotation direction is given by SDI positive (SDIp) and SDI negative (SDIn) control bits.



- The SDIp and SDIn states displayed by the safety module indicate the current rotational state of the servo motor, independent of whether the input SDI

command is active or not. When both SDIp and SDIn states are 0, it means the servo motor is stopped.

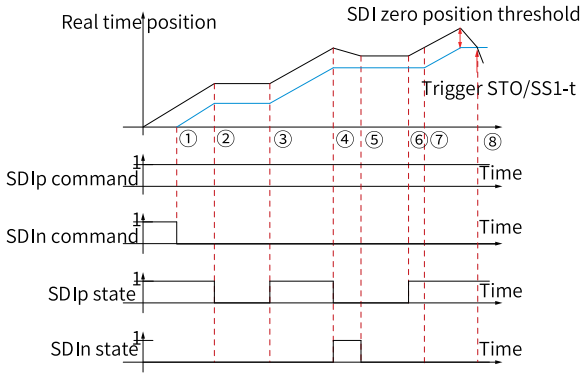
- When the SDIp command is deactivated, the motor can rotate in forward direction, and when it is activated, the motor can only rotate in reverse direction.
- When the SDIn command is deactivated, the motor can rotate in reverse direction, and when it is activated, the motor can only rotate in forward direction.

SDI monitoring

When the SDI zero position threshold or SDI zero speed threshold is exceeded, the stop mode defined by H02.78 is triggered.

The SDI monitoring diagram is shown below.

Stop according to H20.78 when the SDI zero position threshold is exceeded



The sequence is described as follows:

1. The safety module receives an active SDIn command and starts monitoring whether the motor shaft rotates into the reverse direction. The motor rotates into the allowable forward direction.

2. The motor stops rotating and the position feedback remains unchanged.

3. The motor continues to rotate into the allowable forward direction.

4. The motor rotates into the reverse direction, the safety module locks the maximum allowed reverse position threshold and checks whether the current position exceeds the maximum allowed value.

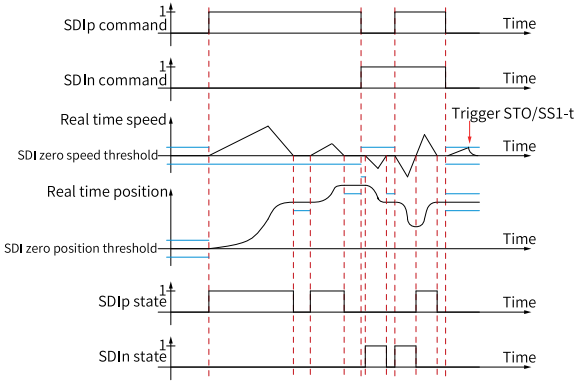
5. The motor stops before the maximum reverse position threshold is reached.

6. The motor continues to rotate into the allowable forward direction.

7. The motor returns to the position it was in when the reverse position threshold was locked.

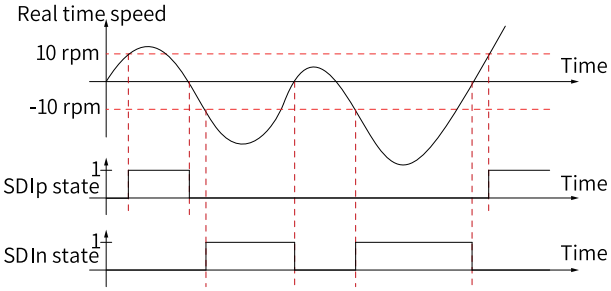
8. The zero position threshold is exceeded and the safety stop set by H20.78 is triggered.

Stop according to H20.78 when the SDI zero speed threshold is exceeded



Hysteresis speed

To avoid the SDIp and SDIn states jumping back and forth near zero speed, the safety module is configured with a hysteresis speed of 10 rpm. Only when the speed exceeds ±10rpm, the corresponding SDI state value changes to 1.



16.13Safe Speed Monitor (SSM)

16.13.1Overview

The SSM function provides a safe output signal to indicate whether the motor speed is below a prescribed limit to identify, for example, a standstill. The safety module provides a safe output signal for further processing.

The SSM monitors whether the motor speed is within the limit threshold. The safety module does not trigger any stop response when the motor speed exceeds the SSM limit threshold.

The SSM applies to enabling through feedback in the local mode, such as unlocking the protective door at a speed lower than the critical speed.

The SSM state can be output via local mode or via the TPDO status word of the EtherCAT safety bus.

16.13.2SSM Triggered Locally

The parameter DO: FunOUT.12 (SSM Active) enables the DO to output that SSM function is active.

Table 16–12 Description of function No.

Code	Name	Function Name	Function
FunOUT.12	SSM Active	SSM active	0: Out of SSM limit 1: Within SSM limit

Note

- OFF (0): The 24V voltage of the corresponding DI is disconnected.
- ON (1): The 24V voltage of the corresponding DI is connected.

The parameters for safety DO controlling SSM are as follows:

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H20.20	2020-15h	Safety module DO1 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.21	2020-16h	Safety module DO2 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active			
H20.22	2020-17h	Safety module DO3 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.23	2020-18h	Safety module DO4 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.24	2020-19h	Safety module DO5 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active	0	-	At stop

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
			11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active			
H20.25	2020-1Ah	Safety module DO6 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop
H20.70	2020-47h	SSM upper limit	–6000 rpm to 6000 rpm	200	rpm	At stop
H20.71	2020-48h	SSM lower limit	–6000 rpm to 6000 rpm	-200	rpm	At stop
H20.72	2020-49h	SSM hysteresis threshold	0 rpm to 6000 rpm	10	rpm	At stop

Note

- When the upper and lower limits of SSM are set to 0 at the same time, the SSM function can be disabled, and the SSM status is always inactive.
- The upper limit of the SSM must be greater than the lower limit, and the hysteresis threshold of the SSM must be less than the upper limit minus the lower limit.
- The SSM hysteresis threshold is set by parameter H20.72, and is valid for both local DO and FSoE output status words.

16.13.3SSM Triggered by Bus Mode [functional safety N]

The SSM hysteresis threshold is not planned in the object dictionary. To prevent the motor speed from fluctuating near the upper or lower SSM threshold, the SSM hysteresis threshold configured for the SSM function triggered locally adopts the value set by the parameter 20.72.

That is, the SSM hysteresis threshold set by H20.72 will take effect for both the local mode and the bus mode.

The object dictionaries involved are as follows:

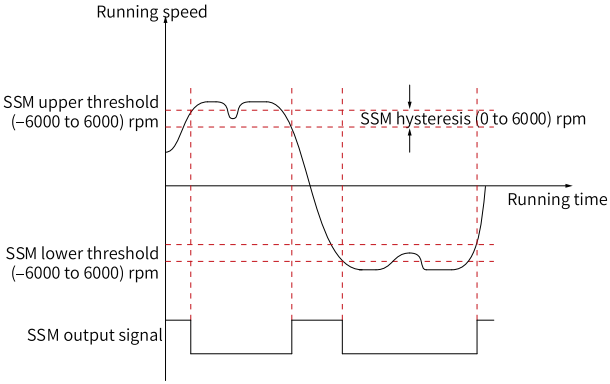
Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
66E0.01h	66E0-01h	SSM state	0 to 1	0	-	Unchangeable
66E2.01h	66E2-01h	SSM upper limit	–6000 rpm to 6000 rpm	200	rpm	Real-time
66E4.01h	66E4-01h	SSM lower limit	–6000 rpm to 6000 rpm	-200	rpm	Real-time

Note

- When the upper and lower limits of SSM are set to 0 at the same time, the SSM function is turned off and the SSM state is always inactive.
- The upper limit of the SSM must be greater than the lower limit, and the hysteresis threshold of the SSM must be less than the upper limit minus the lower limit.
- The SSM hysteresis threshold is set by parameter H20.72, and is valid for both local DO and FSoE output status words.

16.13.4Sequence Diagram



The purpose of the SSM hysteresis setting is to achieve a more stable signal output when the motor speed is near the upper or lower SSM threshold. The SSM function prevents the SSM output signal from jumping back and forth between 0 and 1 several times around the threshold due to the real-time fluctuation of the motor speed.

- When the motor speed is within the upper and lower SSM thresholds, the SSM output is 1.
- When the motor speed exceeds the upper SSM threshold, the SSM output is 0.
- When the motor speed drops below upper SSM threshold minus hysteresis threshold, the SSM output is 1 again.
- When the motor speed drops below the lower SSM threshold, the SSM output is 0.
- When the motor speed increases to lower SSM threshold + hysteresis threshold, the SSM output is 1 again.

16.14 Safety Function Response Time



Set the parameters correctly to achieve the desired response time and ensure the accumulation of diagnostic test interval (DTI) and safety function response time can meet the safety requirements of the system.

16.14.1 Response Time in Local Mode

When the local mode triggers the safety function, configure the safety DI to a safety function and trigger the corresponding safety function by controlling the safety DI. The response time from DI operation to the time when the safety function take effect is shown in the following table.

Table 16–13 Response time during terminal control

Function	Max. response time[5]
STO/SBC/SS1/SS2	t_DI[1]+2.5ms
SLS	t_DI[1]+t_SLS[3] + 6.5ms
SDI	t_DI[1]+t_SDI[4] + 6.5ms
SOS	t_SOS[2] + 6.5ms
SSM	4ms

Note

[1]: t_DI is the noise removal filter time of the safety module DI, which is configured by parameters H20.08 to H20.12, with setpoints ranging from 1 ms to 500 ms.

[2]: t_SOS is the filter time set by H20.47, which ranges from 0 ms to 65535 ms.

[3]: t_SLS is the delay time set by parameters H20.48 to H20.51, which ranges from 0 ms to 65535 ms.

[4]: t_SDI is the delay time set by H20.77, which ranges from 0 ms to 65535 ms.

[5]: Indicates the time interval between the safety function demand state and the safety function completion state (such as entering the safety state).

16.14.2Response Time in Bus Mode

When the FSoE mode triggers safety function, the corresponding safety function is triggered by the control word of a certain safety function in the RPDO. The following table shows the time between function trigger and start.

Table 16–14 Response time during FSoE control

Function	Max. response time[7]
STO/SBC/SS1/SS2	2*t_ET [1] + 2ms
SLS	2*t_ET [1] + t_SLS [3] + 6.5ms
SDI	2*t_ET [1] + t_SDI [4] + 6.5ms
SOS	t_SOS [2] + 6.5ms
SSM	4*t_EFS [5] +4*t_EFM [6]

Note

- [1]: t_ET is the EtherCAT communication synchronization cycle. The setpoint is determined by the parameter configurations of the customer controller.
- [2]: t_SOS is the filter time set by H20.47, which ranges from 0 ms to 65535 ms.
- [3]: t_SLS is the delay set by H20.48 to H20.51, which ranges from 0 ms to 65535 ms.
- [3]: t_SDI is the delay set by H20.77, which ranges from 0 ms to 65535 ms.
- [5] t_EPS is the communication cycle between the EtherCAT master and the FSoE slave. The setpoint is determined by the parameter configurations of the customer controller.
- [6]: t_EFM is the communication cycle between the EtherCAT master and the FSoE master. The setpoint is determined by the parameter configurations of the customer controller.
- [7]: Indicates the time interval between the safety function demand state and the safety function completion state (such as entering the safety state).

16.15 Fault Reset

When the resettable safety function fault occurs, you can stop the keypad from displaying the fault using the fault reset function.

1. To stop the keypad from displaying the fault/warning, set H0d.01 (Fault reset) to 1 or activate the DI terminal assigned with DI function 2 (FunIN.2: ALM- RST, fault and warning reset).
2. For EtherCAT servo drives, enable the rising edge of the control word 6040h bit7 on the host controller to stop the keypad from displaying the fault.

For No. 1 and No. 2 resettable faults, turn off the S-ON signal before resetting the faults.

When a non-resettable safety function fault occurs, the power must be restarted to stop the fault display.

16.16 Safety Module Working with Beckhoff Safety CPU [Functional Safety N]

The following is an example of the simple configuration for FSoE-triggered safety function, with a Beckhoff safety CPU and TwinCAT3 master.

Hardware

The Beckhoff safety CPU unit includes a logic sub-module EL6900, 4-channel DI sub-module EL1904, and 4-channel DO sub-module EL2904 which are connected to

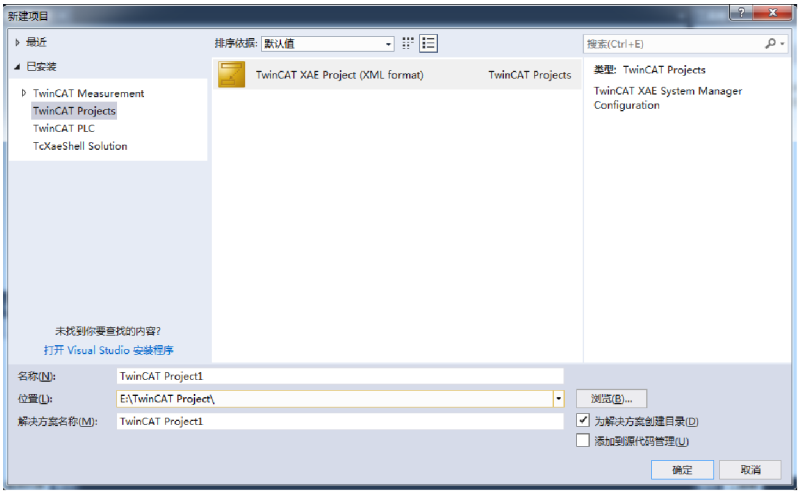
EtherCAT network through EtherCAT coupler EK1100. For FSoE network hardware wiring, see the related section.

The safety address must be set to the safety module and every module of the safety CPU unit. The safety address cannot be 0, and the safety address must be unique for every module of the system. You can set the safety address for the safety module through the knob.

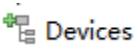
Software

You can obtain TwinCAT3 at the official website of Beckhoff. The software version of TwinCAT must be 3.1.4024.1 or above when FSoE is used.

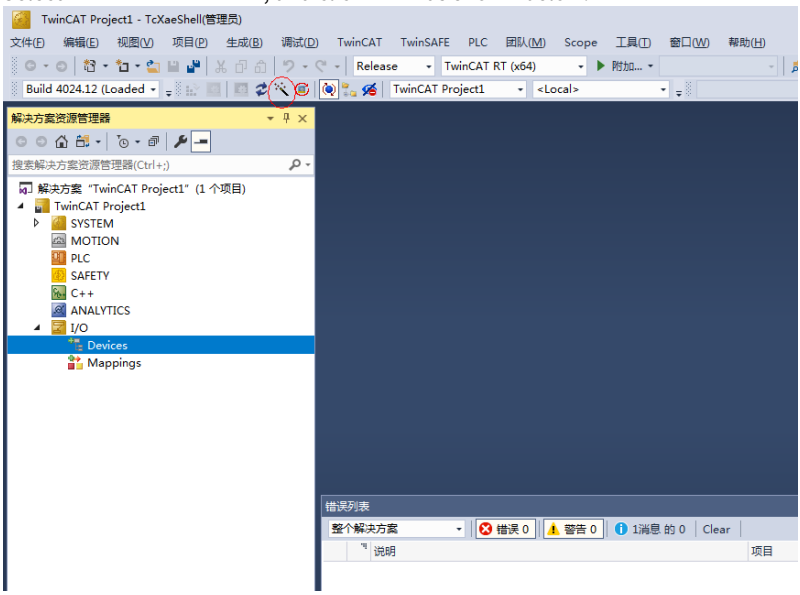
1. Copy the SV680N-INT EtherCAT configuration file (SV680_1Axis_04001_FSoE.xml) to the TwinCAT installation directory: TwinCAT\3.1\Config\Io\EtherCAT.
2. Start TwinCAT3 and Create a TwinCAT project.



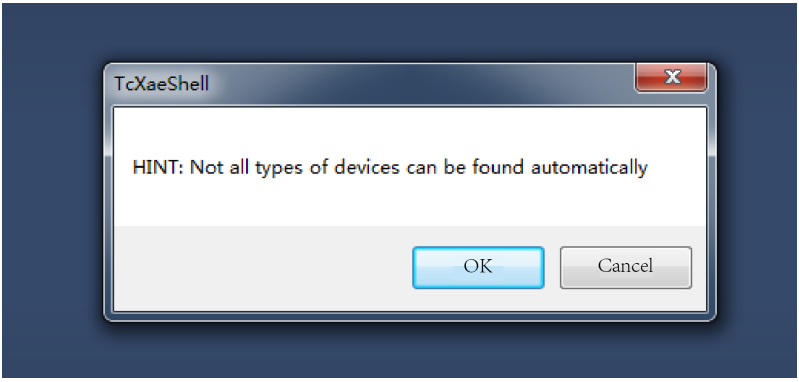
Search for devices.

1. Select 

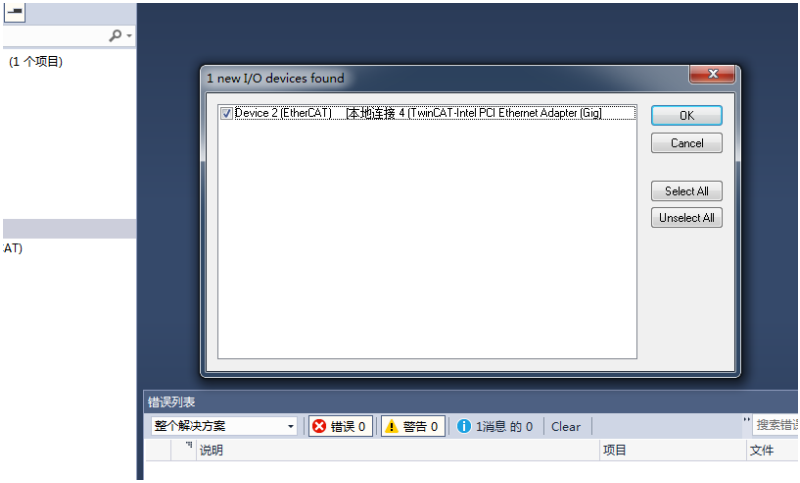
, and click  as shown below.



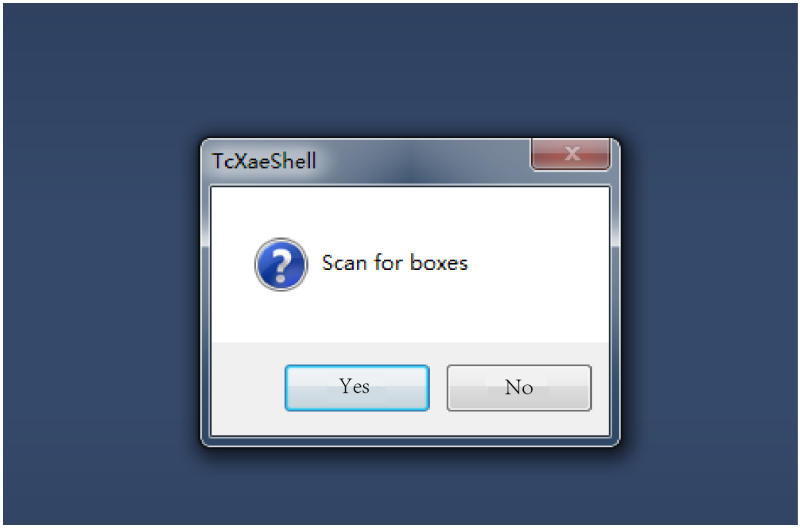
2. Click **OK**.



3. Click **OK**.



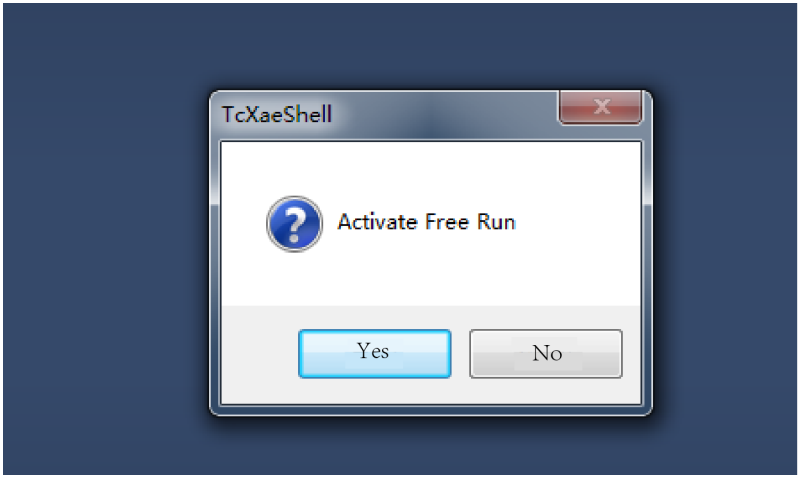
4. Click **OK**.



5. Click **OK**.



6. Click **Cancel**.

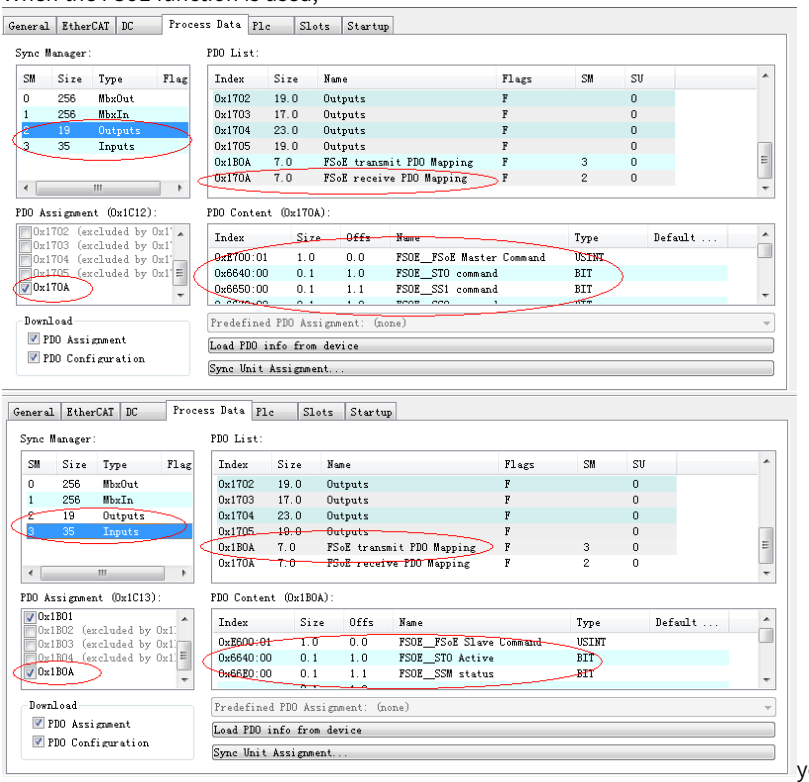


7. If the search is successful, the following devices should show: the SV680N-INT servo drive, safety module, Beckhoff EK1100, EL6900, EL1904 and EL2904.



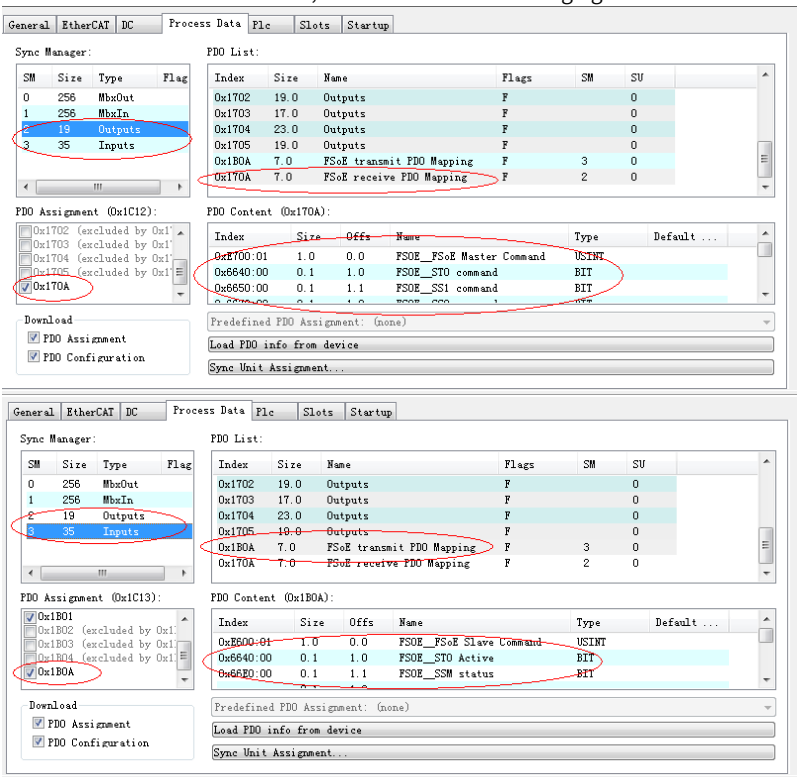
Configuring PDO

When the FSoE function is used,



you

must select 0x170A and 0x1B0A, as shown in the following figure.



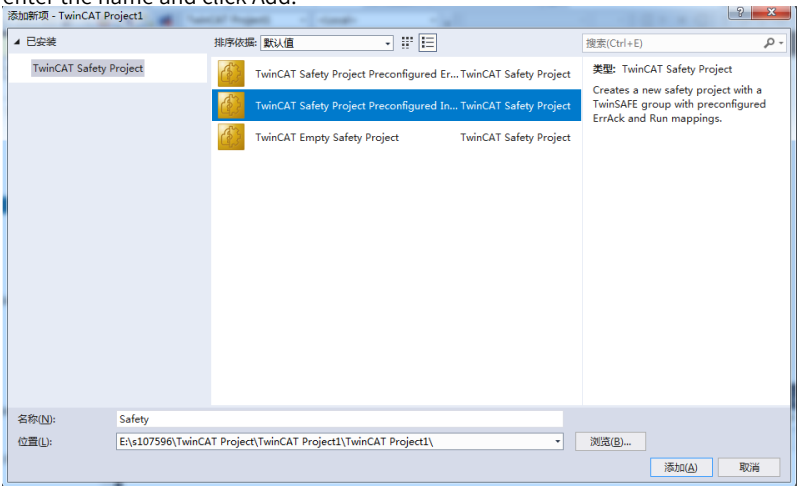
Safety hardware configuration

1. Create a safety project.

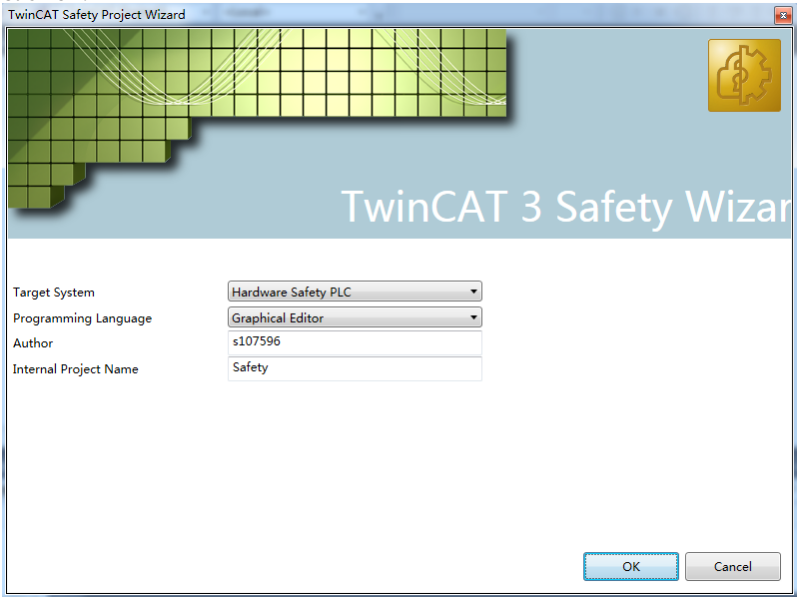
   a. Right click SAFETY and select Add New Item.



b. In the pop-up dialog box, select TwinCAT Safety Project Preconfigured In…, enter the name and click Add.

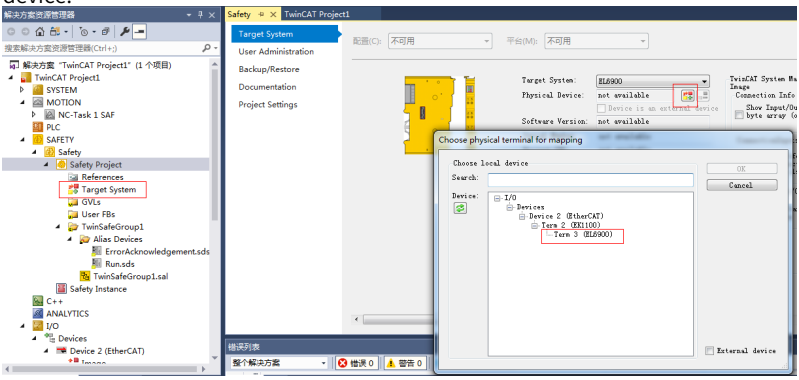


c. Click OK.



2. Set EL6900 as the safety logic module, do as follows.

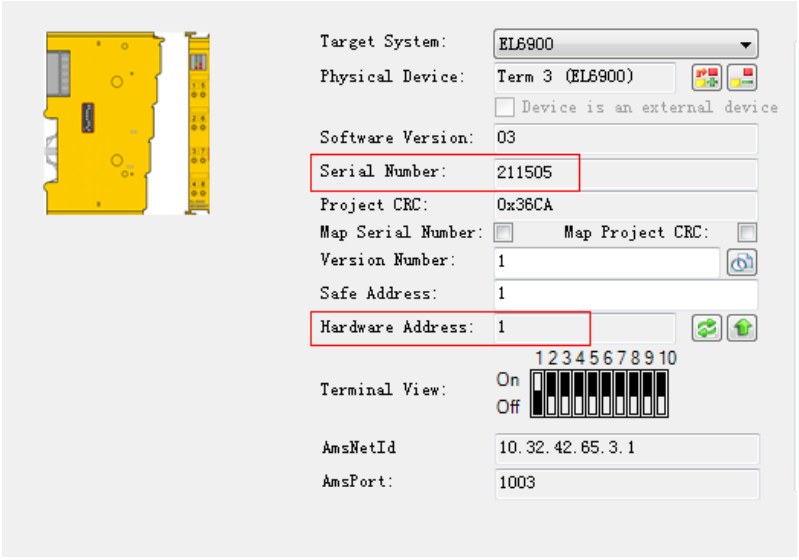
a. Click Target System, then click  after Physical device to add the hardware device.



b. Check the serial number and hardware address of the EL69XX module.

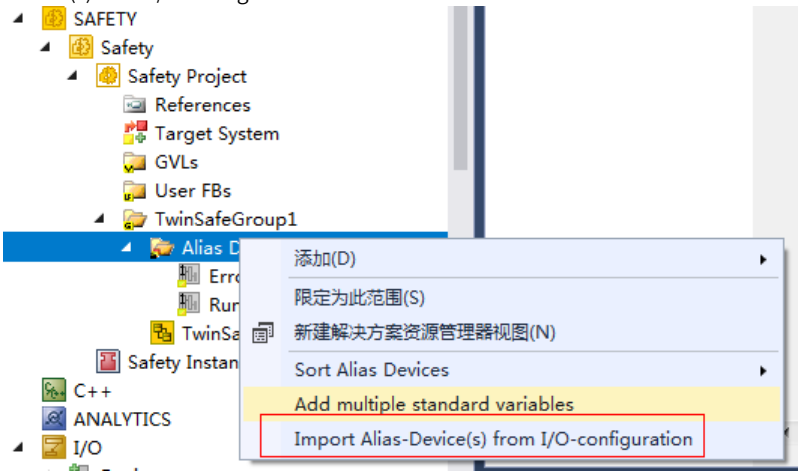
Note

Target System needs to select a model based on actual conditions during on-site commissioning. The EL6900 model is used in this example.

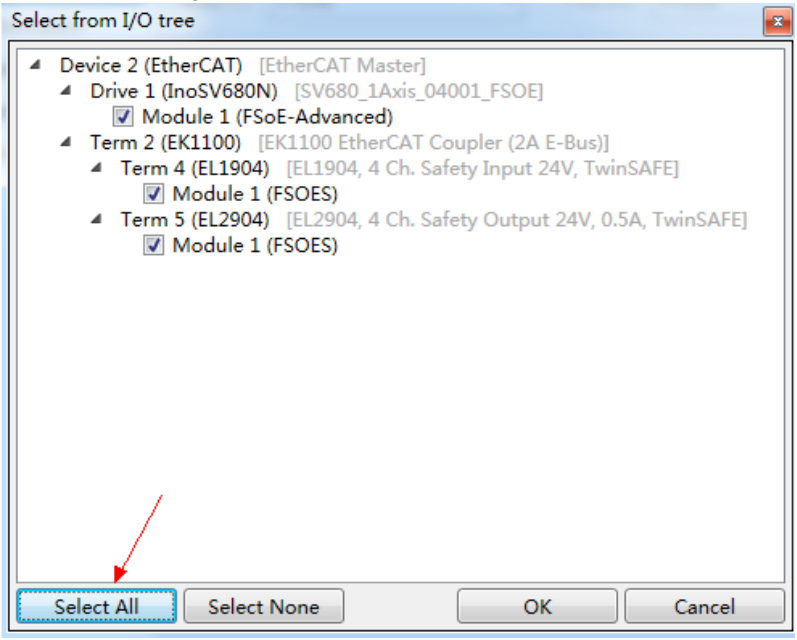


3.

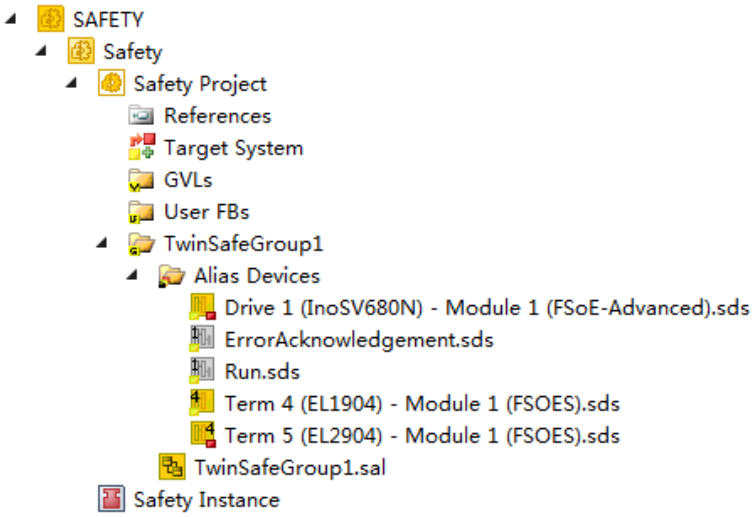
a. Expand TwinSafeGroup1, right-click on Alias Device and select Import Alias-Device(s) from I/O-configuration.



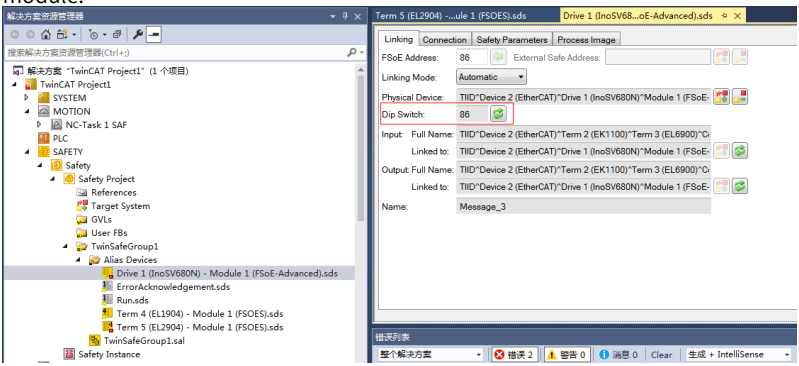
b. In the pop-up dialog, click Select All and then OK.

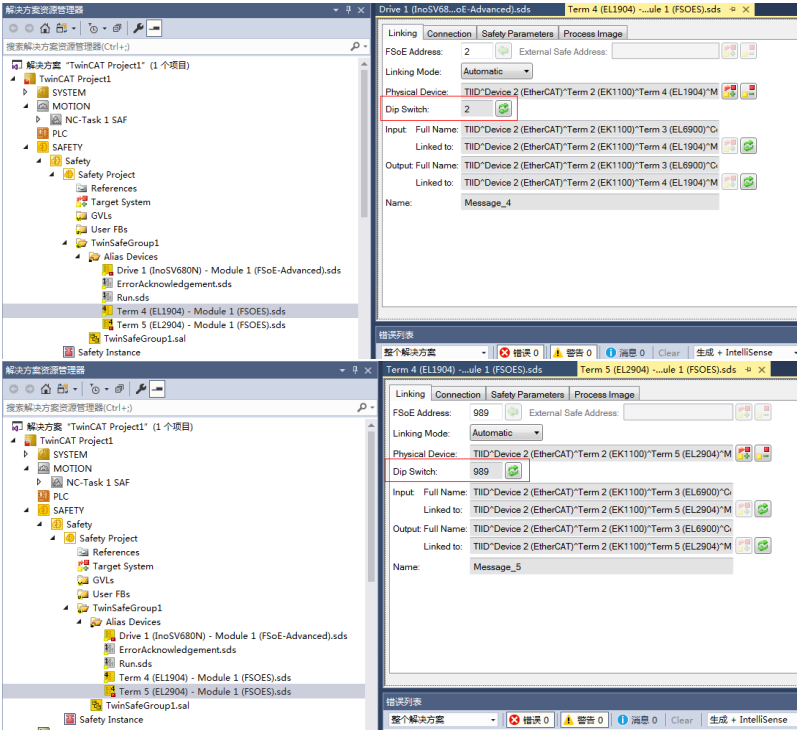


c. Add safety I/O module and safety module under Alias Devices.



d. Check the FSoE address of the safety module and Dip Switch of the Beckhoff module.

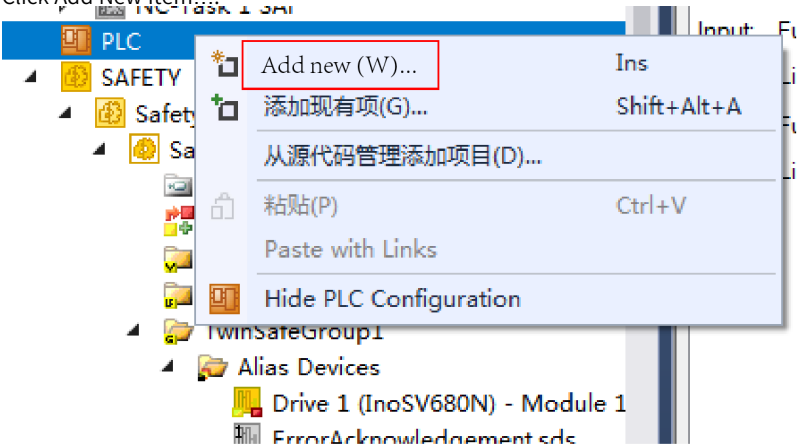




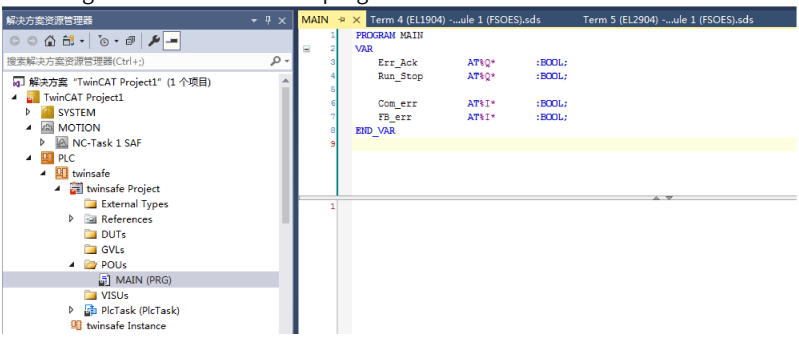
Safety program configuration

1. Add a PLC project.

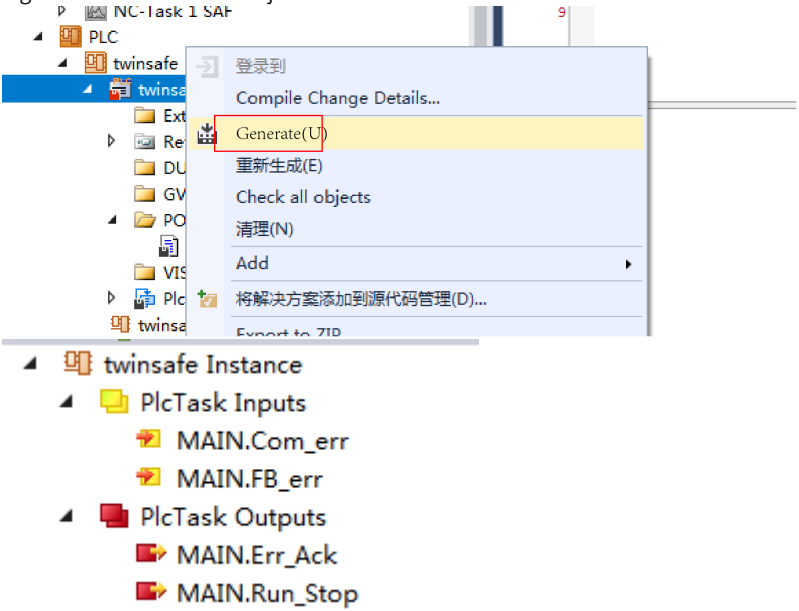
   a. Click Add New Item....



b. Select Standard PLC Project, name the project as "twinsafe" and make the following statement in the main program area.

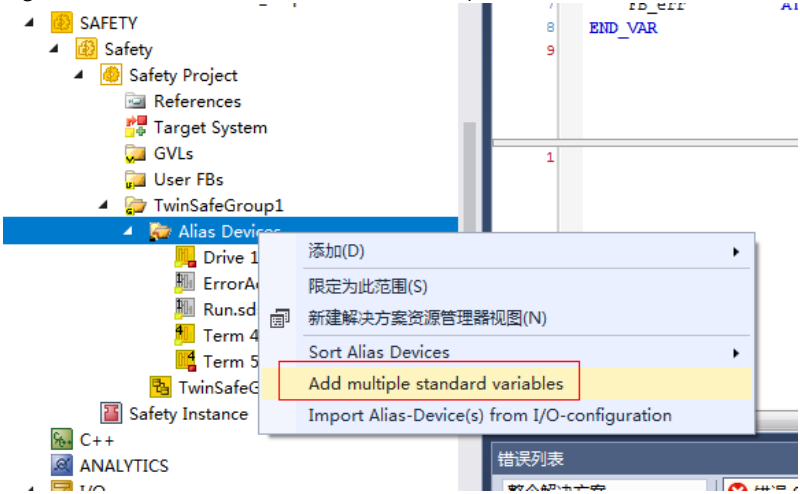


c. Right-click on Twinsafe Project and select Build.

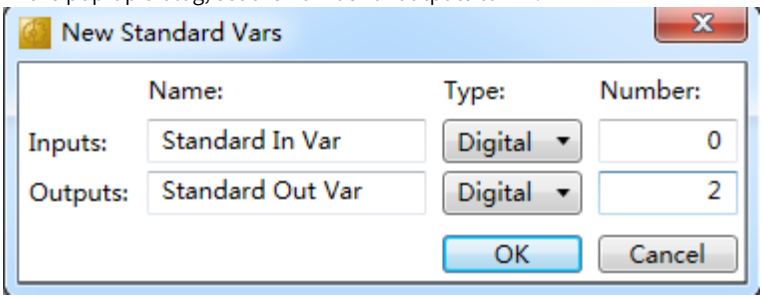


2. Add non-safety standard variables.

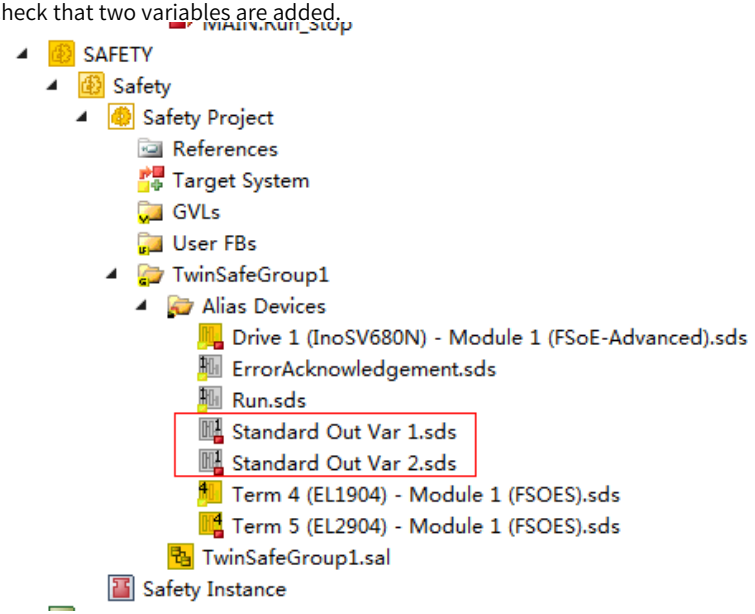
a. Right-click on Alias Device and select Add multiple standard variables.



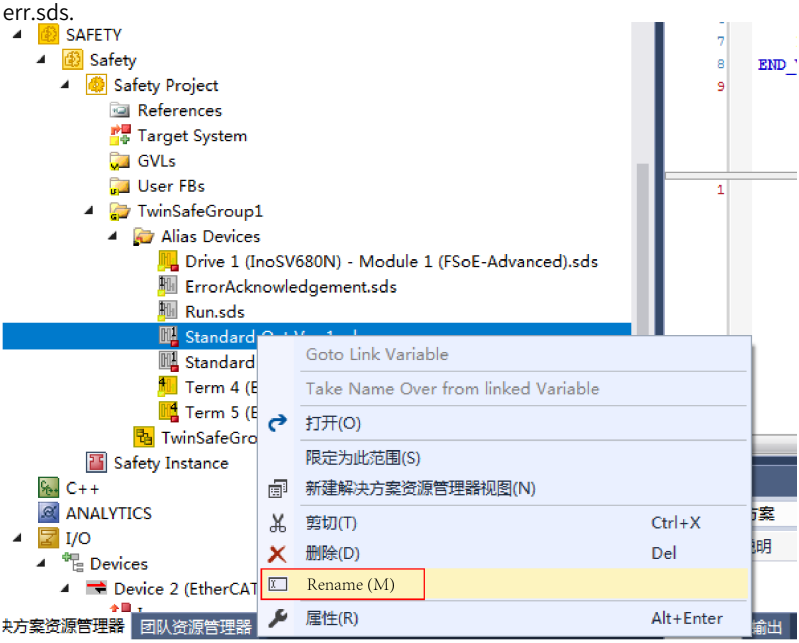
b. In the pop-up dialog, set the number of outputs to "2".



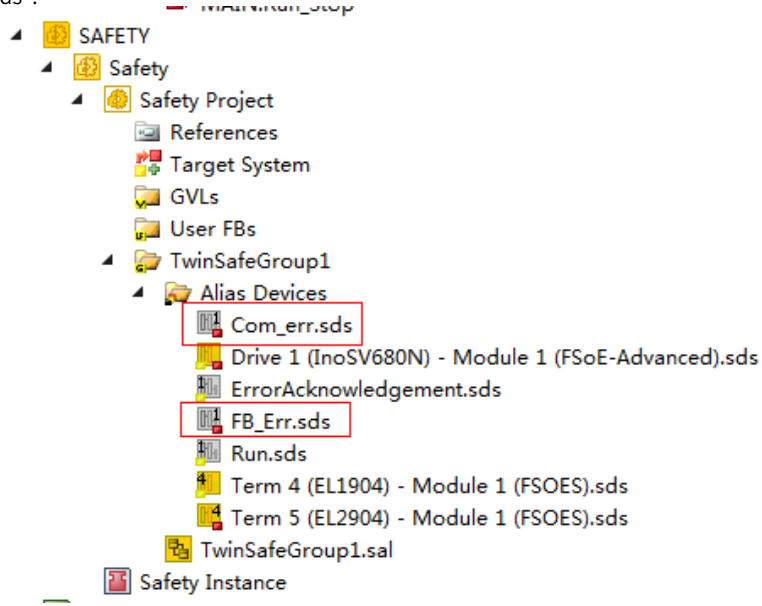
c. Check that two variables are added.



d. Right-click on Standard Out Var 1.sds and select Rename to rename it to Com_err.sds.

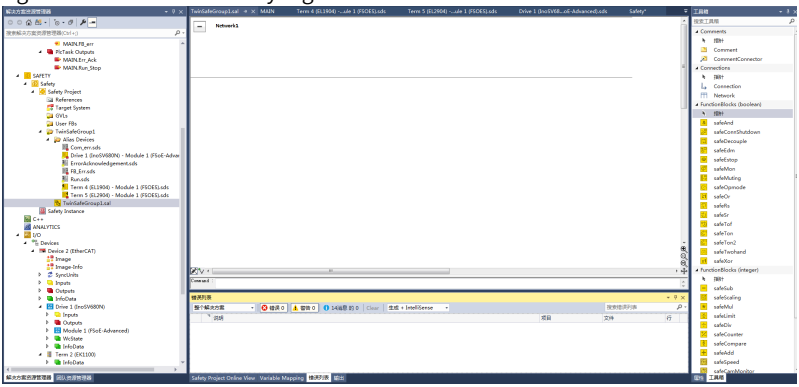


e. Right-click on Standard Out Var 2.sds and select Rename to rename it to "FB_Err.sds".

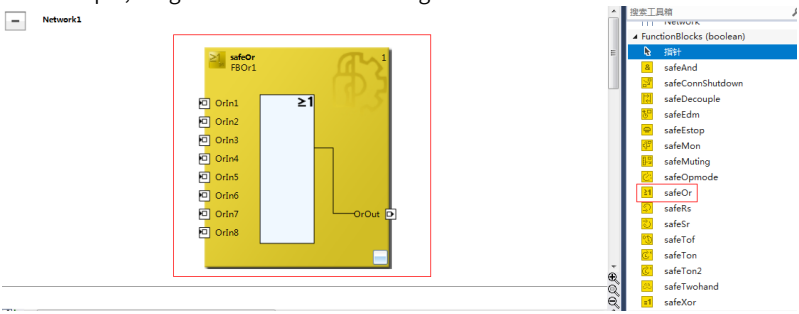


3. Write the safety program.

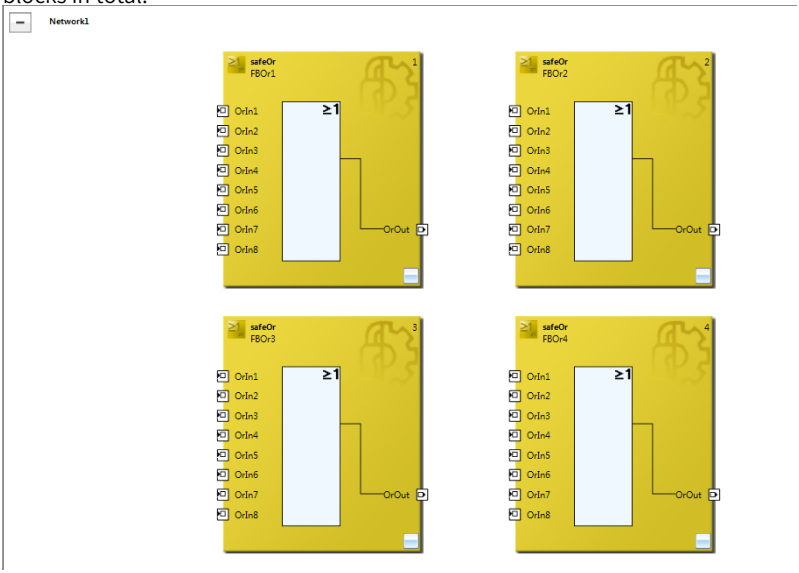
a. Double click "TwinSafeGroup1.sal" and use the safety function blocks on the right side to write the safety logic.



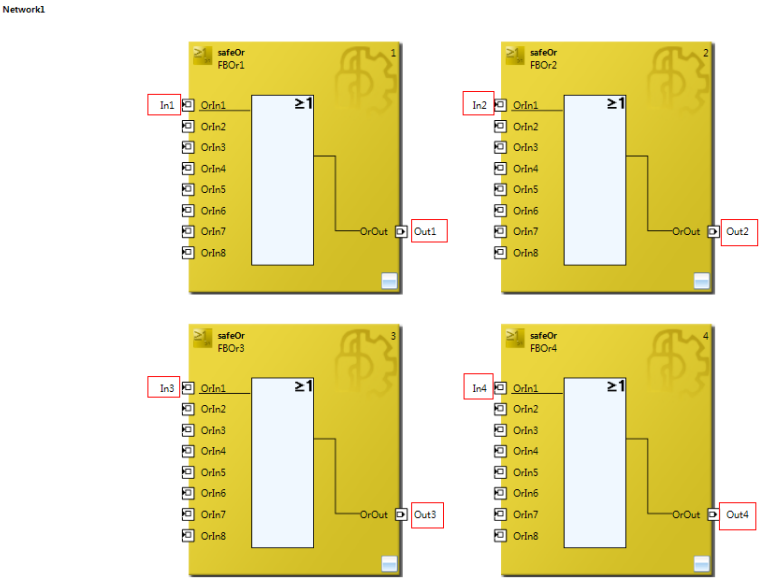
b. For example, drag safeOr block from the right side to Network1.



c. Four safety DI inputs are used to trigger the safety function. There are four safeOr blocks in total.

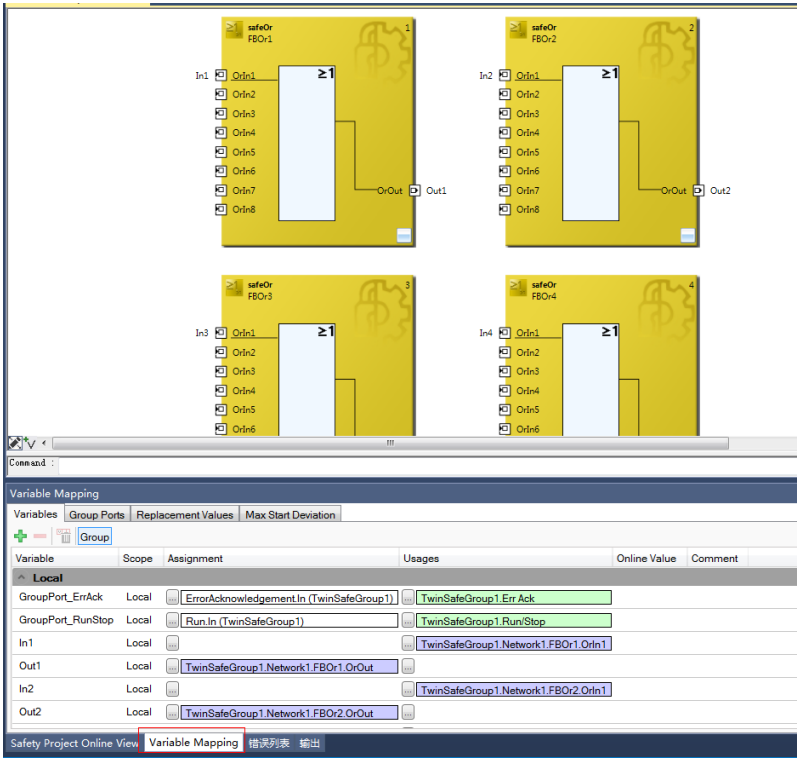


d. Define the pins as needed.

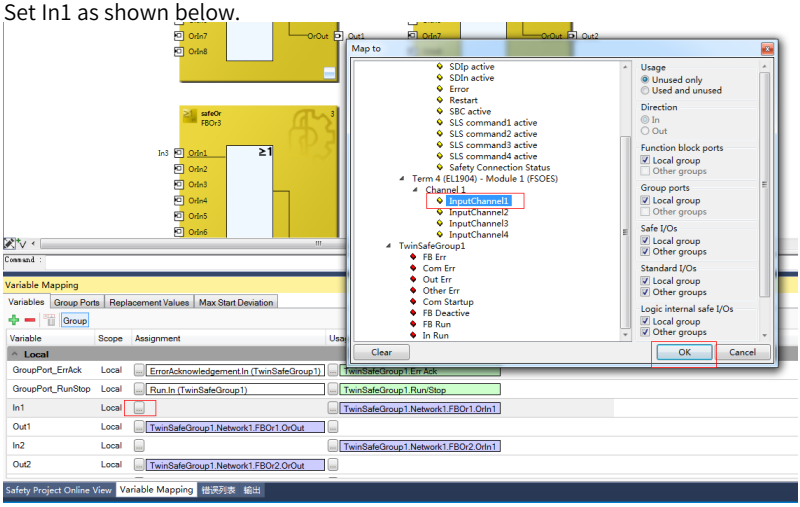


4. Link the safety program to the safety hardware.

   a. Find Variable Mapping.

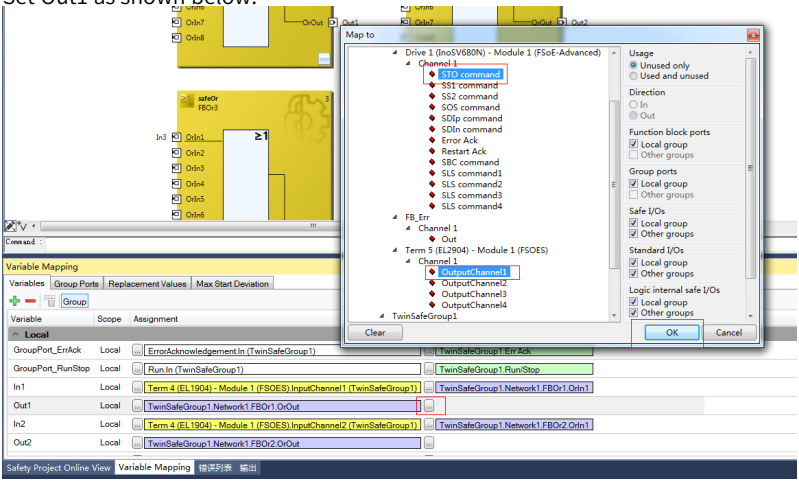


b. Set In1 as shown below.



c. Set In2 to "InputChannel2", In3 to "InputChannel3", and In4 to "InputChannel4", respectively.

d. Set Out1 as shown below.

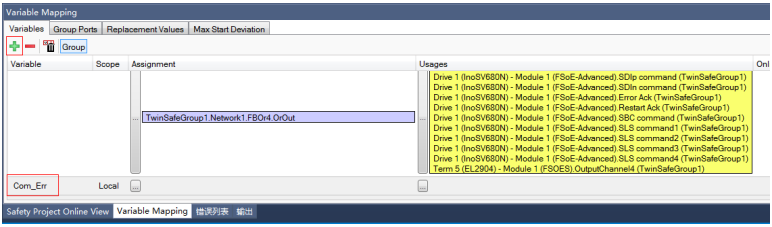


Use In1 to control the control word corresponding to STO and Out1 to indicate the state of In1.

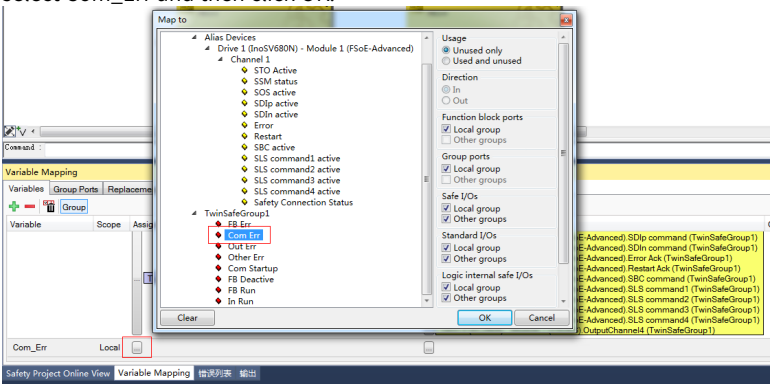
e. Set Out2 to "SS1 command" and "OutputChannel2", Out3 to "SS2 command" and "OutputChannel3", and Out4 to command corresponding to remaining bits of RPDO and "OutputChannel4", respectively.

f. Add two more variables. Follow the steps below to add the first variable.

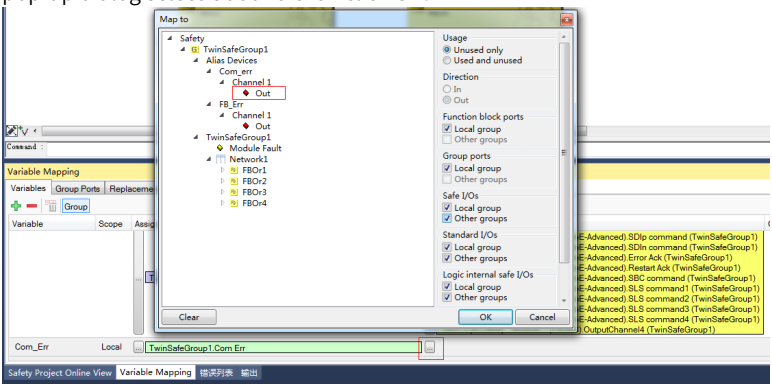
1). Click  and name the variable as "Com_Err".



2). Click the bottom left button highlighted in red box, and in the pop-up dialog select Com_Err and then click OK.

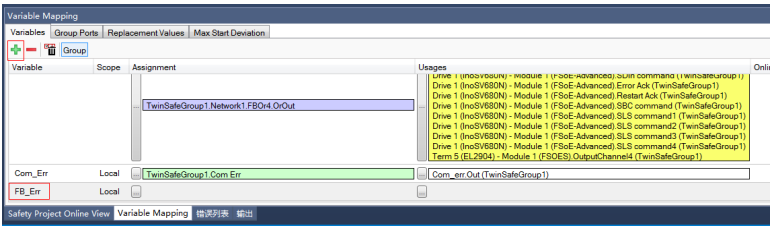


3). Click the bottom right browse button highlighted in red box, and in the pop-up dialog select Out and then click OK.

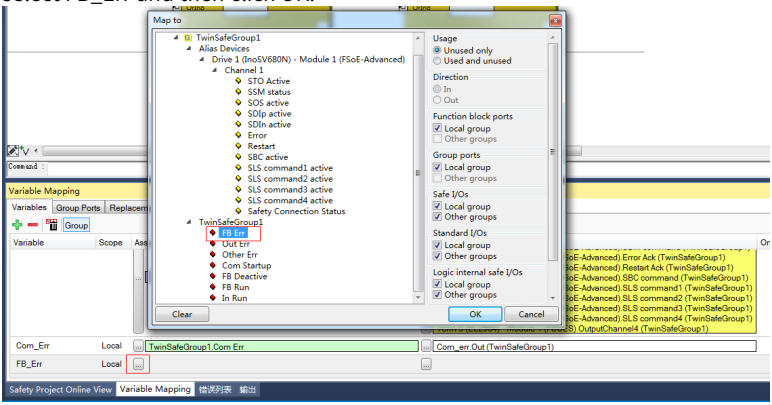


g. Follow the steps below to add the second variable.

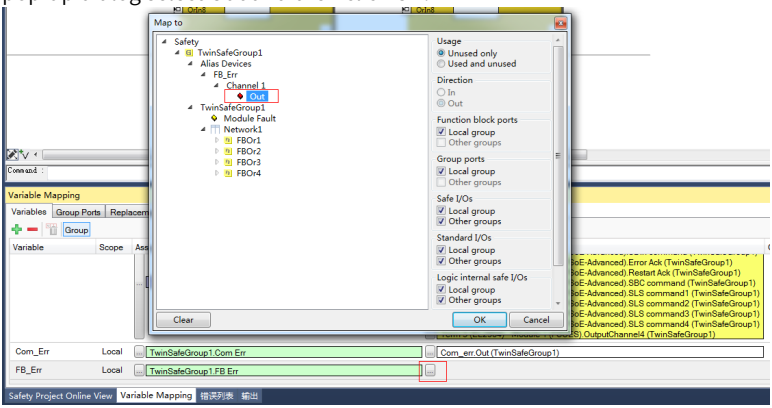
1). Click  and name the variable as "Com_Err".



2). Click the bottom left button highlighted in red box, and in the pop-up dialog select FB_Err and then click OK.

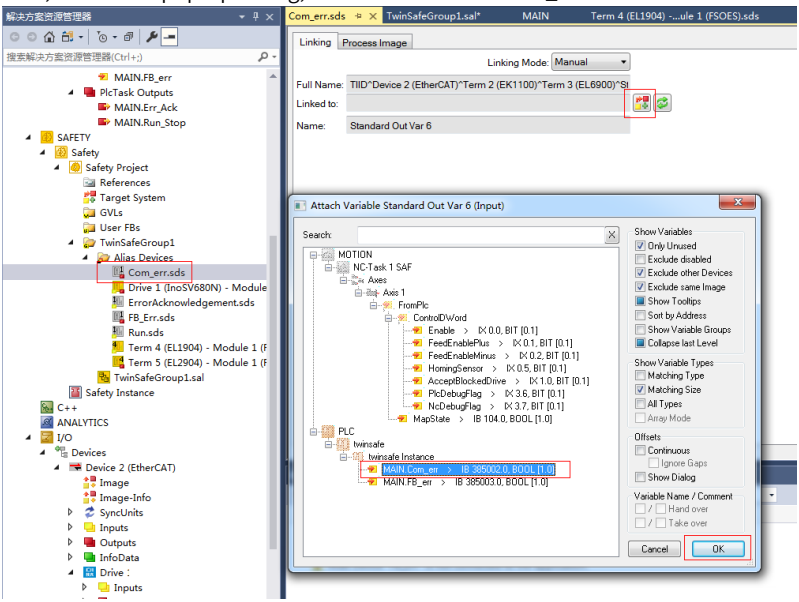


3). Click the bottom right browse button highlighted in red box, and in the pop-up dialog select Out and then click OK.

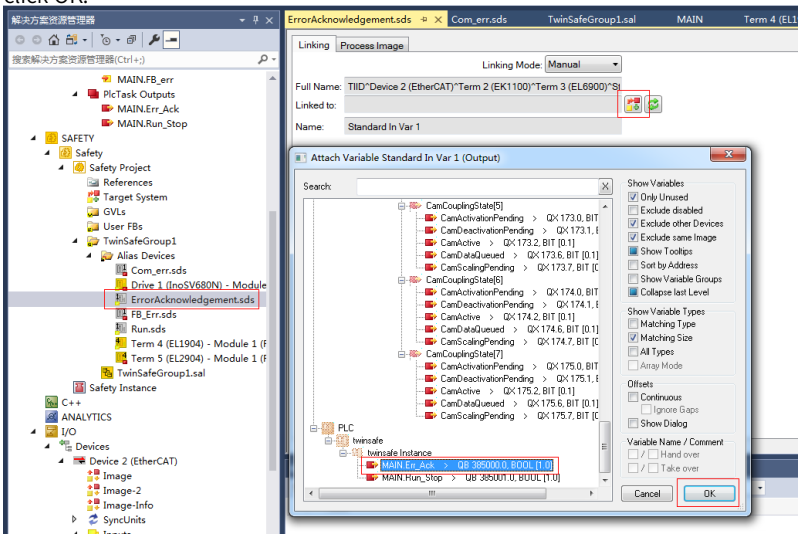


5. Link the non-safety variables added in step 2 to to the variables in the PLC program.

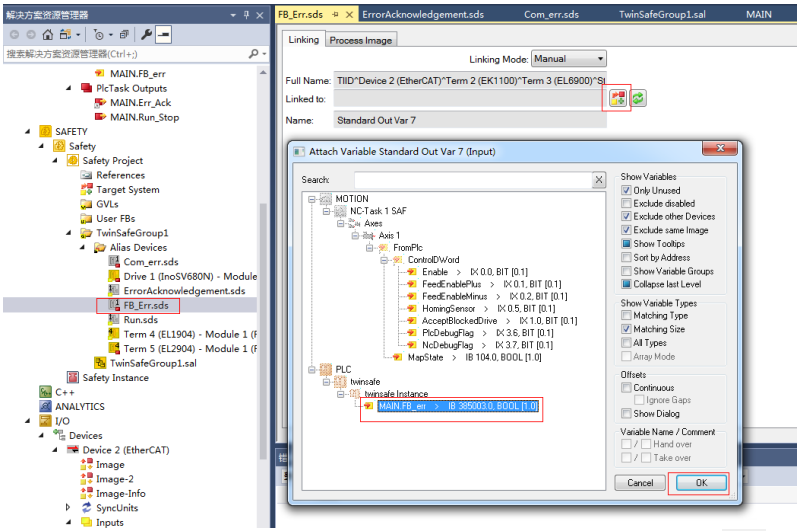
a. On the left side, double-click the variable Com_err.sds. On the right side, click , and in the pop-up dialog, select the instance Com_err and click OK.



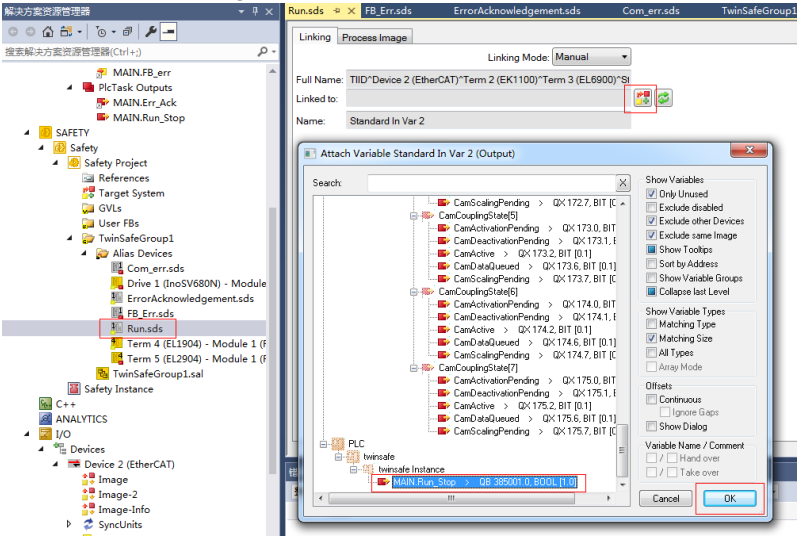
b. On the left side, double-click the variable ErrorAcknowledgement.sds. On the right side, click , and in the pop-up dialog, select the instance Err_Ack and click OK.



c. On the left side, double-click the variable FB_Err.sds. On the right side, click , and in the pop-up dialog, select the instance FB_err and click OK.

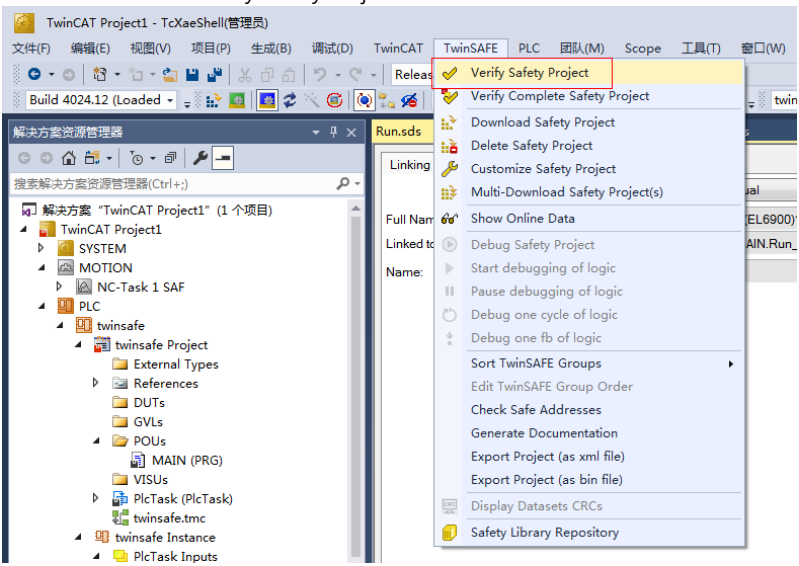


d. On the left side, double-click the variable Run.sds. On the right side, click , and in the pop-up dialog, select the instance Run_Stop and click OK.



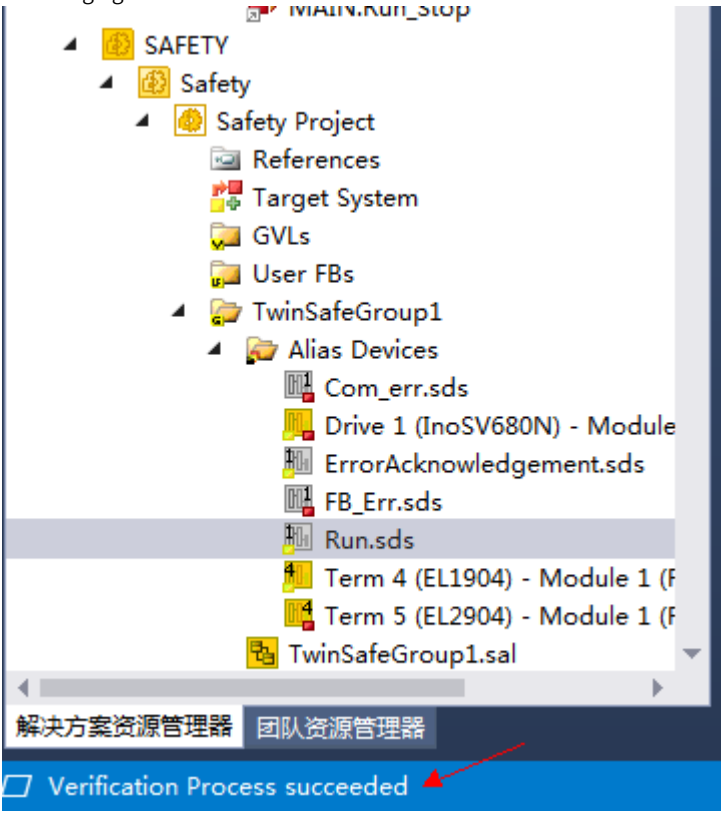
6. Verify the safety logic program.

a. Choose TwinSAFE > Verify Safety Project.



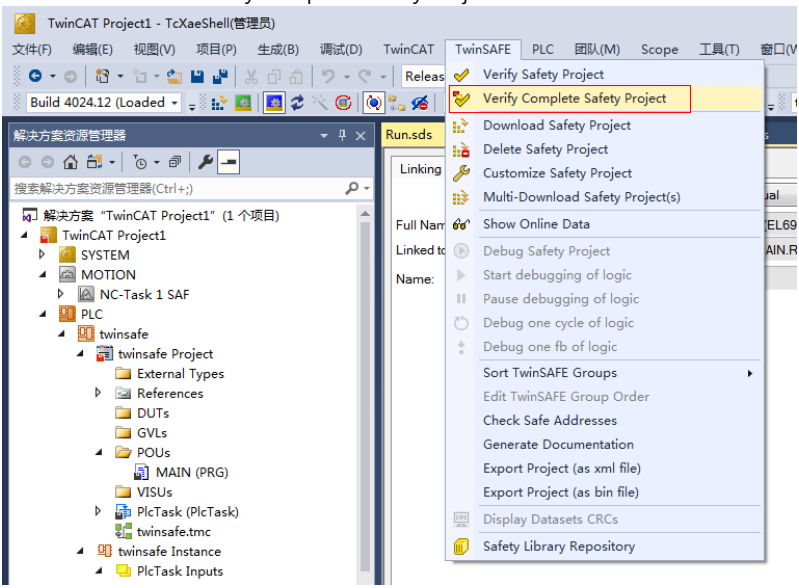
b. After verification is complete, check whether there is an error and whether the message "Verification Process succeeded" appears in the lower left corner. The

following figure shows that the verification is successful.



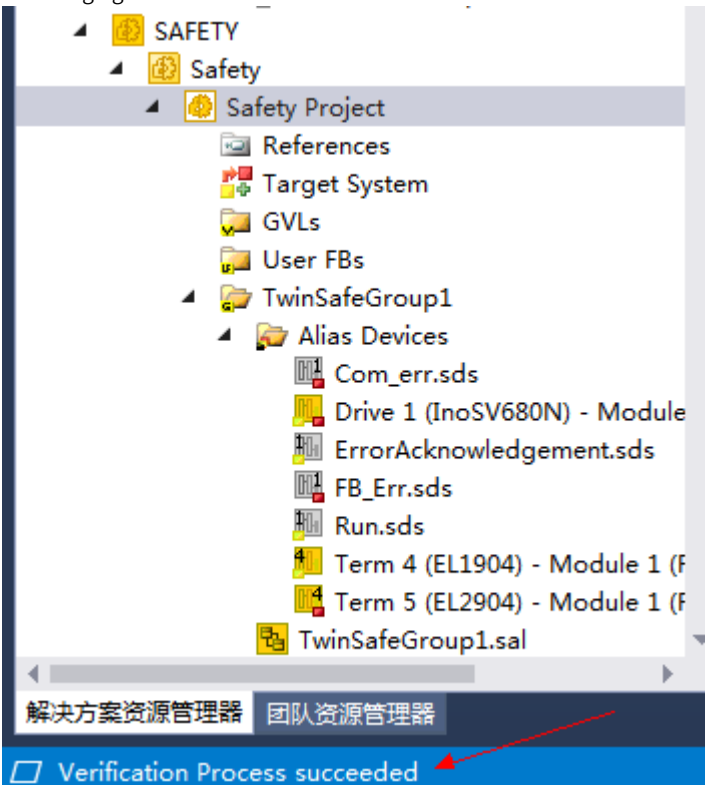
7. Verify the safety logic program and hardware modules.

a. Choose TwinSAFE > Verify Complete Safety Project.



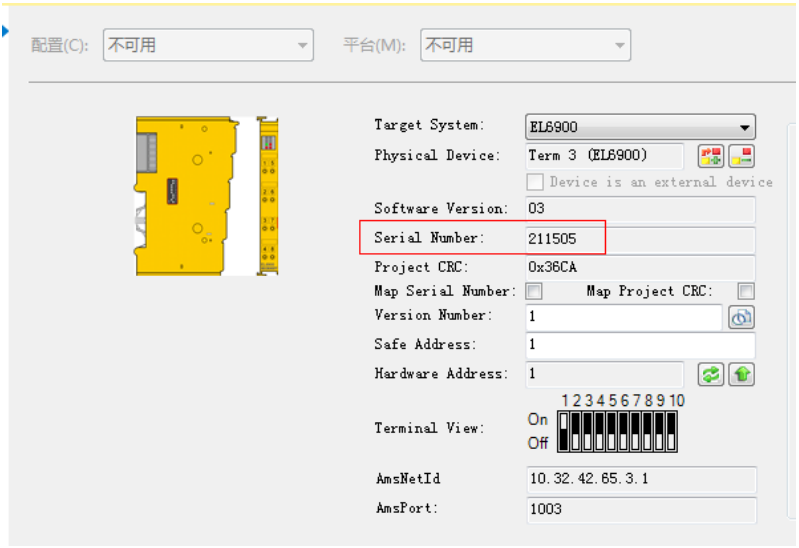
b. After verification is complete, check whether there is an error and whether the message "Verification Process succeeded" appears in the lower left corner. The

following figure shows that the verification is successful.

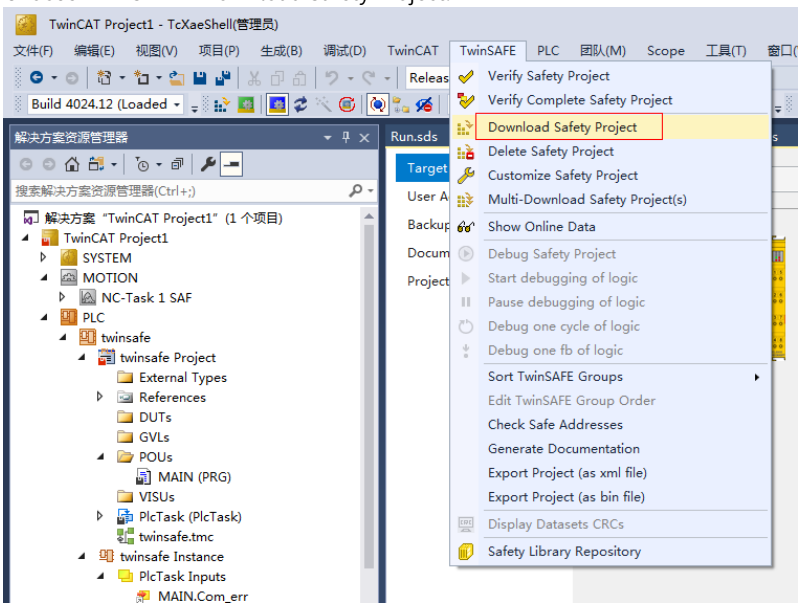


8. Download the safety program.

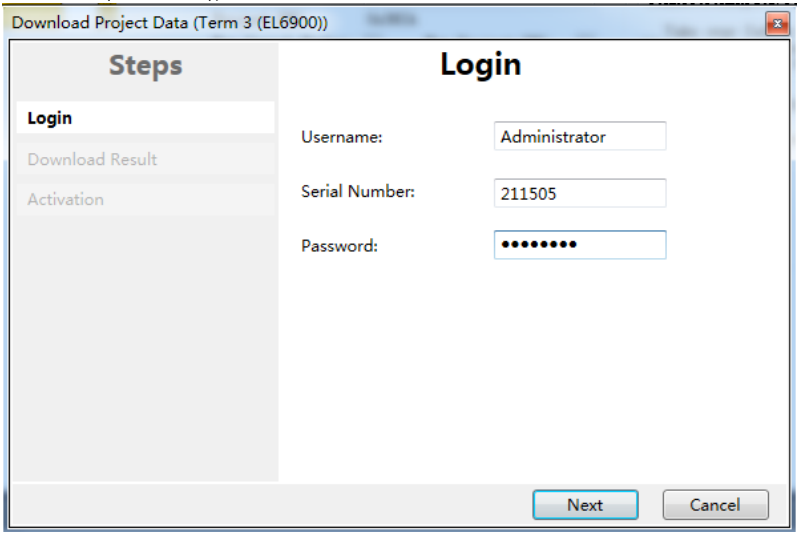
   a. Copy the Serial Number "211505".



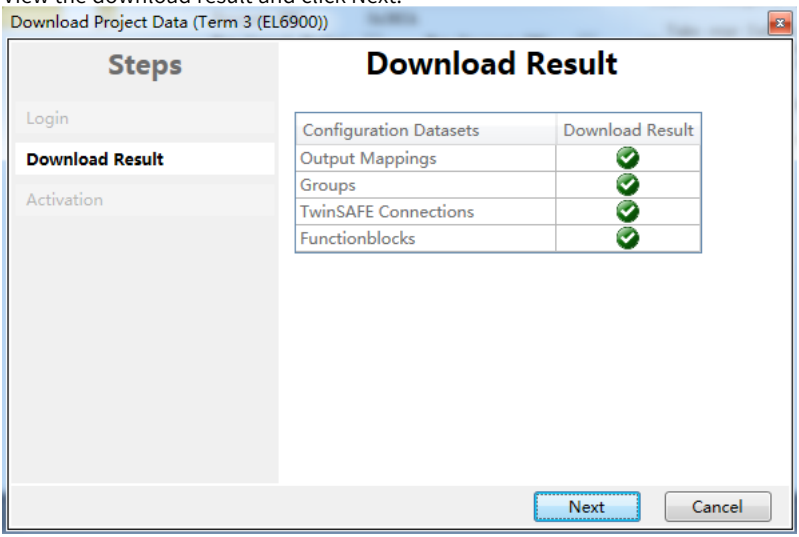
b. Choose TwinSAFE > Download Safety Project.



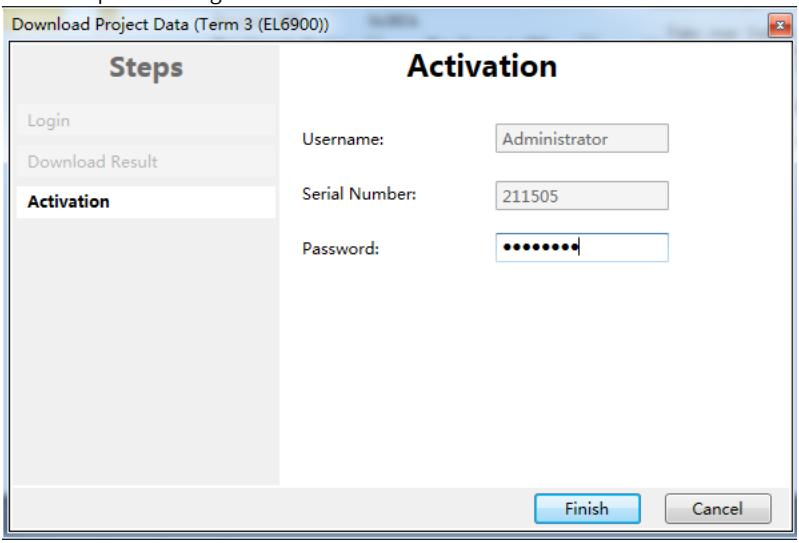
c. In the pop-up dialog, enter the Username (Administrator), Serial Number, and Password (TwinSAFE), then click Next.



d. View the download result and click Next.



e. Enter the password again and click Finish.



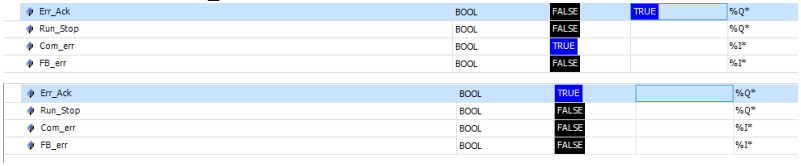
f. After completing all the above configurations, you can activate the hardware configuration and carry out safety function test.

Safety Function Test

1.  Click  to activate the configuration and the controller turns to the running mode.
2. Click  and then  to execute the PLC program.
3. As the safety program is downloaded and run for the first time, the communication is re-established. A communication error prompt is displayed. In this case, the value of expression Com_err is "TRUE".



Set the value of Com_err to "TRUE" and then "FALSE".



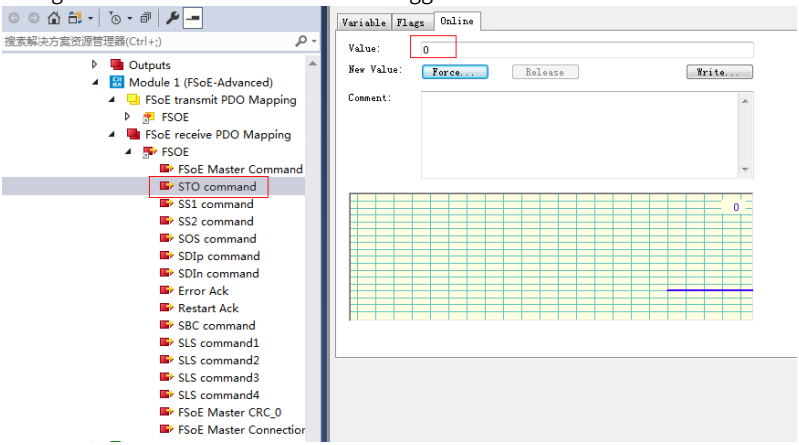


The communication error is cleared.

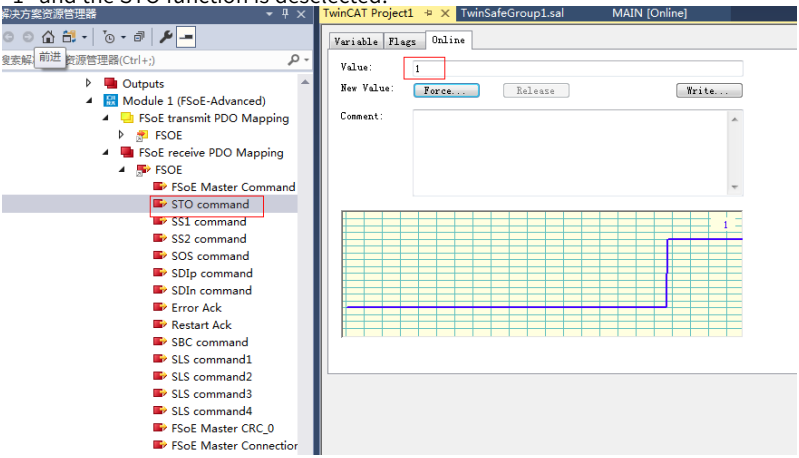
4. Run the safety program and set Run_Stop to "True".



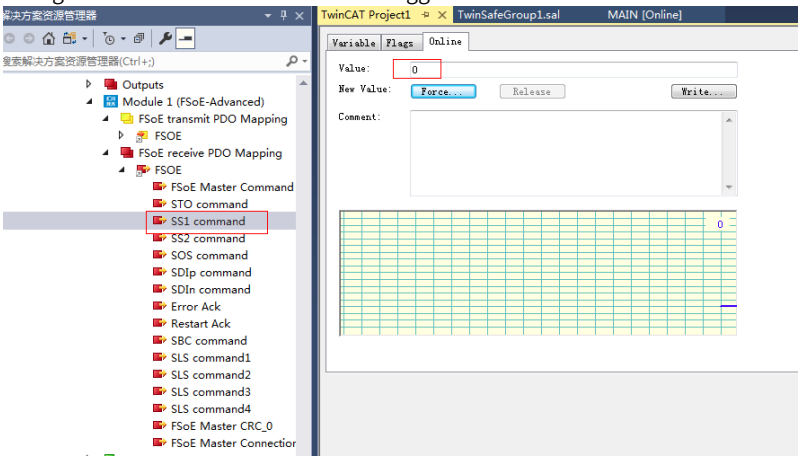
5. Disconnect the safety DI1. The bit in RPDO corresponding to STO command changes to "0" and the STO function is triggered.



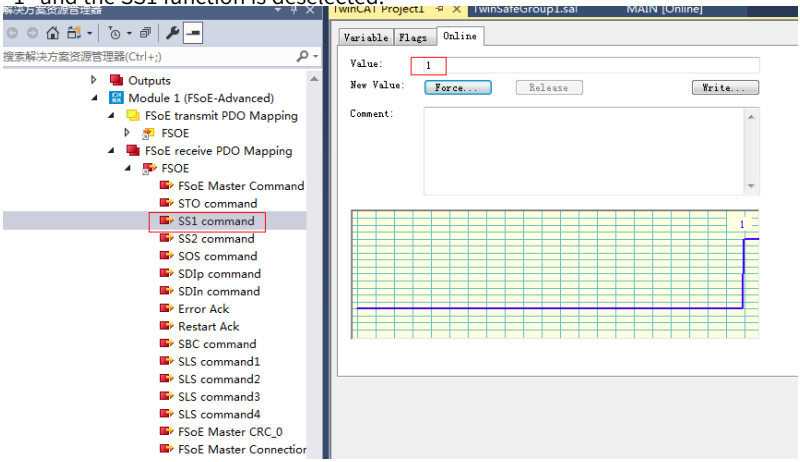
Restore the safety DI1. The bit in RPDO corresponding to STO command changes to "1" and the STO function is deselected.



6. Disconnect the safety DI2. The bit in RPDO corresponding to SS1 command changes to "0" and the SS1 function is triggered.



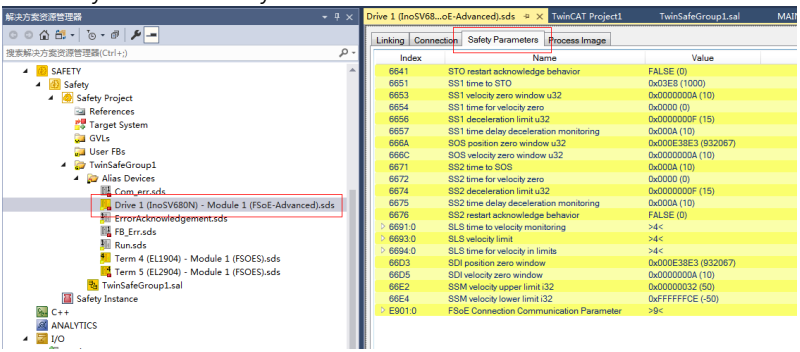
Restore the safety DI2. The bit in RPDO corresponding to SS1 command changes to "1" and the SS1 function is deselected.



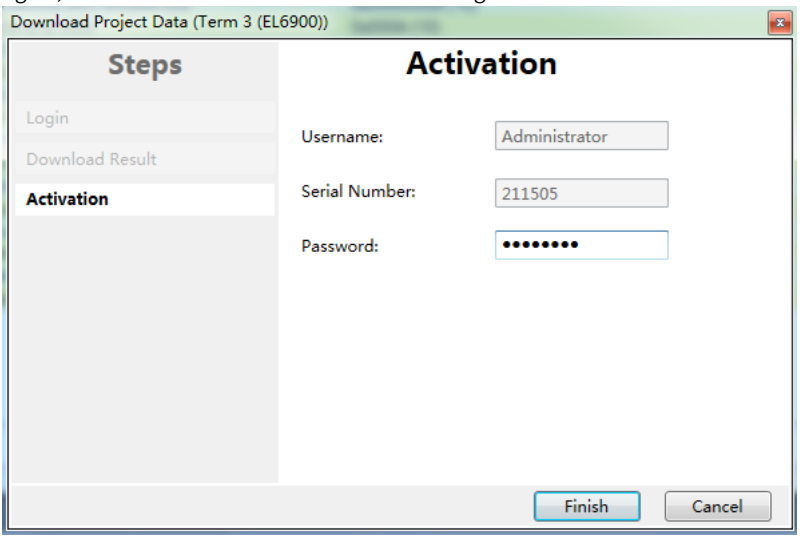
Modifying the Safety Object Dictionary

1. When modifying the safety object dictionary, you need to find the corresponding safety module under SAFETY menu, and modify the corresponding object

dictionary under the Safety Parameters tab.



2. After the modification is completed, you need to download the safety program again, and then click  to activate the configuration.



17 Commissioning and Operation [functional safety]

17.1 Pre-operation Inspection

Check the following items before operating the servo drive and the motor.

Table 17–1 Checklist before operation

No.	Item	Yes
Wiring		
1	The power input terminals (L1C, L2C, L1, L2, L3, R, S, T) of the servo drive are connected properly.	☐
2	The main circuit cables (U, V, W) of the motor are connected to the U/V/W terminals of the drive correctly.	☐
3	No short circuit exists in the power input terminals (L1C, L2C, L1, L2, L3, R, S, T) or main circuit output terminals (U, V, W) of the servo drive.	☐
4	The control signal cables, such as the brake signal cable and overtravel protection signal cable, are connected properly.	☐
5	The servo drive and motor are grounded properly.	☐
6	The stress suffered by the cable is within the specified range.	☐
7	All the wiring terminals are insulated properly.	☐
8	The shield layer of the encoder cable is reliably connected with the PE terminal on the drive.	☐
Environment and Mechanical Conditions		
1	There are no unwanted objects (such as cable terminals and metal chippings) that may cause short circuit of the signal cable and power cable inside or outside the servo drive.	☐
2	The servo drive and the external braking resistor are placed on incombustible objects.	☐
3	The motor is installed properly. The motor shaft is connected to the machine securely.	☐
4	The motor and the machine it is connected to are in good condition and ready to run.	☐

17.2 Trial Run

Safety function in local mode control (H20.01 = 0)

1. Ensure that the wiring of the DI and DO of the safety module is correct. The DO requires an external 24V input voltage.
2. Use the software tool to configure the functions of DI and DO, for example, set DI1 to 1-STO.

3. Control the DI input voltage, observe whether the DO state changes normally and the servo drive reports any fault.
   For example, disconnect the 24V input voltage of DI1 assigned with the STO function and observe whether the STO state indicated by DO1 is active. Then restore the 24V input voltage of DI1 and observe whether the STO state output by DO1 is inactive.
4. The DI of the safety module adopts dual-channel (A&B) control. The safety function can be executed when either of the two channels is active. The safety module monitors whether there is discrepancy at the two input signals. If the discrepancy lasts for a period of time exceeding the preset allowable time, the safety module outputs the corresponding fault information.

Safety function in bus mode control (H20.01 = 1)

1. Ensure that the safety PLC and the servo are properly connected.
2. The Beckhoff EL1904 supports up to four safety input controls, and the EL2904 supports up to four safety state output controls. Configure the RPDO corresponding to the input signal of EL1904 and TPDO corresponding to the output signal of EL2904.
   Example: Configure one EL1904 to STO RPDO and one EL2904 to STO TPDO.
3. Control the on and off of the EL1904 input signal and observe whether the EL2904 output signal changes normally and the servo drive reports any fault.
   For example, disconnect the 24V input voltage of EL1904 assigned with the STO function to let the safety type drive enter the STO state. Observe whether the STO output state indicated by EL2904 is active. Then restore the STO 24V input voltage on EL1904 to let the safety type drive exit the STO state. Observe whether the STO output state on EL2904 is inactive.

Note

In the above example, an ACK signal is not required for the safety motor to exit the STO state by default. As long as the STO command is canceled, the safety motor automatically exits the STO state.

17.3 Verification and validation

Overview

This chapter describes verification and validation of the implemented safety functionality.

Verification and validation produce documented proof of the compliance of the implementation with specified safety requirements.

Basic requirements

- Technical staff must be trained to understand the requirements and principles of designing and operating safety-related systems.
- Person performing the maintenance must be trained to understand the requirements and principles of designing and operating safety-related systems.
- Operators must be trained to understand the requirements and principles of designing and operating safety-related systems.
- The safety-related circuit on the control board that fails to operate must be replaced with a new one as it is not repairable.

Commissioning Checklist

- Start-up test and validation
  IEC 61508, EN/IEC 62061 and EN ISO 13849 require the final assembler of the equipment to verify the operation of the safety function through acceptance testing. This acceptance test is described in the drive manual. The testing of optional safety features is described in the corresponding manuals.

  The acceptance test must be performed:

  - at initial start-up of the safety function
  - After any changes related to safety functions (wiring, assembly, settings, or other related operations)
  - after any maintenance work related to the safety function.

  The acceptance test of the safety function must be carried out by an authorized person with expertise and knowledge of the safety function. The test must be documented and signed by the test staff.

  Signed acceptance test reports must be stored in the logbook of the machine. The report shall include documentation of start-up activities and test results, fault reports, and troubleshooting records. Any new acceptance tests performed due to changes or maintenance need to be logged into the logbook.

- Checklist

Table 17–2 Checklist of integrated STO output

No.	Item	Yes
1	Ensure that the drive runs and stops freely during commissioning.	☐
2	Stop the drive (if running), switch the input power supply off and isolate the drive from the power line by a disconnector.	☐
3	Check the STO circuit connections against the circuit diagram.	☐
4	Check that the shield of the STO input cable is grounded to the drive frame.	☐
5	Close the disconnector and switch the power supply on.	☐
5.1	Test the STO signal #1 when the motor is stopped: Set STO1 and STO2 to "H".	☐

No.	Item	Yes
	Send a stop command to the drive (if running) and wait until the motor shaft is at standstill. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal #1 and send a start command to the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	
5.2	Set STO1 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	☐
5.3	Test the STO signal #2 when the motor stops: Set STO1 and STO2 to H. Send a stop command to the drive (if running) and wait until the motor shaft is at standstill. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal #2 and give a start command for the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	☐
5.4	Set STO2 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	☐
6.1	Test the STO channel 1 when the motor is running: Set STO1 and STO2 to H. Start the drive and ensure the motor is running. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal 1. Ensure that the motor stops and the drive trips. Reset the fault and try to start the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	☐
6.2	Set STO1 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	☐
6.3	Test the STO channel 2 when the motor is running: Set STO1 and STO2 to H. Start the drive and ensure the motor is running. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal 2. Ensure that the motor stops and the drive trips. Reset the fault and try to start the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	☐
6.4	Set STO2 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	☐
7	Document and sign the acceptance test report which verifies that the safety function is safe and acceptable for operation.	☐

Verifying the achieved SIL/PL level

Verification of the functional safety system demonstrates and ensures that the implemented safety system meets the requirements specified for the system in the safety requirements specification phase.

The most convenient way to verify the required SIL/PL level reached with the implemented system is to use a specific safety calculator software.

Validation procedure

Inovance ensures that the functionality of all the required safety functions has been appropriately verified and validated.



- The system cannot be considered safe until all safety functions are validated.
- The acceptance test must be performed on each safety function.

The acceptance test using the start-up checklist described below must be performed:

- at initial start-up of the safety function
- after any changes related to the safety function (wiring, components, settings, etc.)
- after any maintenance work related to the safety function. The acceptance test must include at least the following steps:

  1. having an acceptance test plan
  2. testing all commissioned functions for proper operation
  3. testing all used inputs for proper operation
  4. testing all used outputs for proper operation
  5. documenting all acceptance tests performed
  6. testing person signing and archiving the acceptance test report for further reference.

Acceptance test reports

You must store the signed acceptance test reports in the logbook of the machine. The report must include the following:

- description of the safety application (including a figure)
- a description and revisions of safety components that are used in the safety application
- a list of all safety functions that are used in the safety application

- a list of all safety related parameters and their values (the drive STO has no safety-related parameters, but listing the non-safety related parameter and its setting is recommended)
- documentation of start-up activities, references to failure reports and resolution of failures
- the test results for each safety function, check, date of the tests and confirmation by the test personnel.

You must store any new acceptance test reports performed due to changes or maintenance in the logbook of the machine.

Competence

The acceptance test of the safety function must be carried out by a competent person with expertise and knowledge of the safety function as well as functional safety, as required by IEC 61508-1 clause 6. The test procedures and report must be documented and signed by this person.

Validation checklists for start-up

Validation of the FSoE connection

1. Make sure that the EtherCAT communication is enabled.
2. Make sure that the FSoE address of the safety drive in the network is unique.
3. Make sure that the safety functions are configured to be triggered through FSoE.
4. Make sure that the FSoE-related PDOs on the master side are configured correctly.
5. Make sure the FSoE watchdog time is configured correctly.
6. Make sure that the FSoE SRA parameters are configured correctly.
7. Make sure that no faults or warnings are displayed on the operation panel.

Validation of safety functions

Once the system is fully configured and wired for the safety functions, and the startup safety check has been done, you must do the following functional test procedure for each safety function:

- Have the system at the Operational state when the safety function is requested.
- Make sure that the acknowledgment method has been configured as suitable for the application (for example, manual or automatic acknowledgment).
- Activate the safety function by requesting it with the designated trigger device.
- Verify that the desired functionality takes place.
- Document the test results to the acceptance test report.
- Sign and file the acceptance test report.

18 STO

18.1 General

18.1.1Terms and Abbreviations

Terms and Abbreviations	Description
Cat.	Safety category It includes B, 1, 2, 3, and 4.
CCF	Common cause failure
DCavg	Average diagnostic coverage (%)
DTI	Diagnostic test interval time
SFF	Safe failure fraction
HFT	Hardware fault tolerance
PFH	Probability of a dangerous Failure per Hour
PL	Performance Level
SC	Systematic capability
SIL	Safety integrity level
T_1	Verification test interval
DI	Digital inputs
DO	Digital output
PCB	Printed circuit board
MCU	Micro computer unit
FPGA	Field programmable gate array
MTTFd	Mean time to dangerous failure
SRA	Safety Related Application Parameter
nSRA	Non-SRA parameters
STO	The safe torque off (STO) function brings the machine safely into a no-torque state and prevents it from unexpected start. When the STO function is activated, the servo drive stops according to the preset stop mode (H02.08).

18.1.2Safety Standards

Standards compliance

- EC directives and standards
  Low Voltage Directive 2014/35/EU Standard EN 61800-5-1

  EMC Directive 2014/30/EU Standard EN 61800-3: 2018

Machinery Directive 2006/42/EC (Safety Functions) Standard IEC 61800-5-2

- Safety standard

Safety standard	Reference
Functional safety	IEC 61508: 2010 ISO 13849-1: 2015 ISO 13849-2: 2012 IEC 62061: 2021 EN 61508: 2010 EN ISO 13849-1: 2015 EN ISO 13849-2: 2012 EN IEC 62061: 2021 IEC 60204-1: 2016 (in extracts) EN 60204-1: 2018 (in extracts)
EMC	IEC 61800-5-2: 2016 IEC 61800-3: 2017 IEC 61326-3-1: 2017 IEC 61000-6-7: 2014 EN 61800-5-2: 2017 EN IEC 61800-3: 2018 EN 61326-3-1: 2017 EN 61000-6-7:2015
LVD	IEC 61800-5-1:2007/AMD1:2016 EN 61800-5-1:2007/A1:2017

- Safety data

Item	Safety data
SIL	SIL3, IEC61508 Maximum SIL3, EN IEC62061
PFH_D	$PFH_D \leqslant 1.1\times10^{-9}$ [1/h] (1.1% of SIL3)
Cat.	3, EN ISO 13849-1
PL	e, EN ISO 13849-1
MTTFd	904 years (high)
DCavg	⩾90% (medium)
T_1	20 years
HFT	1
SC	SC3
λ_S	2.2×10^{-7} /h
λ_{DD}	1.3×10^{-7} /h
λ_{DU}	2.7×10^{-9} /h
MTTR	0 hour
MRT	0 hour
Application mode	High demand or continuous mode

Item	Safety data
Device type	Type B
Safe speed accuracy	2197.98 rpm

λ_S means the failure rate of safe failure which brings the system into safe state.

λ_{DD} means the failure rate of dangerous failure but can be diagnosed by the diagnosis subsystem.

λ_{DU} means the failure rate of dangerous failure and can't be diagnosed by the diagnosis subsystem.

Note

- See ISO13849-2: 2012 for failure modes of devices.
- Failure sharing of different failure modes of each device.
- See SN29500 for failure rate of each device.

18.1.3Precautions for Use

General Safety Instructions

The chapter contains the warning symbols used in this manual and the safety instructions which you must obey when you install or connect an option module to a drive or inverter. If you ignore the safety instructions, injury, death or damage can occur. Read this chapter before you start the installation.

Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.

The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual.

Table 18–1 Warnings, Cautions and Notes

Pictogram	Signal word	Meaning	Consequences in case of disregard
Example:  DANGER  Hazardous voltage e.g. electric shock	DANGER	DANGER	Indicates that failure to comply with the notice will result in death or severe personal injuries
	WARNINGS	Warning	Indicates that failure to comply with the notice may result in death or severe personal injuries
	CAUTION	Note	Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage
	STOP	Prohibit	Indicates that failure to comply with the notice will result in equipment or environmental damage

Caution

- High attention is required for electrical installation and at the system design to avoid hazards either in normal operation or in the event of equipment malfunction.
- System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read the operating instruction and this safety information.

It is the responsibility of the machine builder/OEM/system integrator to make sure that the essential health and safety function requirements specified in the Machinery Directive are met. Risk analysis and risk assessment is needed before using a product. Make sure that adequate measures are taken to eliminate/reduce the relating risks and components chosen must meet the safety requirements.

This section describes the information that needs to be noted before starting operation. Read the following safety precautions, risk assessment information, and limitations before starting operation.

Safety function: Use the safety function after properly understanding all of these information. Incorrect use of safety functions or use of safety functions that are not sufficient to meet the safety requirements of the site may result in personal injury.

Safety Precautions

Carefully read the following important precautions and observe them when using the safety function.

- STO function is not intended as a replacement for the emergency stop function (E-stop). If only the STO function is triggered, with no extra measures taken, the power supply cannot be cut off in emergencies and high-current parts of the motor and drive are still energized, incurring the risk of electric shock or other risks result in electric energy. Therefore maintenance work on electrical parts of the drive or motor can only be carried out after isolating the drive system from the main supply.
- Depending on the standards and requirements for a particular application, it may be possible to use STO as an integral part of an E-stop system. However, its main purpose is for use in a dedicated safety control arrangement whose purpose is to prevent any hazard from occurring, without the use of an E-stop.
- An E-stop is often provided in a machine to allow for unexpected situations where an operator sees a hazard and can take action to prevent an accident.
- The design requirement for an E-stop differs from that of a safety interlock. Generally, the E-stop is required to be independent from any complex or "intelligent" control. It may use purely electromechanical devices to either disconnect the power or initiate a controlled rapid stop using other means such as dynamic or regenerative braking.

Note

- The design of safety-related systems requires specialist knowledge. To ensure that a complete control system is safe, it is necessary for the whole system to be designed according to recognized safety principles. The use of individual sub-systems such as drives with STO function, which are intended for safety-related applications, does not in itself ensure that the complete system is safe.
- The STO function can be used to stop the drive in emergency stop situations.
- In processes without personnel protection, it is recommended not to stop the drive by using the STO function. If a drive running is stopped by using STO, the drive performs a coast-to-stop. If this is not acceptable, the system should be stopped using the correct mode instead of the STO function.
- This publication is a guide to the application of Inovance SV660 series safety functions, and also on the design of safety-related systems for machinery control.
- It is the responsibility of the designer of the end product or application to ensure that it is safe and in compliance with the relevant regulations.

Risk Assessment

- When using the safety functions, perform risk assessment on the servo system in advance. Make sure that the safety integrity level of the standards is met.

- The following residual risks can be present even when the safety functions operate. Therefore, safety must always be given consideration during risk assessment.
- If external forces (such as gravitational force with a vertical axis) are applied when the safety functions are operating, the motor will rotate due to the action of these external forces. Therefore, you must use a separate mechanical brake to secure the motor.

Note

- In the case of failure of multiple IGBTs, regardless of whether the STO function is enabled, the servo drive can generate an alignment torque. This torque can cause the motor shaft to rotate within a range of up to 180÷p (for a synchronous reluctance motor, the range is 180÷2p).
- p: Number of motor pole pairs.

To ensure safety, users should decide all the risk assessments and residual risks in the entire machine equipment. A company and individual who constructed the safety related system must take full responsibility for installation and commissioning of the system. Additionally, when complying with a European machinery directive, the system must acquire safety standards certification as a whole.

Perform all risk assessments and safe level certification to the machine or the system as a whole. It is recommended that a Certification Body final safety certification of the system be used.

The following shows residual risks concerning the safety function of this product.

Common residual risks

- At the shipment to end-users, check the settings of safety related components with programming tools and monitored/displayed contents on display and record and save the setting data concerning the safety observation function and the programming tools you used. Perform them using a check sheet, etc.
- The safety will not be ensured such as in assembling machine until installing, wiring, and adjustment are completed properly. Install, wire, and adjust your system referring to installation guide for each unit.
- Only qualified personnel are authorized to install, start-up, repair or adjust the machines in which these components are installed. Only trained engineers should install and operate the equipment.
- Separate the wiring for safety observation function from other signal wiring.
- Protect the cables with appropriate ways (routing them in a cabinet, using a cable guard, etc.).

- We recommend using a switch, relay, sensor, etc. which comply with safety standards. When using a switch, relay, sensor, etc. which do not comply with safety standards, perform a safety confirmation.
- Keep the required clearance/creepage distance depending on voltage you use.

Residual risks in each function

- **Safe torque off (STO)**
  This function only cuts off the torque of the motor, and does not cut off the power supply of the servo/inverter. Before servicing the servo/inverter, cut off the power supply and ensure that the servo/inverter are not energized.

  You must conduct STO diagnosis every three month by powering off and powering on the drive once, or running the STO function once.

Note

There are two ways to perform STO diagnosis:

- Power off and restart;
- Trigger and then cancel STO.

You can use either of them.

- **Safe brake control (SBC)**
  This function guarantees only that power to mechanic break is properly supplied and abrasion of the brake cannot be detected. Check this function regularly that the mechanic brake can operate. Evaluate whether the holding force of the mechanical brake meets the application requirements. Incorrect use may result in abrasion of brake and personal injury.
- **Safely-limited speed (SLS)**
  - Speed monitoring function guarantees the servo motor speed, but it does not guarantee the actual machine safety speed. Set parameters so that the safe speed of the machine is the same as the safety speed of the specified motor.
  - Check if the speed of the monitored servo axis is the same as the actual speed by using a tachometer, etc. considering the speed includes an error caused by the command and encoder resolution.
  - The defect of the mechanical section such as slid of shaft and wanting of a timing belt, etc. is not covered. Be sure to eliminate the risk of mechanical section before operation.
  - After speed is over the limit, safety observation error (shut-off signal off) does not occur during the speed error detection time set by the parameter. Make sure that safety can be ensured during this period.

- Adjust the speed limit considering the risk of speed acceleration from an acceptable safe speed to an unacceptable speed due to the system response time.

- **Safe operating stop (SOS)**
  This function is used in applications with external force loads such as vertical axis applications. Servo drive failure can cause axis position hold failure. Evaluate the impact on the system and take hazard reduction or control measures such as mechanical braking.

- **Safe speed monitor (SSM)**
  - Speed monitoring function guarantees the servo motor speed, but it does not guarantee the actual machine safety speed. Set parameters so that the safe speed of the machine is the same as the safety speed of the specified motor.
  - Check if the speed of the monitored servo axis is the same as the actual speed by using a tachometer, etc. considering the speed includes an error caused by the command and encoder resolution.
  - The defect of the mechanical section such as slid of shaft and wanting of a timing belt, etc. is not covered. Be sure to eliminate the risk of mechanical section before operation.
  - After speed is over the limit, safety observation error (shut-off signal off) does not occur during the speed error detection time set by the parameter. Make sure that safety can be ensured during this period.
  - Adjust the speed limit considering the risk of speed acceleration from an acceptable safe speed to an unacceptable speed due to the system response time.

18.2 Safety Function

18.2.1Overview

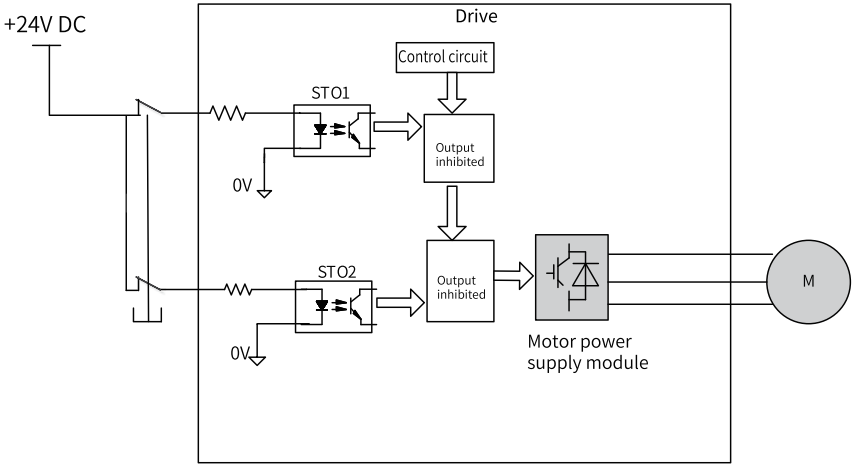


Figure 18-1 Schematics of the STO function

Safe Torque Off (STO) is a safety function that complies with IEC 61800-5-2:2016. It is integrated in Inovance SV680-INT series servo drives.

Remember to perform a power cycle of the drive every three months or trigger the STO through disconnecting the 24V input of CN6, so that STO can be reset periodically.

The STO function inhibits the control signal of the power semiconductors on the drive output end, preventing the drive from generating torque at the motor shaft end.

The STO function prevents movement of the motor by two redundant external hardware signals (STO1 and STO2) that block the PWM signals from being outputted to the power layer of the servo drive. STO1 and STO2 input signals must be both active to allow the servo drive to operate normally.

See the following table for the STO function.

STO1 Input	STO2 Input	PWM Signal
H	H	Normal
L	H	Prohibit
H	L	Prohibit
L	L	Prohibit

STO (safe torque)	
Description	Cuts off the power of the motor.
Description	The safe torque off (STO) function brings the machine safely into a no-torque state and prevents it from unexpected start. When the STO function is activated, the servo drive stops according to the preset stop mode (H02.08).
Safe state	Disables the PWM gating signal of the drive.
Operation mode	High demand mode or continuous mode

18.2.2Function Use and Monitoring

Function Use

The keypad displays the STO function state and error information.

See the following table to identify the cause of a fault and the action to be taken. Contact Inovance technical support if the fault persists after corrective actions listed in the following table are taken.

Fault codes related to the STO function are listed in the following table:

Fault Code	Fault code name	Description	Cause	Corrective Action
E150.0	STO safety state applied	The STO input protection applies (safety state).	STO is triggered because either or both of two 24 V inputs are disconnected.	There is no need to take any corrective actions. After the STO terminal is back to normal, clear the fault using the fault reset function. Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected. Replace the servo drive.
E150.1	STO input state abnormal	The single-channel input of STO is ineffective.	1. STO input power supply is abnormal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
			2. STO input resistor is abnormal.	Replace the servo drive.
			3. STO is ineffective.	Replace the servo drive.
E150.2	Buffer 5 V supply error	The MCU monitors the 5 V power supply of the PWM Buffer to detect whether overvoltage or undervoltage occurs. If the voltage is abnormal, E150.2 occurs.	The 5 V voltage supplied to the STO Buffer is abnormal due to undervoltage or overvoltage.	Replace the servo drive.

Fault Code	Fault code name	Description	Cause	Corrective Action
E150.3	STO input circuit hardware diagnosis	The photocoupler of the front hardware circuit for STO input is inspected. If the photocoupler is short-circuited, the servo will display E150.3.	Direct connection occurs on the upstream optocoupler of STO1 or STO2.	Replace the servo drive.
E150.4	STO activated	An error occurs on the PWM buffer integrated circuit during initialization detection upon power-on (the PWM signal cannot be blocked).	STO buffer power-on detection abnormal	Replace the servo drive.
E150.5	STO input signal interference	The STO input signal is interfered with, but the interference does not meet the noise filtering conditions set in H0A.73.	Poor contact of the STO terminal or unstable external 24V input voltage may lead to STO misoperation or malfunction.	Replace the 24V power supply.

Note

- For a motor with brake, if either STO1 or STO2 closes, the drive will be disabled within 30 ms (STO response time).
- For a motor without brake, if either STO1 or STO2 closes, the drive will be disabled within 5 ms (STO response time).

EDM DO signal

When STO1 and STO2 input 24V voltage are cut off, the EDM DO signal is active, otherwise the EDM DO signal is inactive.

At this time, STO1 and STO2 are filtered signals. When EDM is active, the servo drive blocks the PWM signal.

Signal Name	Mark	Photo coupler logic			
Safety input	STO1	ON	ON	OFF	OFF
	STO2	ON	OFF	ON	OFF
EDM output	EDM	OFF	OFF	OFF	ON

Note

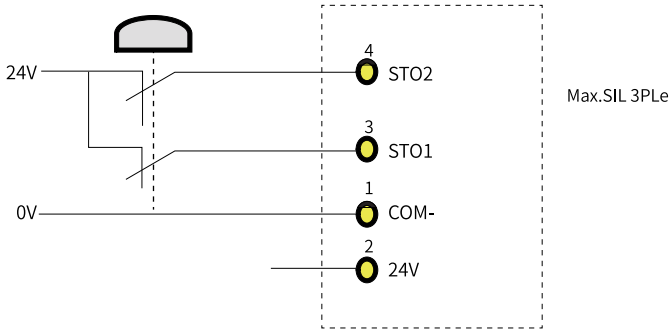
The DO output of this EDM is only a monitoring signal that detects whether the safety function is triggered. It is not a safety signal output.

The EDM state of the STO output integrated by the drive can only be outputted through the non-safety DO of the servo, instead of the DO on the safety module.

Application Example of Safety Function

Example 1:

Emergency button（dual-contact）Class 3 ISO13849



18.2.3Fault reset

The exceptional operation refers to the durations of power-on and initialization, and how to return from the STO state.

- The PWM buffer is disabled as the enable terminal is pulled up during power-on, so the PWM signal is inhibited.
- The PWM buffer is disabled as the enable terminal is pulled up during initialization of the MCU, so the PWM signal is inhibited. Such condition is cleared and servo drive works normally after initialization is done.
- When all of the following conditions are met, the servo system that enters the safe state through the STO function can be back to normal with the safe state cleared after auto-reset of the drive.
  - The input state of the STO request must be "high".
  - The servo ON or servo RUN command must be inactive.
  - No dangerous faults exist.

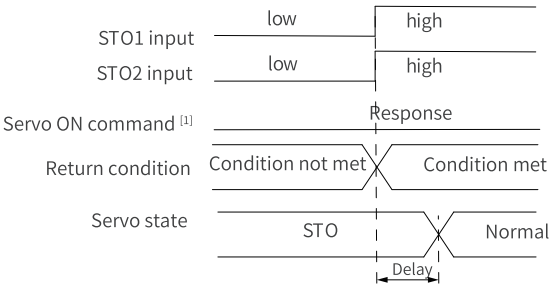


Figure 18-2 Return condition of external STO request state

Note

[1]: The servo ON command is a servo-enabled command, not an internal servo-enabled state.

- When STO_IN (STO1 or STO2 input) is restored to 24 V, the EDM and servo ready signals are immediately reset to 0. When STO1 and STO2 are restored to 24V at the same time, the servo ready to output signal and servo operational signal are activated after 400 milliseconds. Servo operation is PWM drive signal output.

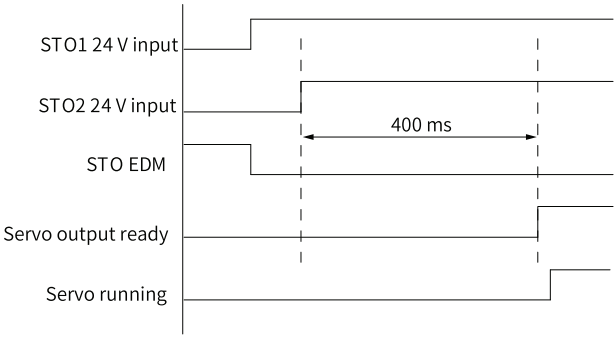
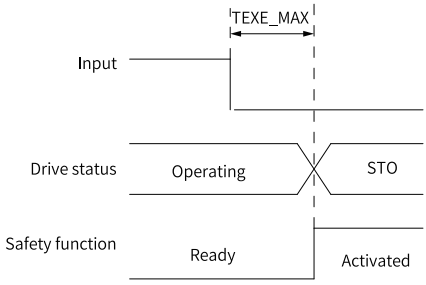


Figure 18-3 Servo drive reset timing diagram

18.2.4Safety Function Response Time

The STO function prevents movement of the motor by two redundant external hardware signals (STO1 and STO2) that block the PWM signals from being outputted to the power layer of the servo drive. STO1 and STO2 input signals must be both active to allow the servo drive to operate normally.

If either one or both signals are set to "Low" level, the PWM signals will be blocked within 30 ms[1].



Note

[1]: The typical response time is 30 ms. The maximum response time is 100 ms.

18.3 Acceptance

Basic requirements

- Technical staff must be trained to understand the requirements and principles of designing and operating safety-related systems.
- Person performing the maintenance must be trained to understand the requirements and principles of designing and operating safety-related systems.
- Operators must be trained to understand the requirements and principles of designing and operating safety-related systems.
- The safety-related circuit on the control board that fails to operate must be replaced with a new one as it is not repairable.

Commissioning Checklist

- Start-up test and validation
  IEC 61508, EN/IEC 62061 and EN ISO 13849 require the final assembler of the equipment to verify the operation of the safety function through acceptance testing. This acceptance test is described in the drive manual. The testing of optional safety features is described in the corresponding manuals.

  The acceptance test must be performed:

  - at initial start-up of the safety function
  - After any changes related to safety functions (wiring, assembly, settings, or other related operations)
  - after any maintenance work related to the safety function.

  The acceptance test of the safety function must be carried out by an authorized person with expertise and knowledge of the safety function. The test must be documented and signed by the test staff.

Signed acceptance test reports must be stored in the logbook of the machine. The report shall include documentation of start-up activities and test results, fault reports, and troubleshooting records. Any new acceptance tests performed due to changes or maintenance need to be logged into the logbook.

- Checklist of integrated STO functions

Step	Action	Result
1	Ensure that the drive runs and stops freely during commissioning.	
2	Stop the drive (if running), switch the input power supply off and isolate the drive from the power line by a disconnector.	
3	Check the STO circuit connections against the circuit diagram.	
4	Check that the shield of the STO input cable is grounded to the drive frame.	
5	Close the disconnector and switch the power supply on.	
5.1	Test the STO signal #1 when the motor is stopped: Set STO1 and STO2 to H. Send a stop command to the drive (if running) and wait until the motor shaft is at standstill. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal #1 and send a start command to the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	
5.2	Set STO1 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	
5.3	Test the STO signal #2 when the motor is stopped: Set STO1 and STO2 to H. Send a stop command to the drive (if running) and wait until the motor shaft is at standstill. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal #2 and give a start command for the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	
5.4	Set STO2 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	
6.1	Test the STO channel 1 when the motor is running: Set STO1 and STO2 to H. Start the drive and ensure the motor is running. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal 1. Ensure that the motor stops and the drive trips. Reset the fault and try to start the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	

Step	Action	Result
6.2	Set STO1 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	
6.3	Test the STO channel 2 when the motor is running: Set STO1 and STO2 to H. Start the drive and ensure the motor is running. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal 2. Ensure that the motor stops and the drive trips. Reset the fault and try to start the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	
6.4	Set STO2 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	
7	Document and sign the acceptance test report which verifies that the safety function is safe and acceptable for operation.	

Special requirements

You must conduct STO diagnosis every three month by powering off and powering on the drive once, or running the STO function once.

Note

There are two ways to perform STO diagnosis:

- Power off and restart;
- Trigger and then cancel STO.

You can use either of them.

18.4 Troubleshooting

See the following table to identify the cause of a fault and the action to be taken. Contact Inovance technical support if the fault persists after corrective actions listed in the following table are taken. Fault codes related to the STO function are listed in the following table:

Error code	Cause	Corrective Action
E150.1	1. STO input power supply is abnormal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.

Error code	Cause	Corrective Action
	2. STO input resistor is abnormal.	Replace the servo drive.
	3. STO is ineffective.	Replace the servo drive.
E150.2	The 5 V voltage supplied to the STO Buffer is abnormal due to undervoltage or overvoltage.	Replace the servo drive.
E150.3	Direct connection occurs on the upstream optocoupler of STO1 or STO2.	Replace the servo drive.
E150.4	STO buffer power-on detection abnormal	Replace the servo drive.
E150.5	Poor contact of the STO terminal or unstable external 24V input voltage may lead to STO misoperation or malfunction.	Replace the 24V power supply.

19 Communication

19.1 Communication Protocols

Supported Protocol	SV680P-INT	SV680N-INT
Modbus	✓	×
CANopen	✓	×
EtherCAT	×	✓

19.2 Modbus Communication [P]

19.2.1 Communication

19.2.1.1 Communication Technical Data

Item		Specification
Modbus Basic performance of slave	Link layer protocol	RS485
	Application layer protocol	Modbus-RTU, GBT 19582.2-2008, custom command areas
	Baud rate	2400kbps, 4800kbps, 9600kbps, 19200kbps, 38400kbps, 57600kbps, 115200kbps
	Duplex mode	Half-duplex
	Data format	8-N-1 (8 data bits, no parity, 1 stop bit)

19.2.1.2 Protocols

The Modbus protocol is a common language applied to electronic controllers. Through this protocol, the controllers can communicate with each other and other devices. It has become a general industry standard. Thanks to the Modbus communication protocol, control devices produced by different manufacturers can be connected into an industrial network for centralized monitoring.

19.2.2 Hardware Configuration

19.2.2.1 Terminal Arrangement

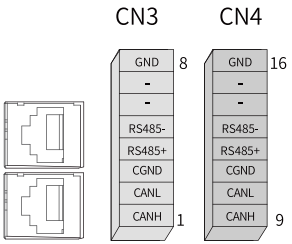


Figure 19-1 Communication Terminal pin layout of the servo drive

Table 19–1 Description of communication terminal pins

Pin No.	Description	Description
1 and 9	CANH	CAN communication port
2 and 10	CANL	
3 and 11	CGND	CAN communication GND
4 and 12	RS485+	Modbus communication interface
5 and 13	RS485-	
6 and 14	-	-
7 and 15	-	-
8 and 16	GND	Signal reference ground
Enclosure	PE	Shield

19.2.2.2 RS485 Communication Connection Example

RS485 communication connection with PLC

The following figure shows the cable used for 485 communication between the servo drive and PLC.

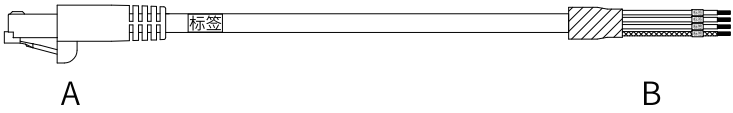


Figure 19-2 Outline drawing of cable used for CAN communication between the servo drive and PLC

Use a three-conductor shielded cable to connect the RS485 bus, with three conductors connected to 485+, 485-, and GND (GND represents non-isolated RS485

signal reference ground) respectively. Connect RS485+ and RS485- with two conductors twisted together and connect the remaining conductor to the RS485 reference ground (GND). Connect the shield to the device ground (PE). Connect a 120Ω termination resistor on each end of the bus to prevent RS485 signal reflection.

Table 19–2 Pin connection relation of the cable used for CAN communication between the servo drive and PLC

RJ45 on the Drive Side (A)			PLC Side (B)		
Communication Type	Pin No.	Description	Communication Type	Pin No.	Description
RS485	4	485+	RS485	4	485+
	5	485-		5	485-
	8	GND		8	GND
-	Shell	PE (shield layer)	-	Shell	PE (shield layer)

RS485 communication connection for multi-CAN applications

The following figure shows the cable used for parallel connection of multiple servo drives during RS485 communication.

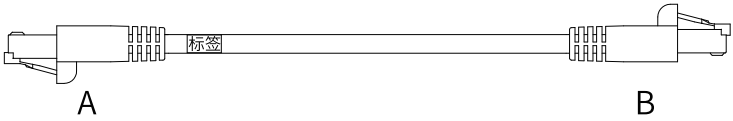


Figure 19-3 Outline drawing of multi-drive communication cable

Table 19–3 Pin connection relation of multi-drive communication cable (pins in RS485 group used only)

RJ45 on the Drive Side (A)			RJ45 on Servo Drive Side (Side B)		
Communication Type	Pin No.	Description	Communication Type	Pin No.	Description
RS485	4	485+	RS485	4	485+
	5	485-		5	485-
	8	GND		8	GND
-	Shell	PE (shield layer)	-	Shell	PE (shield layer)

In case of a large number of nodes, use the daisy chain mode for RS485 communication. Connect the reference grounds of RS485 signals of all the nodes (up to 128 nodes) together.

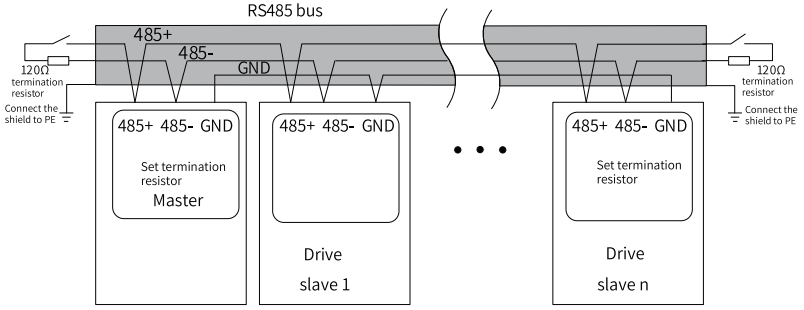


Figure 19-4 RS485 bus topology

Caution

Do not connect the GND terminal () of the host controller to the CGND terminal of the servo drive. Failure to comply will damage the device.

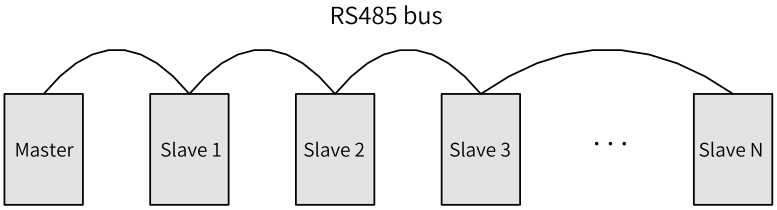


Figure 19-5 Daisy chain mode

The maximum number of nodes and transmission distance of standard RS485 circuit vary with the baud rate, as listed in the following figure:

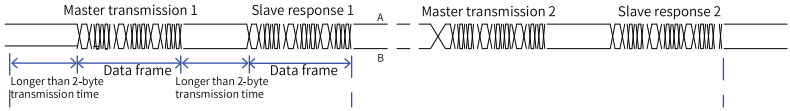
Table 19–4 Transmission distance and number of nodes

No.	Transmission Rate (kbps)	Transmission Distance (m)	Number of Nodes	Cable Size (AWG)
1	115.2	100	128	26
2	19.2	1000	128	26

19.2.3Communication Transmission Mode

In an RS485 communication network, data is transmitted in the asynchronous serial and half-duplex transmission mode. Data is sent frame by frame in the message

format specified by the Modbus-RTU protocol. The idle time longer than 2-byte transmission time marks the start of a new communication frame.



The built-in communication protocol of the drive is the Modbus-RTU slave communication protocol, which allows the drive to respond to the query command from the master or execute the action according to query command from the master and respond with communication data.

The master can be a PC, an industrial control device, or a PLC, etc. The master can separately communicate with a slave or issue broadcast information to all slaves. When the master sends a query command to a single slave, the slave needs to return a response frame. For a broadcast message sent by the master, the slaves do not need to return a response to the master.

19.2.4Data Frame Structure

Parameters of the SV680P-INT servo drive are divided into 16-bit and 32-bit parameters based on the data length. You can read and write parameters through the Modbus RTU protocol.

The command codes for reading/writing parameters vary with the data length.

Operation	Command code
Read 16-bit/32-bit parameters	0x03
Write 16-bit parameters	0x06
Write 32-bit parameters	0x10

Command code for reading parameter: 0x03

In Modbus RTU protocol, command code 0x03 is used to read both 16-bit and 32-bit parameters.

Request frame format:

Value	Description
START	Equal to or larger than 2-character idle time, indicating the start of a frame
ADDR	Servo axis address: 1 to 127 **Note: 1 to 127 are decimal values which need to be converted into hexadecimal equivalents.**
CMD	Command code: 0x03
DATA[0]	Register start address (eight high bits): parameter group number of the start register

Value	Description
	Take H06.11 as an example, "06" is the group number, which means DATA[0] = 0x06. **Note: In this example, "06" is a hexadecimal value that needs no conversion.**
DATA[1]	Register start address (eight low bits): offset within the parameter group of the start register Take H06.11 as an example, "11" is the offset within the parameter group. That is, DATA [1] = 0x0B. **Note: In this example, ''11" is a decimal value that needs to be converted into the hexadecimal equivalent 0x0B.**
DATA[2]	Read the eight high bits N (H) of the number of parameters (hexadecimal)
DATA[3]	Read the eight low bits N (L) of the number of parameters (hexadecimal)
CRCL	CRC valid byte (low 8 bits).
CRCH	CRC valid byte (high 8 bits).
END	Equal to or larger than 2-character idle time, indicating the end of a frame

Response frame format:

Value	Description
START	Equal to or larger than 2-character idle time, indicating the start of a frame
ADDR	Servo axis address, hexadecimal
CMD	Command code: 0x03
DATALENGTH	Number of parameter bytes, equal to reading the number of parameters N x 2
DATA[0]	Parameter data in the first register (eight high bits)
DATA[1]	Parameter data in the first register (eight low bits)
DATA[…]	…
DATA[N*2-2]	Parameter data in the Nth register (eight high bits)
DATA[N*2-1]	Parameter data in the Nth register (eight low bits)
CRCL	CRC valid byte (low 8 bits).
CRCH	CRC valid byte (high 8 bits).
END	Equal to or larger than 2-character idle time, indicating the end of a frame

In Modbus RTU protocol, command code 0x06 is used to write 16-bit parameters. Command code for writing 32-bit parameters: 0x10

Communication example

- To read data with a length of two words by taking H02.02 as the start register in the drive whose servo axis address is 01:

Master request frame

01	03	02	02	00	02	CRCL	CRCH

Slave response frame:

01	03	04	00	01	00	00	CRCL	CRCH

The response frame indicates the slave returns data with a length of two words (four bytes), the content of which is 0x0001 and 0x0000.

If the slave response frame is as follows:

01	83	02	CRCL	CRCH

This response frame indicates a communication error occurs and the error code is 0x02. (0x83 indicates an error.)

- To read H05.07 (32-bit) in the drive whose servo axis address is 01:
  Master request frame

01	03	05	07	00	02	CRCL	CRCH

Slave response frame:

01	03	04	00	01	00	00	CRCL	CRCH

The preceding response frame indicates the value of H05.07 is 0x00000001.

Command code for writing 16-bit parameters: 0x06

Caution

Do not write 32-bit parameters with 0x06. Failure to comply can result in unexpected error.

Request frame format:

Value	Description
START	Equal to or larger than 2-character idle time, indicating the start of a frame
ADDR	Servo axis address 1 to 127 **Note: 1 to 127 are decimal values which need to be converted into hexadecimal equivalents.**
CMD	Command code: 0x06
DATA[0]	Register start address (eight high bits): parameter group number of the start register Take H06.11 as an example, "06" is the group number, which means DATA[0] = 0x06. **Note: In this example, "06" is a hexadecimal value that needs no conversion.**

Value	Description
DATA[1]	Register start address (eight low bits): offset within the parameter group of the start register Take H06.11 as an example, "11" is the offset within the parameter group, which means DATA[1] = 0x0B. **Note: In this example, ''11" is a decimal value that needs to be converted into the hexadecimal equivalent 0x0B.**
DATA[2]	Write the 8 high bits of register data (hexadecimal)
DATA[3]	Write the 8 low bits of register data (hexadecimal)
CRCL	CRC valid byte (low 8 bits).
CRCH	CRC valid byte (high 8 bits).
END	Equal to or larger than 2-character idle time, indicating the end of a frame

Response frame format:

Value	Description
START	Equal to or larger than 2-character idle time, indicating the start of a frame
ADDR	Servo axis address, hexadecimal
CMD	Command code: 0x06
DATA[0]	Register start address (eight high bits): parameter group number of the start register Take H06.11 as an example, "06" is the group number, which means DATA[0] = 0x06. **Note: In this example, "06" is a hexadecimal value that needs no conversion.**
DATA[1]	Register start address (eight low bits): offset within the parameter group of the start register Take H06.11 as an example, "11" is the offset within the parameter group, which means DATA[1] = 0x0B. **Note: In this example, ''11" is a decimal value that needs to be converted into the hexadecimal equivalent 0x0B.**
DATA[2]	Write the 8 high bits of register data (hexadecimal)
DATA[3]	Write the 8 low bits of register data (hexadecimal)
CRCL	CRC valid byte (low 8 bits).
CRCH	CRC valid byte (high 8 bits).
END	Equal to or larger than 2-character idle time, indicating the end of a frame

Communication example

To write data 0x0001 to H02.02 in the drive whose servo axis address is 01:

Master request frame

01	06	02	02	00	01	CRCL	CRCH

Slave response frame:

01	06	02	02	00	01	CRCL	CRCH

This response frame indicates 0x0001 has been written to H02.02 in the drive whose servo axis address is 01.

If the slave response frame is as follows:

01	86	02	CRCL	CRCH

This response frame indicates a communication error occurs and the error code is 0x02. (0x86 indicates an error.)

Command code for writing 32-bit parameters: 0x10

Caution

Do not write 16-bit parameters with 0x10. Failure to comply can result in unexpected error.

Request frame format:

Value	Description
START	Equal to or larger than 2-character idle time, indicating the start of a frame
ADDR	Servo axis address 1 to 127 **Note: 1 to 127 are decimal values which need to be converted into hexadecimal equivalents.**
CMD	Command code: 0x10
DATA[0]	Register start address (eight high bits): parameter group number of the start register Take H11.12 as an example, "11" is the group number, which means DATA[0] = 0x11. **Note: In this example, "11" is a hexadecimal value that needs no conversion.**
DATA[1]	Register start address (eight low bits): offset within the parameter group of the start register Take H11.12 as an example, "12" is the offset within the parameter group, which means DATA[1] = 0x0C. **Note: In this example, ''12" is a decimal value that needs to be converted into the hexadecimal equivalent 0x0C.**
DATA[2]	Write the eight high bits M (H) of the number of parameters (hexadecimal) Take H05.07 as an example, DATA[2] is 00, DATA[3] is 02, and M is H0002. **For 32-bit parameters, each parameter is calculated as two words.**

Value	Description
DATA[3]	Write the eight low bits M (L) of the number of parameters (hexadecimal)
DATA[4]	Write the number of bytes (M x 2) corresponding to the register data Take H05.07 as an example, DATA[4] is H04.
DATA[5]	Write the eight high bits of the start register data (hexadecimal)
DATA[6]	Write the eight low bits of the start register data (hexadecimal)
DATA[7]	Write the eight high bits of the start register address +1 (hexadecimal)
DATA[8]	Write the eight low bits of the start register address +1 (hexadecimal)
CRCL	CRC valid byte (low 8 bits).
CRCH	CRC valid byte (high 8 bits).
END	Equal to or larger than 2-character idle time, indicating the end of a frame

Response frame format:

Value	Description
START	Equal to or larger than 2-character idle time, indicating the start of a frame
ADDR	Servo axis address, hexadecimal
CMD	Command code: 0x10
DATA[0]	Register start address (eight high bits): offset within the parameter group of the start register Take H11.12 as an example, DATA[0] = 0x11.
DATA[1]	Register start address (eight low bits): offset within the parameter group of the start register Take H11.12 as an example, DATA[1] = 0x0C.
DATA[2]	Write the eight high bits M (H) of the number of parameters (hexadecimal)
DATA[3]	Write the eight low bits M (L) of the number of parameters (hexadecimal)
CRCL	CRC valid byte (low 8 bits).
CRCH	CRC valid byte (high 8 bits).
END	Equal to or larger than 2-character idle time, indicating the end of a frame

Error response frame

Error frame response format:

Value	
START	Equal to or larger than 2-character idle time, indicating the start of a frame
ADDR	Servo axis address, hexadecimal
CMD	Command code: 0x80
DATA[0]...[3]	DATA error code.
CRCL	CRC valid byte (low 8 bits).
CRCH	CRC valid byte (high 8 bits).
END	Equal to or larger than 2-character idle time, indicating the end of a frame

Error code:

Error code	Description
0x0001	Invalid command code
0x0002	Illegal data address
0x0003	Illegal data
0x0004	Slave device fault

32-bit parameter addressing

When 32-bit parameters are read/written through Modbus commands, the communication address is determined by the address of the parameter with lower offset number. Two offset numbers are operated in one operation.

Note

In the following examples, the servo axis address is 01 by default.

- The Modbus command for reading H11.12 (Displacement 1) is as follows:

01	03	11	0C	00	02	CRCL	CRCH

If the "1st displacement" is 0x40000000 (decimal equivalent: 1073741824), then the following response frames apply:

- When H0E.84 is set to 1 (Low 16 bits before high 16 bits), the response frame is as follows.

01	03	04	00	00	40	00	CRCL	CRCH

- When H0E.84 is set to 0 (High 16 bits before low 16 bits), the response frame is as follows.

01	03	04	40	00	00	00	CRCL	CRCH

- For example, the Modbus command for writing 0x12345678 to H11.12 (Displacement 1) is as follows.
  - If H0E.84 = 1 (Low 16 bits before high 16 bits):

01	10	11	0C	00	02	04	56	78	12	34	CRCL	CRCH

  - If H0E.84 = 0 (High 16 bits before low 16 bits):

01	10	11	0C	00	02	04	12	34	56	78	CRCL	CRCH

CRC check

The host controller and the drive must use the same CRC algorithm during communication. Otherwise, a CRC error can occur. The servo drive uses 16-bit CRC with low byte before high byte. The CRC function is as follows: The polynomial used for CRC is $X^{16} + X^{15} + X^2 + 1$ (0xA001).

```
Uint16 COMM_CrcValueCalc(const Uint8 *data, Uint16 length)
{
  Uint16 crcValue = 0xffff;
  int16 i;
  while (length--)
  {
    crcValue ^= *data++;
    for (i = 0; i < 8; i++)
    {
      if (crcValue & 0x0001)
      {
        crcValue = (crcValue >> 1) ^ 0xA001;
      }
      else
      {
        crcValue = crcValue >> 1;
      }
    }
  }
  return (crcValue);
}
```

19.2.5Communication Parameters

Parameter	Default Value	Description	Remarks
H0E.00	1	Drive axis address	-
H0E.80	9	Baud rate of the serial port	9–115200 bps

Parameter	Default Value	Description	Remarks
H0E.81	3	Modbus communication data format	3: No parity, 1 stop bit (8-N-1)
H0E.84	1	Modbus communication data sequence	0: High bits before low bits 1: Low bits before high bits

19.3 CANopen Communication [P]

19.3.1 Communication

19.3.1.1 Communication Technical Data

Item	Name	Description
Parameter setting	Node address switching	The node address can only be set manually. The maximum value is 127.
	Baud rate switching	The baud rate can only be set manually.
Description of state machine	State description/ display of communication layer	Initializing, Pre-Operational, Operational, Stopped
	Description/display of emergency error codes	Time-Out, State-Switch-Err, PDO-Length-Err
Error frame recording	Reception error frames can be recorded.	Count of NMT frames with incorrect length
		Count of NMT frames with incorrect command
		Count of heartbeat/node protection frames with incorrect length
Sync deviation detection	Multi-quantile sync deviation detection	1/4-period deviation
		1/2-period deviation
		3/4-period deviation
		1-period deviation
		2-period deviation
Baud rate	20 k–1 M	20kbps, 50kbps, 100kbps, 125kbps, 250kbps, 500kbps, 1Mbps
SYNC	SYNC Producer	Synchronous frame production
	SYNC Consumer	Synchronous signal consumption with deviation detection (in IP mode)
SDO	Start domain upload/ download	Transmit data ⩽ 4 bytes
	SDO abort error	Report an SDO error code contextually

Item	Name	Description
PDO	Synchronous TPDO	The sync number is 1–240. The default number of TPDOs/RPDOs is 4, which can be configured.
	Asynchronous TPDO	Time-triggered by time. The default number of TPDOs/RPDOs is 4, which can be configured.
EMCY	**Emergency message**	Heartbeat timeout, PDO length error, node state switching error, application layer error
NMT	Bootup Service	Support for node online message transmit
NMTErrCtl	Life Guard	Optional node protection (cannot be used with heartbeat production)
	Heartbeat Consumer	Node heartbeat consumption
	Heartbeat Producer	Node heartbeat production
Expert mode	PDO communication parameters and their mapping are set through parameters.	PDO communication parameters and their mapping are set manually.

19.3.1.2 Protocols

CANopen is a protocol for the application layer of the network transmission system based on CAN serial bus. It complies with the ISO/ OSI standard model. Different devices in the network exchange data through the object dictionary or objects. The master node obtains or modifies data in the object dictionary of other nodes through PDO or SDO. The CANopen device model is shown in the following figure.

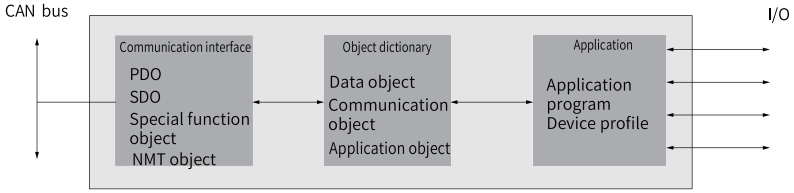


Figure 19-6 CANopen device model

19.3.2 Hardware Configuration

19.3.2.1 Terminal Layout

For details, see the related section.

19.3.2.2 CAN Communication Connection Example

CAN communication with PLC

The following figure shows the cable used for the communication between the servo drive and PLC in CAN communication networking.



Figure 19-7 Outline drawing of cable used for CAN communication between the servo drive and PLC

Use a three-conductor shielded cable to connect the CAN bus, with the three conductors connected to CANH, CANL, and CGND (CGND represents isolated RS485 circuit signal reference ground) respectively. Connect CANH and CANL with twisted pairs. Connect CGND to the CAN reference ground. Connect the shield to the device ground. Connect a 120Ω termination resistor on each end of the bus to prevent CAN signal reflection.

Table 19–5 Pin connection relation of the cable used for CAN communication between the servo drive and PLC

RJ45 on the Drive Side (A)			PLC Side (B)		
Communication Type	Pin No.	Description	Communication Type	Pin No.	Description
CAN	1	CANH	CAN	1	CANH
	2	CANL		2	CANL
	3	CGND		3	CGND
-	Shell	PE (shield layer)	-	Shell	PE (shield layer)

CAN communication connection for multi-CAN applications

The following figure shows the cable used for parallel connection of multiple servo drives during CAN communication.

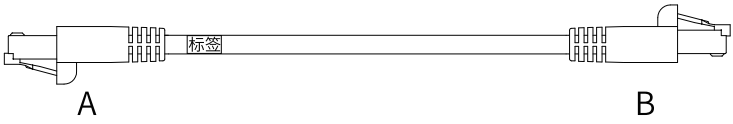


Figure 19-8 Outline drawing of multi-drive communication cable

Table 19–6 Pin connection relation of multi-drive communication cable (pins in CAN group used only)

RJ45 on the Drive Side (A)			RJ45 on Servo Drive Side (Side B)		
Communication Type	Pin No.	Description	Communication Type	Pin No.	Description
CAN	1	CANH	CAN	1	CANH
	2	CANL		2	CANL
	3	CGND		3	CGND
-	Shell	PE (shield layer)	-	Shell	PE (shield layer)

Use the daisy chain mode for CAN bus, as shown in the following figure.

- Shielded twisted pair cables are recommended for connecting the CAN bus. Twisted pairs are recommended for connecting CANH and CANL.
- Connect a 120Ω termination resistor on each end of the bus to prevent signal reflection.
- Connect the reference grounds of CAN signals of all the nodes together.
- Up to 127 nodes can be connected.

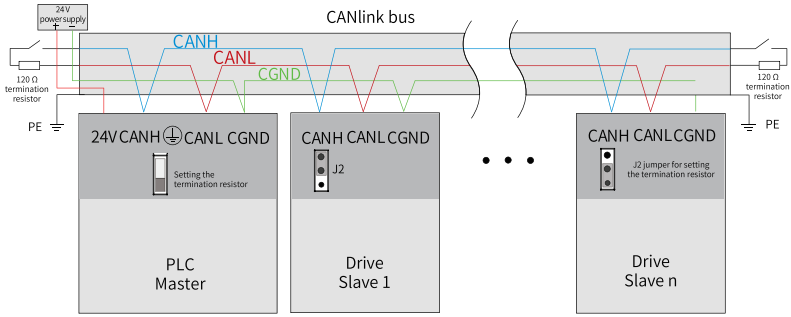


Figure 19-9 CAN bus topology

Caution

Do not connect the CGND terminal of the host controller to the GND terminal of the servo drive. Otherwise, the servo drive may be damaged.

19.3.3Communication Transmission Mode

CANopen provides multiple communication objects. Every communication object has different features. You can select a communication object according to different applications. The predefined COB-ID is used. Specific rules are as follows:

- NMT object: 0x000
- SYNC object: 0x080
- SDO object:
  - Transmit SDO — 0x600+Node-Id
  - Receive SDO — 0x580+Node-Id
- PDO object:
  - RPDO1 — 0x200+Node-Id
  - RPDO1 — 0x300+Node-Id
  - RPDO1 — 0x400+Node-Id
  - RPDO1 — 0x500+Node-Id
  - RPDO1 — 0x180+Node-Id
  - RPDO1 — 0x280+Node-Id
  - RPDO1 — 0x380+Node-Id
  - RPDO1 — 0x480+Node-Id
- EMCY object: 0x80+Node-Id

Communication objects are defined as follows:

- NMT
  A network management object (NMT) includes Boot-up messages, Heartbeat protocol, and NMT messages. Based on the master-slave mode, an NMT is used to manage and monitor nodes in the network and implements three functions: node status control, error control, and node activation.

- SDO
  By using indexes and sub-indexes, SDOs enable clients to access entries in the object dictionary of devices. An SDO is achieved through a CMS object of the multi-element domain in CAL and transmitting data in any length is allowed. When the data exceeds four bytes, the data is divided into several packets. The SDO protocol produces a response for every message. SDO request and response packets alway contain eight bytes.

- PDO
  A PDO is used to transmit real-time data from one creator to one or multiple receivers. The length of transmitted data ranges from one to eight bytes. Every CANopen device contains eight default PDO channels, four PDO sending channels and four PDO receiving channels. The PDO supports synchronous and asynchronous transmission modes, which are determined by the communication

parameter corresponding to the PDO. The content of a PDO message is pre-defined and is determined by the mapping parameter corresponding to the PDO.

- SYNC object
  An SYNC object is a packet that is broadcast to the CAN bus periodically by the CANopen master. It is used to achieve basic network clock signals. Every device can determine whether to perform synchronous communication with other network devices using this event according to its own configurations.

19.3.4 Data Frame Structure

19.3.4.1 Network Management System (NMT)

The NMT initializes, starts, and stops the network and devices in the network. It belongs to the master-slave system. There is only one NMT master in the CANopen network. A CANopen network that includes the master can be configured.

NMT Service

CANopen works according to the state machine specified by the protocol. Some states are converted automatically and some must be converted through NMT messages transmitted by the NMT master, as shown below.

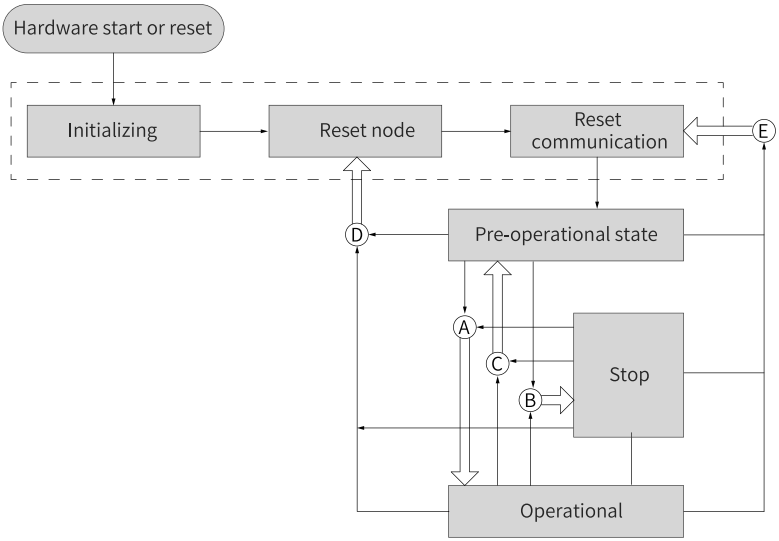


Figure 19-10 Execution process of NMT state machine

In the figure above, conversion marked with a letter is implemented through NMT messages and only the NMT master can send NMT control messages. The message format is shown in *"Table 19–7 " on page 918*.

Table 19–7 NMT message format

COB-ID	RTR	Data/Byte	
		0	1
0x000	0	Command word	Node_ID

The COB-ID of the NMT message is fixed to "0x000".

The data area contains two bytes. The first byte is a command word indicating this frame is for control purpose. See *"Table 19–8 " on page 918* for details.

The second byte (Node_ID) is the CANopen node address. The byte value 0 indicates it is a broadcast message and all slave devices in the network are active.

Table 19–8 NMT message command

Command word	Conversion Code	Description
0x01	A	Instruction for starting a remote node
0x02	B	Instruction for stopping a remote node
0x80	C	Instruction for entering the pre-operational status
0x81	D	Instruction for resetting a node
0x82	E	Instruction for resetting communication

1. After power-on, the device automatically enters the initialization state, including initializing, node reset, and communication reset. During initializing, parameters of each mode is loaded. During node reset, the manufacturer-defined area and profile area of the object dictionary are restored to values saved last time. During communication reset, communication parameters in the object dictionary are restored to values saved last time.
2. Next, the device sends Boot-up and enters the pre-operation status, which is the status of the main configuration nodes.
3. After configuration is done, the node can enter the operational status only after the NMT master sends the NMT message. When CANopen is working properly, it is in the operation status. All modules should work properly.
4. When the NMT master sends a node stop message, the device enters the stop state and only the NMT module works normally during CANopen communication.

The following table lists CANopen services available in various NMT status.

Table 19–9 Services supported in different NMT states

Service	Pre-operational	Operation	Stop
PDO	No	Yes	No
SDO	Yes	Yes	No
Synchronization object (SYNC)	Yes	Yes	No

Service	Pre-operational	Operation	Stop
Emergency message (EMCY)	Yes	Yes	No
Network management system (NMT)	Yes	Yes	Yes
Error control	Yes	Yes	Yes

NMT error control

NMT error control is used to detect whether devices in the network are online and the device status, including node guarding, life guarding, and heartbeat.

Note

- Life guard and heartbeat cannot be used at the same time.
- Do not set the node guarding, life guarding, and heartbeat time to small values to prevent excessive network load.

- **Node/life guarding**
  In node guarding, the NMT master periodically check the NMT slave state through remote frames. In life guarding, the slave monitors the master state indirectly through the remote frame interval used to monitor the slave. Node guarding complies with the master/slave model. A response must be provided for each remote frame.

  Objects related to node/life guarding include the protection time 100Ch and life factor 100Dh. The value of 100Ch is the remote frame interval (ms) of node guarding under normal conditions. The product of 100Ch multiplied by 100Dh determines the latest time of master query. Node guarding is available normally. When 100Ch and 100Dh of a node are non-zero values and a node guarding request frame is received, life guarding will be activated.

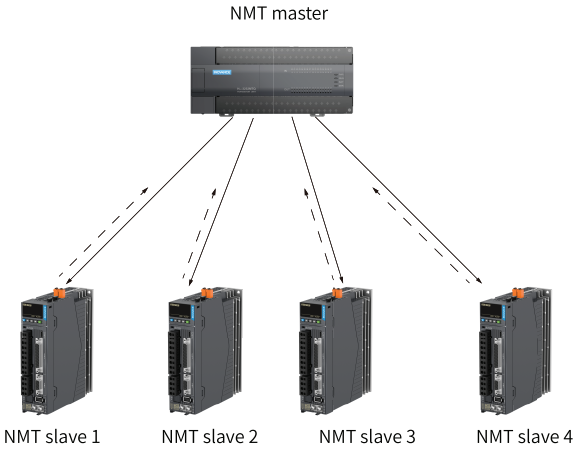


Figure 19-11 Description of node protection

As shown in the figure above, the master sends a node guarding remote frame at the interval defined by 100Ch, and the slave must respond to the remote frame. Otherwise, the slave is considered to be offline.

If the node guarding remote frame is not received by the slave within the time defined by 100Ch × 100Dh, the master is considered to be offline.

The following table describes the remote frame sent by the NMT master node.

Table 19–10 Node guarding remote frame message

COB-ID	RTR
0x700+Node_ID	1

The following table describes the response message returned by NMT from the slave. The data segment is a status word consisting of one byte.

Table 19–11 Response message of node guarding

COB-ID	RTR	Data
0x700 + Node-ID	0	Status word

Table 19–12 Description of response message state

Data bits	Description
Bit 7	It must be set to 0 or 1 alternatively.
Bit 6 to bit 0	4: Stopped 5: Operation status 127: Pre-operation status

Caution

It is recommended that the protection time 100Ch be longer than 10 ms, and the life factor be greater than or equal to 2.

- **Heartbeat**
  The heartbeat mode adopts the producer—consumer model. The CANopen device can send heartbeat messages based on the cycle (ms) defined by the producer heartbeat interval object (1017h). In the network, there is always a node configured with the consumer heartbeat function, which monitors the producer based on the consumer time defined by object 1016h. Once the producer heartbeat is not received from the corresponding node within the consumer heartbeat time, a fault occurs on the node.

  After the producer heartbeat interval (1017h) is configured, the node heartbeat function is activated and a heartbeat message starts to be generated. After a valid sub-index is configured for consumer heartbeat (1016h) and a heartbeat frame is received from the corresponding node, monitoring starts.

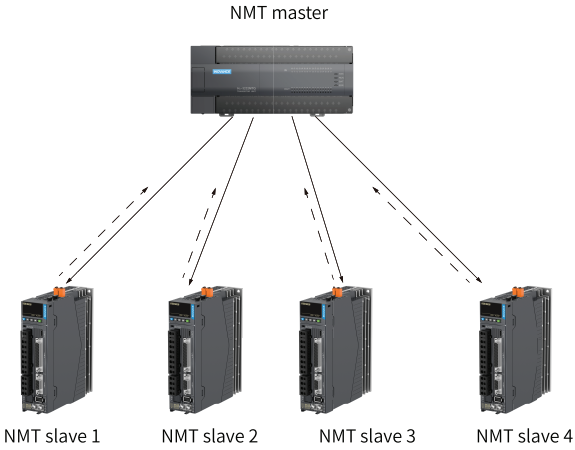


Figure 19-12 Heartbeat diagram

The master sends a heartbeat message based on the producer time. If the slave that monitors the master does not receive the heartbeat message within the time defined by the sub-index of 1016h , the master is considered to be offline. The time of the sub-index of 1016h must be longer than or equal to the master producer

time multiplied by 1.5. Otherwise, a false report indicating the master is offline may occur.

The slave sends a heartbeat message at the interval defined by 1017h. If the master (or other slave) that monitors the slave does not receive the heartbeat message within the consumer time, the slave is considered to be offline. If 1017h multiplied by 1.5 is smaller than or equal to the consumer time of the master (or other slaves) that monitors the slave, a false report indicating the slave is disconnected may be reported.

The following table describes the format of a heartbeat message. The data segment contains only one byte. The most significant bit is permanently set to 0 and other bits are consistent with the response message status of node guarding, as shown in the following table.

Table 19–13 Heartbeat message

COB-ID	RTR	Data
0x700 + Node-ID	0	Status word

The SV680P-INT series servo drive is both a heartbeat producer and a heartbeat consumer. It can serve as the heartbeat consumer for five different nodes. It is recommended that the heartbeat producer time be set to a value not lower than 20 ms and the consumer heartbeat time be set to a value not lower than 40 ms (Consumer heartbeat time ＞ 1.5 x Producer heartbeat time).

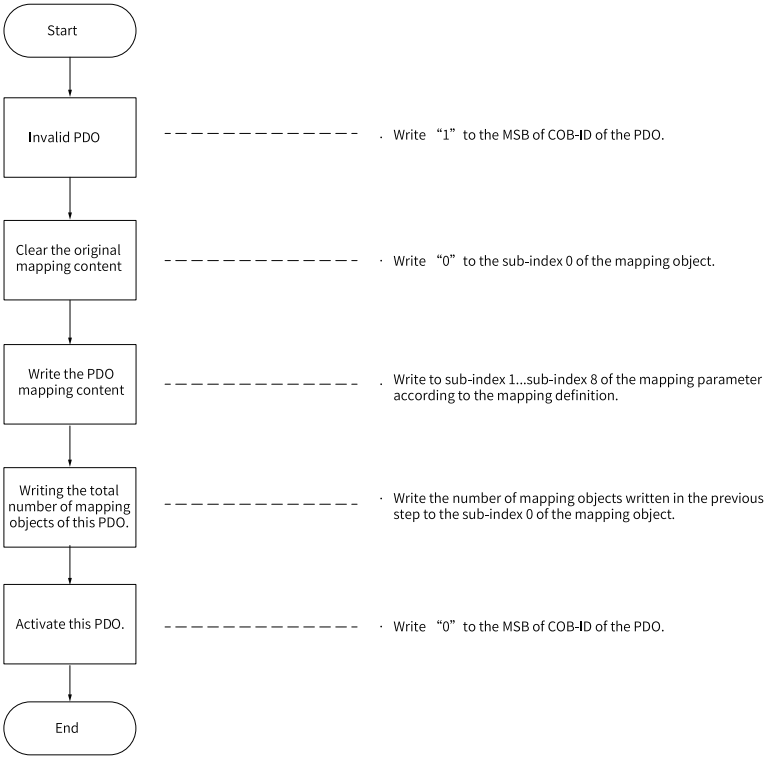
19.3.4.2 Service data object (SDO)

The SDO is associated with the object dictionary through object index and sub-index. Based on the SDO can read the object content in the object dictionary or modify the object data if allowed.

19.3.4.3 Process Data Object (PDO)

The PDO is used to transmit real-time data, which is the major data transmission mode in CANopen. PDO transmission features high speed as no response is required and the PDO may consist of less than eight bytes.

The following figure shows the PDO mapping configuration flowchart.



PDO Transmission Framework

PDO transmission complies with the producer- consumer model, that is, in the CAN bus network, the TPDO generated by the producer may be received by one or multiple consumers in the network based on the COB-ID. The transmission model is shown in the following figure.

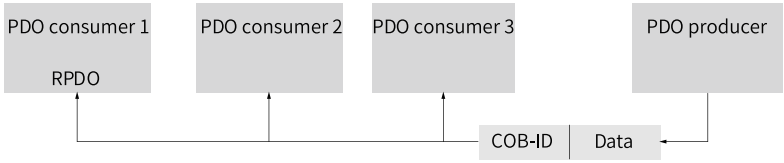


Figure 19-13 PDO transmission model

CANopen communication in SV680P-INT series servo drives only supports point-to-point PDO transmission.

PDO object

PDO can be divided into RPDO (Receive PDO) and TPDO (Transmitted PDO). The final PDO transmission mode and content are determined by communication parameters and mapping parameters. The SV680P-INT series servo drive uses four RPDOs and four TPDOs to transmit the PDO. The following table lists the related objects.

Table 19–14 PDOs of SV680P-INT servo drives

Name		COB-ID	Communication Object	Mapping Object
RPDO	1	200h + Node_ID	1400h	1600h
	2	300h + Node_ID	1401h	1601h
	3	400h + Node_ID	1402h	1602h
	4	500h + Node_ID	1403h	1603h
TPDO	1	180h + Node_ID	1800h	1A00h
	2	280h + Node_ID	1801h	1A01h
	3	380h + Node_ID	1802h	1A02h
	4	480h + Node_ID	1803h	1A03h

PDO Communication Parameters

- **CAN Identifier for PDO**

  The CAN identifier of a PDO, namely COB-ID, includes a control bit and identifier data and determines the bus priority of the PDO.

  COB-ID is in the sub-index 01 of communication parameters (RPDO: 1400h–1403h, TPDO: 1800h–1803h). The most significant bit determines whether this PDO is valid.

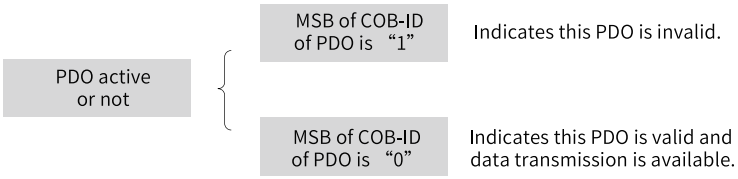


Figure 19-14 Description of PDO validity

The SV680P-INT servo drive only supports point-to-point PDO transmission. Therefore, the seven least significant bits of the COB-ID must be the station address of the node.

Example:

For the node whose station No. is 4, when TPDO3 is invalid, its COB-ID should be 80000384h. When 384h is written for the COB-ID, it indicates the PDO is activated.

- **Transmission type of PDO**
  The transmission type of the PDO is in the sub-index 02h of communication parameters (RPDO: 1400h–1403h, TPDO: 1800h–1803h). It determines the transmission type of the PDO.



Figure 19-15 Supported PDO transmission mode

Different values of the sub-index 02 stand for different transmission types and define the methods for triggering TPDO transmission or processing received RPDOs. The following table lists the methods for triggering TPDOs and RPDOs.

Table 19–15 Triggering Methods of TPDO and RPDO

Value of Communication Type	Synchronous		Asynchronous
	Cyclic	Acyclic	
0	-	✓	-
1 to 240	✓	-	-
241 to 253	-		
254, 255	-	-	✓

  - When the transmission type of a TPDO is 0, if mapping data is changed and a synchronous frame is received, the TPDO is sent.
  - When the transmission type of a TPDO is a value in the range 1 to 240 and a corresponding number of synchronous frames are received, the TPDO is sent.
  - When the transmission type of a TPDO is 254 or 255, if mapping data is changed or the event timer expires, the TPDO is sent.
  - When the transmission type of an RPDO is a value in the range 0 to 240, once a synchronous frame is received, the latest data of the RPDO is updated to the application; when the transmission RPDO of an RPDO is 254 or 255, the received data is directly updated to the application.

- **Disabled time**
  The disabled time is set for TPDOs and is stored on the sub-index 03h of communication parameters (1800h to 1803h) to prevent the CAN from being continuously occupied by PDO with lower priorities. After the parameter (unit: 100 μs) is set, the transmission interval of one TPDO must be longer than or equal to the time corresponding to this parameter.

  Example: If the inhibit time of TPDO2 is 300 x 100 μs, the transmission interval of TPDOs is no shorter than 30 ms.

- **Event timer**
  For TPDO transmitted in asynchronous mode (transmission types 254 or 255), the event timer is defined in sub-index 05 of communication parameters (1800h–1803h). The event timer can be considered as a trigger event. It also triggers corresponding TPDO transmission. If another event, for example, data change, occurs in the operation cycle of the event timer, the TPDO is triggered and the event timer is reset immediately.

PDO mapping parameter

PDO mapping parameters include pointers of process data that corresponds to PDO and that is to be sent or received by PDO, including index, sub-index, and mapping object length. The length of each PDO data can be up to eight bytes and one or multiple objects can be mapped. The sub-index 00 records the number of objects mapped by the PDO and the sub-indexes 01...08 are the mapping content.

The following takes 1600h as an example.

Table 19–16 Description of PDO mapping relation

Index	Sub-index	Description
1600h	00	Number of mapped objects
	01	Content of mapping parameter
	…	
	08	

Table 19–17 Definition of PDO mapping parameters

Places	31	…	16	15	…	8	7	…	0
Description	Index			Sub-index			Object Length		

The index and sub-index together define the position of an object in the object dictionary. The object length indicates the bit length of the object in hexadecimal, as shown below.

Table 19–18 Relation between object length and object bit length

Object Length	Bit Length
08h	8-bit
10h	16-bit
20h	32-bit

For example: the mapping parameter of the 16-bit command word 6040.00h is 60400010h.

The following example describes the PDO mapping relation.

Example:

RPDO1 maps the following three parameters.

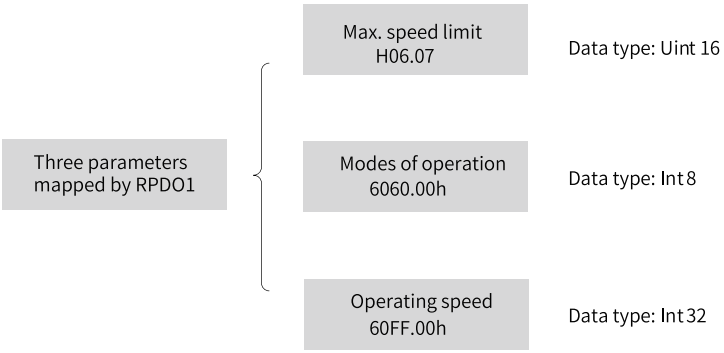


Figure 19-16 Example of PDO1 mapping

Then, the mapping length is seven bytes (2+1+4), namely there are seven bytes in the data segment of RPDO1 during transmission. The mapping relation is shown in the following figure.

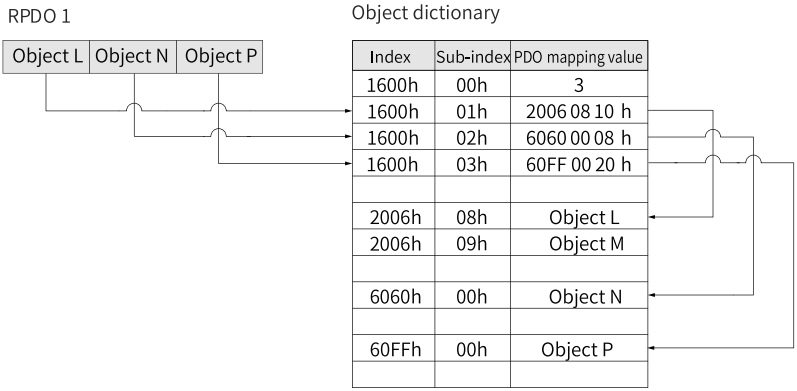


Figure 19-17 Example of RPDO mapping relation

The mapping mode of TPDO is the same as that of RPDO, but in the opposite direction. The RPDO decodes the input based on the mapping relation. The TPDO encodes the output based on the mapping relation.

Example:

TPDO2 maps the following two parameters.

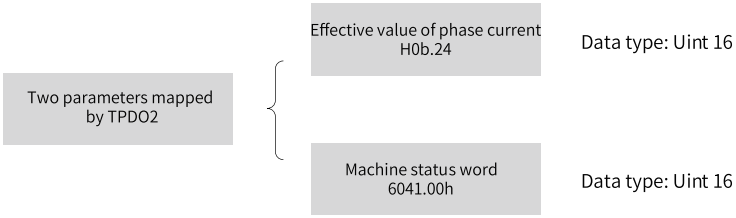


Figure 19-18 Example of TPDO2 mapping

Then, the mapping length is four bytes (2+2), namely there are four bytes in the data segment of TPDO2 during transmission. The mapping relation is shown in the following figure.

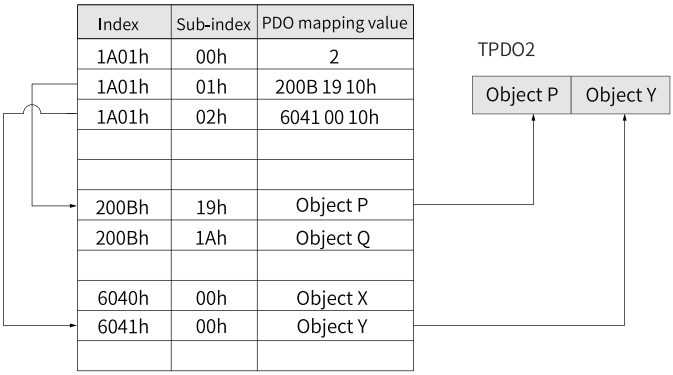


Figure 19-19 Example of TPDO mapping relation

19.3.4.4 Synchronization Object (SYNC)

The SYNC object is a special mechanism that controls harmony and synchronization between transmission and reception of multiple nodes. It is used for synchronous transmission of the PDO.

The following figure shows the configuration flowchart of the Sync generator.

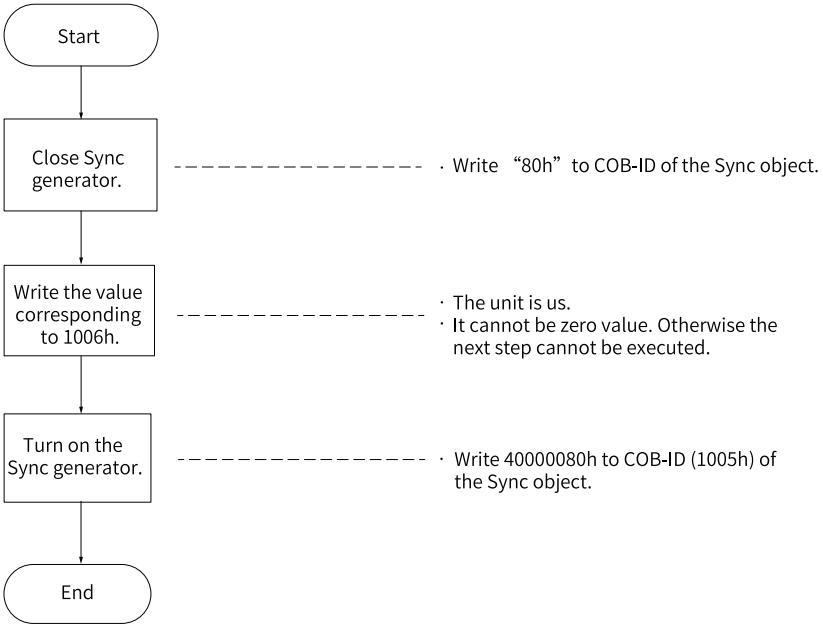


Figure 19-20 Synchronization generator configuration flowchart

Note

The SV680P-INT series does not support the Sync generator with cycle lower than 500 μs. Synchronization cycles lower than 1 ms are not recommended.

Sync generator

The SV680P-INT servo drive is both a synchronization consumer and a synchronization producer. The objects related to synchronization are synchronization object COB-ID (1005h) and synchronization cycle (1006h).

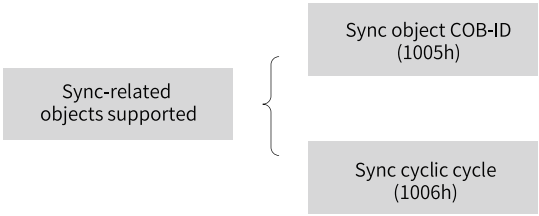


Figure 19-21 Description of supported objects related to synchronization

The second most significant bit of the synchronization object COB-ID determines whether to activate the Sync generator.

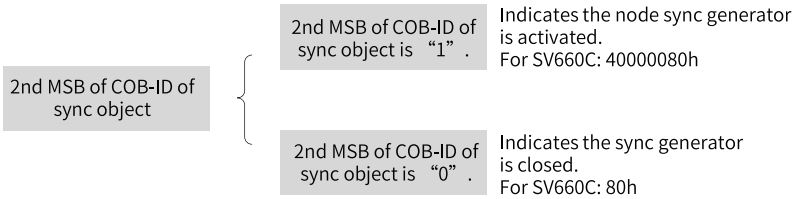


Figure 19-22 Activating the synchronization generator

The synchronization cycle (unit: μs) is only used for the Sync generator. It indicates the interval of the node in generating the synchronization object.

Synchronization object transmission framework

Synchronization objects are transmitted based on the producer-consumer model, which is similar to PDO transmission. The synchronization producer sends a synchronous frame, and other nodes in the CAN network can receive this frame as consumers, without the need to provide any feedback. Only one Sync generator is allowed to be activated in one CAN network. The following figure shows the transmission framework of synchronization objects.

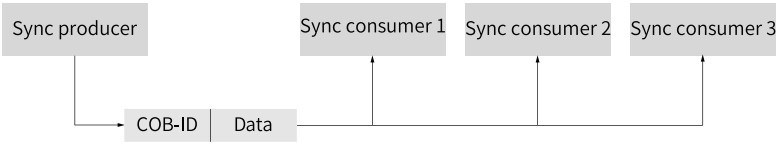


Figure 19-23 Synchronization transmission framework

Transmission of synchronous PDO is closely related to the synchronous frame.

- For an RPDO, so long as the PDO is received, the received PDO is updated to the application in the next synchronization.
- A synchronization TPDO can be transmitted in cyclic synchronization mode or acyclic synchronization mode.

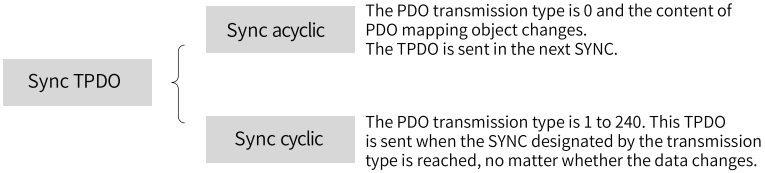


Figure 19-24 Description of synchronization TPDO

The following figure shows the synchronous transmission model.

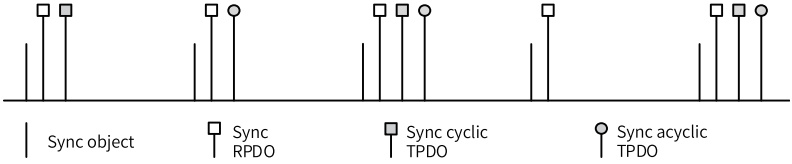


Figure 19-25 Synchronous transmission model

Example:

RPDO1 has a transmission type of 0, RPDO2 has a transmission type of 5, TPDO1 has a transmission type of 0, and TPDO2 has a transmission type of 20. Once RPDO1 and RPDO2 receive the PDO, the latest PDO data will be updated to the corresponding application in the next synchronization. Once the mapping data of TPDO1 changes, TPDO1 will be transmitted in the next synchronization. After TPDO2 experiences 20 SYNC, the PDO will be transmitted no matter whether the data changes.

19.3.4.5 Emergency (EMCY) Object Service

When an error occurs in a CANopen node, the node sends an emergency message according to the standard mechanism. The emergency message complies with the producer-consumer model. After the node fault is sent, other nodes in the CAN network may handle the fault. The SV680P-INT series servo drive only serves as the emergency message producer, which means it does not process emergency messages of other nodes.

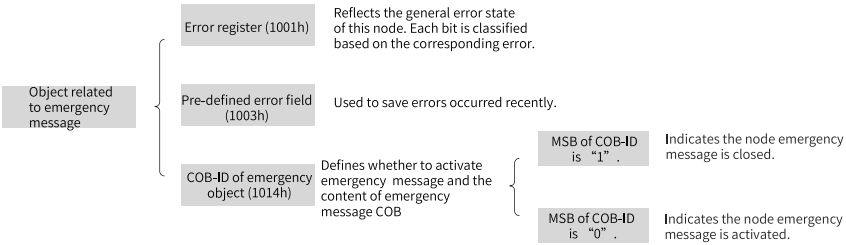


Figure 19-26 Description of objects related to emergency messages

When a fault occurs on the node, the error register and the pre-defined error field must be updated no matter whether the emergency object is activated. The content of the emergency message follows the following specifications.

Table 19–19 Specifications of the content of an emergency message

COB-ID	0	1	2	3	4	5	6	7
80h + Node_ID	Error code		Error register	Re served	Auxiliary byte			

- The error register is always consistent with 1001h.
- When a communication error occurs, the error code is consistent with the one required by DS301 and the auxiliary byte is 0.
- When an error specified by the user occurs on the servo drive, the error code is 0xFF00 and the auxiliary byte displays the error code specified by the user.

19.3.4.6 SDO Transmission Message

SDO transmission include transmission of object data with no more than four bytes and those with more than four bytes. Object data with no more than four bytes are transmitted in the expedited SDO mode. Object data with more than four bytes are transmitted in the segmented SDO mode or block mode.

The SV680P-INT supports expedited SDO transfer and segmented SDO transfer only.

An SDO transmission message consists of a COB-ID and a data segment. As shown in the following table, the COB-ID of T_SDO and R_SDO messages are different.

The data segment adopts the little endian mode, in which least significant bits are arranged in front of most significant bits. The data segment of all SDO messages must consist of eight bytes. The following table describes the format of SDO transmission message.

Table 19–20 Description of SDO transmission message format

COB-ID	Data (data segment)							
580h+Node_ID	0	1	2	3	4	5	6	7
600h+Node_ID	Command code	Index		Sub-index	Data			

The command code specifies the transmission type and transmission data length of the SDO. The index and sub-index indicate the position of the SDO in the list; the data indicates the value of the SDO.

Message written in expedited SDO mode

Expedited SDO transfer is used for reading/writing the object message with no more than four bytes. The transmission message varies the read/write mode and data length. The following table describes the message written in the expedited SDO mode.

Table 19–21 Description

		COB-ID	0	1	2	3	4	5	6	7
Client→		600h+Node_ID	23h	Index		Sub-index	Data			
			27h				Data			-
			2bh				Data		-	-
			2fh				Data	-	-	-
←Server	Normal	580h+Node_ID	60h	Index		Sub-index	-	-	-	-

		COB-ID	0	1	2	3	4	5	6	7
	Abnormal		80h				Abort Code			

Note

"-" indicates data exists but is not considered. It is recommended that 0 is written.

Example:

If the slave station No. is 4 and SDO is used to write the speed value (60FF.00h) in the speed mode, write 1000 (namely 0x3E8). The messages sent by the master are shown in hexadecimal in the following table.

Table 19–22 Example of a message sent by the master

COB-ID	0	1	2	3	4	5	6	7
604	23	FF	60	00	E8	03	00	00

If the value is written successfully, the servo drive returns the following message.

Table 19–23 Example of a message returned by the servo drive upon normal write operation

COB-ID	0	1	2	3	4	5	6	7
584	60	FF	60	00	00	00	00	00

If the type of the data written does not match, the fault code 0x06070010 is returned. The message is as follows.

Table 19–24 Example of a message returned upon mismatch of the written data type

COB-ID	0	1	2	3	4	5	6	7
584	80	FF	60	00	10	00	07	06

Message written in expedited SDO mode

Object message with no more than four bytes are read in the expedited SDO mode. The following table describes the message written in the expedited SDO mode.

Table 19–25 Structure of an SDO start packet transmitted

		COB-ID	0	1	2	3	4	5	6	7
Client→		600h+Node_ID	40h	Index		Sub-index	-	-	-	-
←Server	Normal	580h+Node_ID	41h	Index		Sub-index	Data Length			
	Abnormal		80h				Abort Code			

During transmission, the trigger bit (bit6) of the command code sends 0 or 1 alternatively. This rule must be maintained so that the slave can respond to the message. The structure of the process message is shown in the following table.

Table 19–26 Structure of a message during SDO transmission

		COB-ID	0	1	2	3	4	5	6	7
Client→		600h+Node_ID	60h	-	-	-	-	-	-	-
←Server	Normal	580h+Node_ID	00h	Data Length						
	Abnormal		80h	Index		Sub-index	Abort Code			
Client→		600h+Node_ID	70h	-	-	-	-	-	-	-
←Server	Normal	580h+Node_ID	10h	Data Length						
	Abnormal		80h	Index		Sub-index	Abort Code			

The response packet of the end frame transmitted in segmented mode includes the end frame identifier and valid data length of the end frame. The structure of its transmission message is shown in the following table.

Table 19–27 Message structure of the last frame in SDO segmented transmission

		COB-ID	0	1	2	3	4	5	6	7
Client→		600h+Node_ID	60h/70h	Index		Sub-index	-	-	-	-
←Server	Normal	580h+Node_ID	01h/11h	Data						
			03h/13h	Data						-
			05h/15h	Data					-	-
			07h/17h	Data				-	-	-
			09h/19h	Data			-	-	-	-
			0Bh/1Bh	Data		-	-	-	-	-
			0Dh/1Dh	Data	-	-	-	-	-	-
	Abnormal		80h	Index		Sub-index	Abort Code			

19.3.4.7 SDO Transmission Framework

SDO transmission complies with the client-server mode, that is, one initiates a request and the other responds to the request. The SDO client in the CAN bus network initiates a request and the SDO server responds to the request. Therefore, data exchange between SDOs requires at least two CAN messages with different CAN identifiers. The SDO transmission model is shown in the following figure.

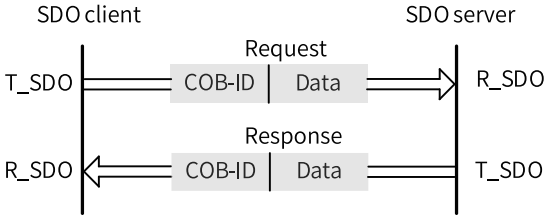


Figure 19-27 Object word in the SDO server read/written by the SDO client

19.3.5Communication Parameters

To connect the servo drive to the CANopen fieldbus network, set related parameters of the servo drive properly.

CANopen parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.00	2002-01h	Control mode	Select the servo control mode. 0: Speed control mode 1: Position control mode 2: Torque control mode 3: Torque/Speed control mode 4: Speed/Position control mode 5: Torque/Position control mode 6: Torque/Speed/Position compound mode 7: Process segment 8: CANopen mode	1	-	At stop
H0E.00	200E-01h	Node address	1–127	1	-	At stop
H0E.01	200E-02h	Save objects written through communication to EEPROM	0: Not save 1: Save parameters 2: Save object dictionaries 3: Save parameters and object dictionaries 4: Save object dictionaries written before communication (OP) 255: Determine through H0E03 and H0E04	1	-	Real-time

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H0E.10	200E-0Bh	CAN selection	0: Pulse/Axis control command 1: Enhanced axis control command 2: CANopen	0	-	At stop
H0E.11	200E-0Ch	CAN baud rate	0: 20kbps 1: 50kbps 2: 100kbps 3: 125kbps 4: 250kbps 5: 500kbps 6: 1Mbps 7: 1Mbps	5	-	At stop

19.4 EtherCAT Communication [N]

19.4.1 Communication

19.4.1.1 Communication Technical Data

Item		Specification
EtherCAT Basic performance of slave	Communication protocol	EtherCAT protocol
	Service supported	CoE (PDO, SDO)
	Synchronization mode	DC - Distributed clock FreeRun
	Physical layer	100Base-TX
	Baud rate	100 Mbit/s (100Base-TX)
	Duplex mode	Full duplex
	Topology	Ring, linear, star, tree
	Transmission medium	Cat5e shielded cables or Cat6e cables
	Transmission distance	Less than 100 m between two nodes (with proper environment and cables)
	Number of slaves	65535 by protocol
	EtherCAT frame length	44 bytes to 1498 bytes
	Process Data	Max. 1,486 bytes per Ethernet frame
	Synchronous jitter of two slaves	< 1 μs
	Communication code error rate	10^{-10} Ethernet standard

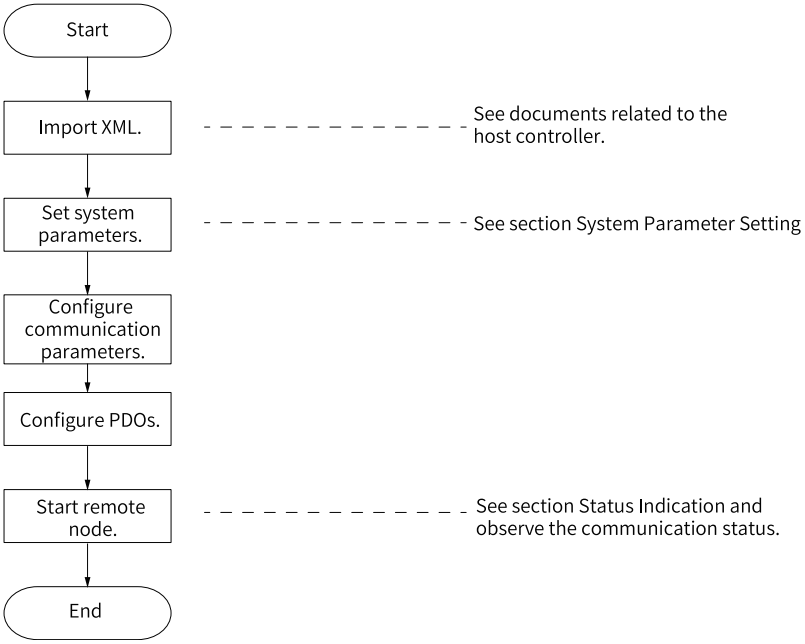
Item		Specification
	Min. sync period	250μs
EtherCAT configuration unit	Number of FMMU units	8
	Number of storage synchronization management units	8
	Process data RAM	8 KB
	Distributed clock	64-bit
	EEPROM capacity	32 kbit

19.4.1.2 Communication Specifications

Item		Specification
Communication protocol		IEC 61158 Type 12, IEC 61800-7 CiA 402 Drive Profile
Application layer	SDO	SDO request, SDO response
	PDO	Variable PDO mapping, fixed PDO mapping
	CiA402	Profile Position Mode (PP)
		Profile Velocity Mode (PV)
		Profile Torque Mode (PT)
		Homing mode (HM)
		Cyclic synchronous position mode (CSP)
		Cyclic synchronous velocity mode (CSV)
		Cyclic synchronous torque mode (CST)
Physical layer	Transmission protocol	100Base-TX (IEEE802.3)
	Maximum distance	100 m
	Interface	RJ45 × 2 (IN, OUT)

19.4.1.3 Protocols

EtherCAT features high performance, low cost, ease of use, and flexible topology. It is applicable to ultra high-speed I/O networks in the industrial field, and adopts standard Ethernet physical layer with twisted pair or optical fiber (100Base-TX or 100Base-FX) as the transmission media.



An EtherCAT system includes the master and the slave. The master requires a common network adapter, and the slave requires a special slave control chip, such as ET1100, ET1200, and FPGA.

EtherCAT can process data at the I/O layer,

- without any sub-bus
- or gateway delay
- One system covers all devices, including input/output devices, sensors, actuators, drives, and displays……
- Transmission rate: 2 × 100 Mbit/s (high-speed Ethernet, full duplex mode).
- Synchronization: synchronization jitter < 1 μs (number of nodes up to 300, cable length within 120 m)

Update time:

256 digital I/O: 11 μs

1000 digital I/Os distributed in 100 nodes: 30 μs = 0.03 ms

200 AI/AOs (16-bit): 50 μs, sampling rate: 20 kHz

100 servo axes (8 bytes IN + 8 bytes OUT for each): 100 μs = 0.1 ms

12000 digital I/Os: 350μs

To support more types of devices and applications, EtherCAT establishes the following application protocols:

- CANopen over EtherCAT (CoE)
- Safety over EtherCAT (SoE, compliant with IEC 61800-7-204)
- Ethernet over EtherCAT (EoE)
- File over EtherCAT (FoE)

The slave only needs to support the suitable application protocol.

Note

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

19.4.2 Hardware Configuration

19.4.2.1 Terminal Arrangement

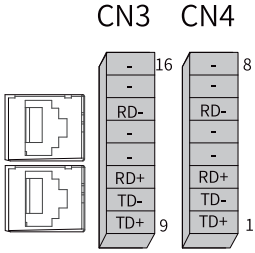


Figure 19-28 Communication Terminal pin layout of the servo drive

Table 19–28 EtherCAT communication terminal pins

Pin No.	Name	Description
1	TD+	Data transmit positive
2	TD-	Data transmit negative
3	RD+	Data reception+
4 and 5	-	-
6	RD-	Data reception–
7 and 8	-	-
9	TD+	Data transmit positive
10	TD-	Data transmit negative
11	RD+	Data reception+
12 and 13	-	-
14	RD-	Data reception–
15 and 16	-	-

19.4.2.2 EtherCAT Communication Connection Example

CN3 and CN4 are EtherCAT connectors. Connect CN4 (IN) to the communication port of the master and CN3 (OUT) to the next slave. For assignment of CN3/CN4 terminal pins, see the related section.

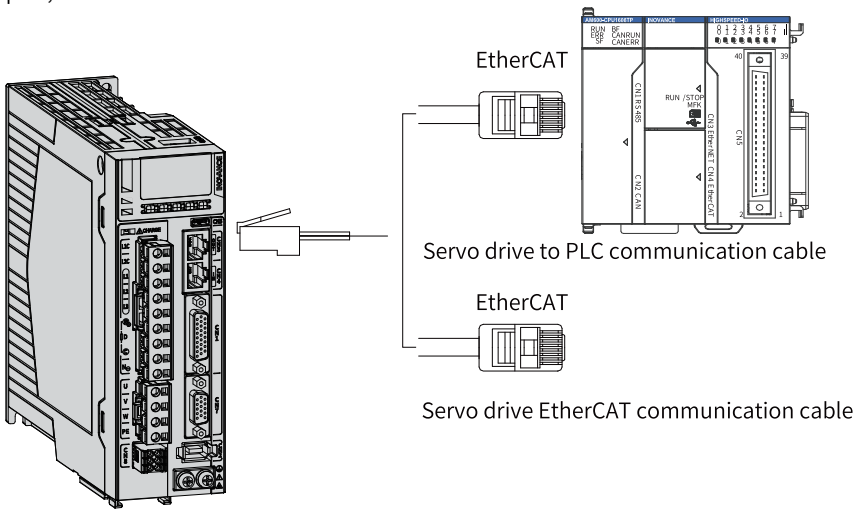


Figure 19-29 Wiring of communication cables

Topology

The communication topology of EtherCAT is flexible without any limit, as shown in *"Figure 19–30 Communication network topology" on page 941*. The drive carries IN and OUT ports.

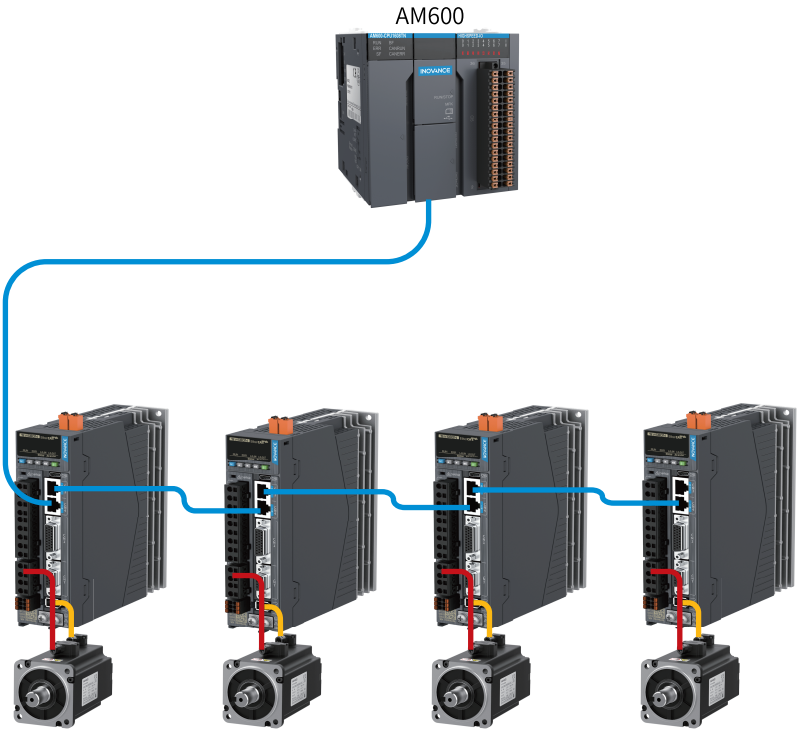
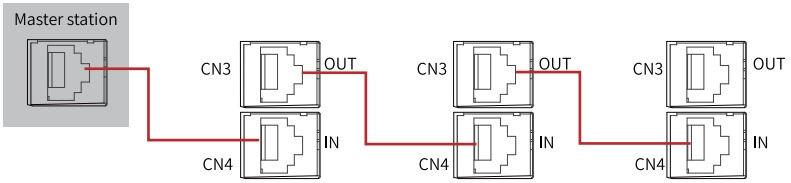
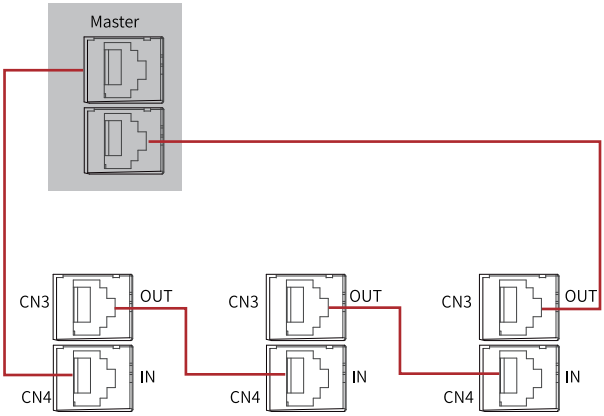


Figure 19-30 Communication network topology

Linear



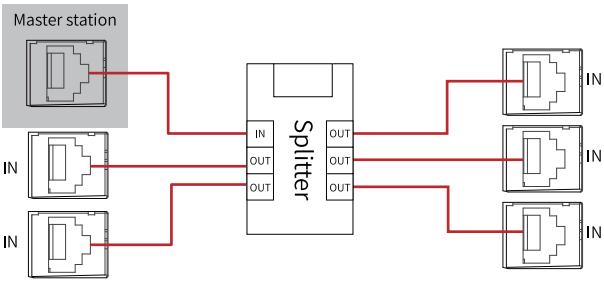
Ring



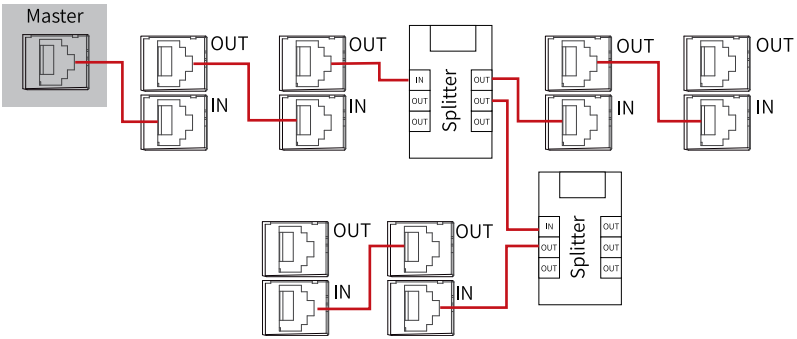
Note

When using the redundant ring, set H0E.36 (EtherCAT AL enhanced link) to 1 (Enable). Power on the drive so that the setting become effective.

Star



Tree



19.4.3 Communication Transmission Mode

19.4.3.1 Structure of EtherCAT Communication

Multiple kinds of application protocols are available for EtherCAT communication. The IEC 61800-7 (CiA 402)-CANopen motion control profile is used for SV680N-INT series servo drives. The following figure shows the EtherCAT communication structure at the CANopen application layer.

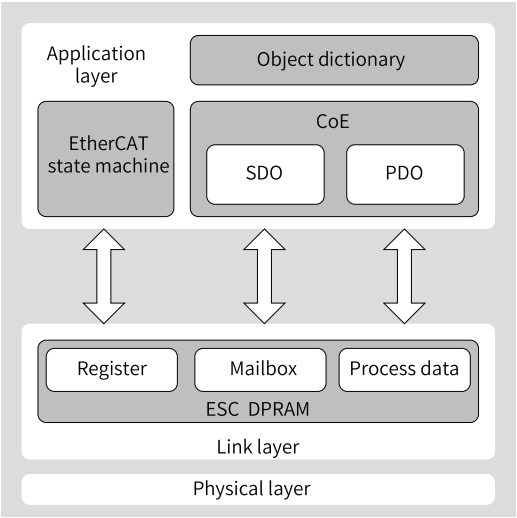


Figure 19-31 EtherCAT communication structure at CANopen application layer

The object dictionary in the application layer includes communication parameters, application process data and PDO mapping data. The process data object (PDO) includes the real-time data generated during operation, which is read and written

cyclically. In the SDO mailbox communication, the communication objects and PDO objects are being accessed and modified non-cyclically.

19.4.3.2 Communication State Machine

The following figure shows the state transition diagram of the EtherCAT module.

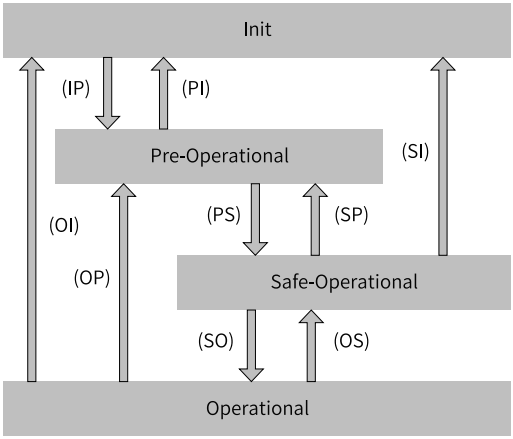


Figure 19-32 EtherCAT state machine

The EtherCAT module must support four states and coordinates the state relationship between the master and slave applications during initialization and operation.

- Init: initialization, shortened as I
- Pre-Operational: pre-operational, shortened as P
- Safe-Operational: safe-operational, shortened as S
- Operational: operational, shortened as O

Transition from Init state to Operational state must be in the sequence of Init→Pre-Operational→Safe→Operational, and then Operational step by step. In transition from the Operational state to the Init state, certain steps can be skipped. The following table lists the state transition and the initialization process.

Status	SDO	RPDO	TPDO	Description
Init (I)	×	×	×	Communication initialization No communication available in the application layer, EtherCAT slave controller (ESC) register can only be read/written by the master
IP	×	×	×	The master configures the slave addresses, mailboxes, and distributed clocks (DCs). Request the Pre-Operational state.

Status	SDO	RPDO	TPDO	Description
Pre-Operational (P)	✓	×	×	Mailbox data communication in the application layer (SDO).
PS	✓	×	×	The master uses process data mapping of SDO initialization. The master configures the Sync Manager channel used during process data communication. The master configures the FMMU. Request the Safe-Operational state.
Safe-Operational (S)	✓	×	✓	SDO, TPDO, and distributed clock mode can be used.
SO	✓	×	✓	The master sends valid output data. to request the Operational state.
Operational (O)	✓	✓	✓	Normal operational state Both input and output are valid. Mailbox communication can still be used.

19.4.3.3 Distributed clock

The distributed clock (DC) enables all EtherCAT devices to use the same system time and allows synchronous execution of slave tasks. A slave produces the synchronization signal according to the synchronized system time. The SV680N-INT drive only supports the DC sync mode. The synchronization period, which is controlled by SYNC, varies with different motion modes.

Note

- The SYNC signal can be used to synchronize all the salves with an error less than 1 μs. The master must synchronize all the slaves to the same clock and continues doing so during operation to prevent clock skew caused by the difference in the crystal oscillator. Generally, it is to synchronize the 0x910 register of ESC.
- SYNC starting time = 0x990 register (with ESC) - 0x920 Note that the DC mode (0x981 = 0x03) can be enabled only after 0x910 reaches the starting time. If the starting time of SYNC is set improperly, the 0x134 status register of ESC will report the error code of 0x2D.

19.4.3.4 Status Indication

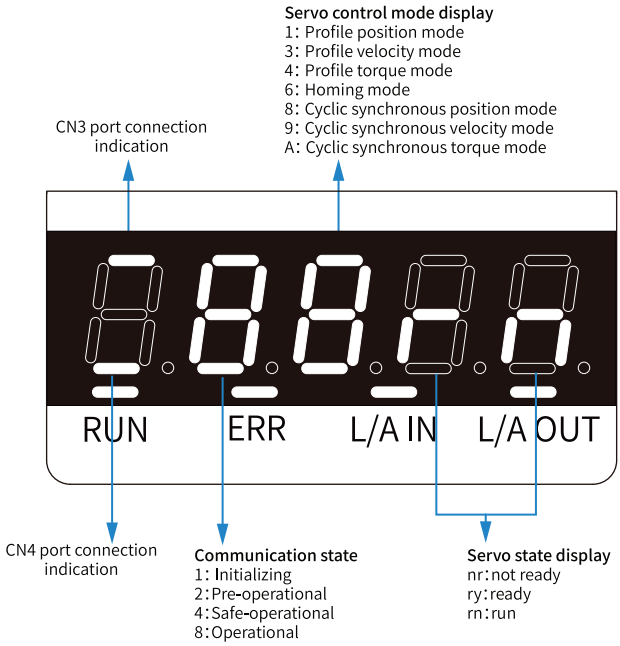


Figure 19-33 Status indication diagram

If the value 0 is displayed, it indicates no value is written or the value 0 is written to 6060h, or H02.00 is set to 0, 1 or 2.

Communication connection

For the SV680N-INT, the connection status of the two RJ45 ports are indicated by "-" on the upper and lower part of the first LED on the keypad. The upper "-" indicates the status of CN3:PORT1, and the lower "-" indicates the status of CN4:PORT0.

Solid OFF: No communication connection is detected in the physical layer.

Solid on: Communication connection is detected in the physical layer.

Communication status

The 2nd LED indicates the status of the EtherCAT state machine of the slave in the form of characters, as described in the following table.

State of EtherCAT state machine:

state	SDO	RPDO	TPDO	Description	Panel Display
Initialization	No	No	No	Communication initialization	1: Steady on
Pre-operational	Yes	No	No	Network configuration initialized SDO is available	2: Blinks at an interval of 400 ms
Safe-operational	Yes	No	Yes	SDO, TPDO, and distributed clock mode are available	4: Blinks with a period of 1200 ms, on for 200 ms and off for 1000 ms
Operation	Yes	Yes	Yes	Normal operation state	8: Steady on

Display of control modes

The 3rd LED indicates the operation mode of the servo drive in the form of hexadecimal without blinking, as described in the following table.

The operation modes include the following:

Modes of operation (6060h)	Panel Display
1: Profile position mode	1
3: Profile velocity mode	3
4: Profile torque mode	4
6: Homing mode	6
8: Cyclic synchronous position mode	8
9: Cyclic synchronous velocity mode	9
10: Cyclic synchronous torque mode	A

Display of servo status

The 4th and 5th LEDs indicate the servo status of the slave.

The statuses include the following:

state	Description	Panel Display
Reset	Initialization	reset
Not ready	Initialization is done. The control circuit is switched on but the main circuit is not switched on. Not ready	nr

state	Description	Panel Display
Ready	The main circuit is switched on, but the S-ON signal is inactive. Ready	ry When the absolute value of the speed exceeds the value of H06.16, the character "y" blinks. When the communication layer is in pre-operational or safe-operational state, the blinking frequency is the same as that of the display "2" or "4" (See *" Communication status" on page 946*). When the communication layer is in Init or Operational state, the blinking frequency is 2 Hz.
Operation	The S-ON signal is active and the motor is energized. Run	rn The character "n" blinks when the absolute value of the speed exceeds the value of H06.16. When the communication layer is in pre-operational or safe-operational state, the blinking frequency is the same as that of the display "2" or "4" (See *" Communication status" on page 946*). When the communication layer is in Init or Operational state, the blinking frequency is 2 Hz.

Description of indicators

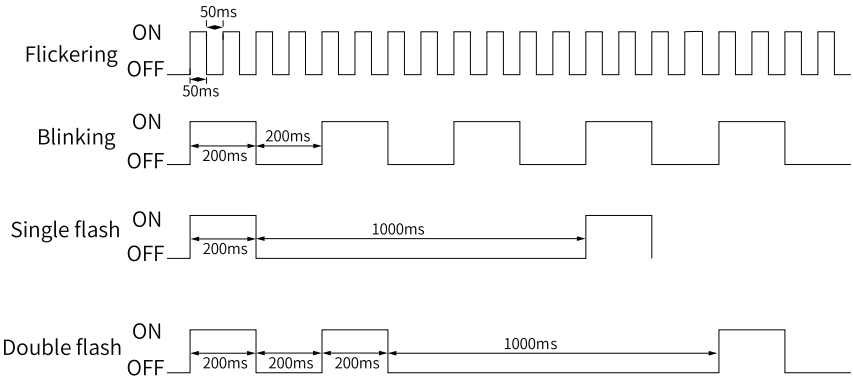


Figure 19-34 Description of indicators

Indicator	state	Status Indication
RUN	OFF	Initialization.

Indicator	state	Status Indication
	Blinking (on for 200 ms and off for another 200 ms)	Pre-Operational.
	Single flash (on for 200 ms and off for 1000 ms)	Safe-Operational.
	ON	Operational.
ERR	OFF	No Network error.
	Blinking (on for 200 ms and off for another 200 ms)	Communication setting error.
	Single flash (on for 200 ms and off for 1000 ms)	Sync event error.
	Double flash (on for 200 ms and off for 200 ms, and then on for 200 ms and off for 1000 ms)	Watchdog timeout.
L/A IN indicator[1] L/A OUT indicator	OFF	Link is not established.
	Flickering (on for 50 ms and off for another 50 ms)	Link is established. A data transceiving signal is present.
	ON	Link is established. No data transceiving signal is present.

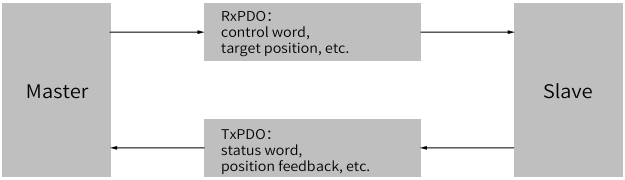
[1]: L/A IN and L/A OUT indicate the Link state and operation state of the physical layer of each port.

The color of the ERR indicator is red, and the other three indicators are green.

19.4.4 Data Frame Structure

19.4.4.1 Process Data

The real-time data transmission of EtherCAT is achieved through PDO. PDOs can be divided into RPDOs (Receive PDO) and TPDOs (Transmit PDO) based on the data transmission direction. RPDOs transmit the master data to the slave, and TPDOs returns the slave data to the master.



The SV680N-INT series servo drive allows users to assign the PDO list and define the PDO mapping objects.

PDO mapping

The PDO mapping is used to establish the mapping relation between the object dictionary and the PDO. 1600h to 17FFh are RPDOs, and 1A00h to 1BFFh are TPDOs. The SV680N-INT provides 7 RPDOs and 6 TPDOs, as listed in the following table.

RPDO (7)	1600h, 1601h	Variable mapping
	1701h to 1705h	Fixed mapping
TPDO (6)	1A00h, 1A01h	Variable mapping
	1B01h to 0x1B04h	Fixed mapping

Fixed PDO mapping

SV680N-INT provides five fixed RPDOs and four fixed TPDOs.

The following table lists the typical instances of RPDOs and TPDOs.

Control Mode	PP/CSP
1701h (Outputs)	Mapping objects (4 mapping objects, 12 bytes)
	6040h (control word) 607Ah (target position) 60B8h (touch probe function) 60FEh sub-index 1 (forced physical outputs)
1B01h (Inputs)	Mapping objects (9 mapping objects, 28 bytes)
	603Fh (error code) 6041h (status word) 6064h (position actual value) 6077h (torque actual value) 60F4h (following error actual value) 60B9h (probe status) 60BAh (probe 1 positive edge) 60BCh (probe 2 positive edge) 60FDh (DI state)

Control Mode	PP/PV/PT/CSP/CSV/CST
1702h (Outputs)	Mapping objects (7 mapping objects, 19 bytes)
	6040h (control word) 607Ah (target position) 60FFh (target velocity) 6071h (target torque) 6060h (mode selection) 60B8h (touch probe function) 607Fh (max. profile velocity)
1B02h (Inputs)	Mapping objects (9 mapping objects, 25 bytes)

	603Fh (error code) 6041h (status word) 6064h (position actual value) 6077h (torque actual value) 6061h (Mode display) 60B9h (probe status) 60BAh (probe 1 positive edge) 60BCh (probe 2 positive edge) 60FDh (DI state)

Control Mode	PP/PV/CSP/CSV
1703h (Outputs)	Mapping objects (7 mapping objects, 17 bytes)
	6040h (control word) 607Ah (target position) 60FFh (target velocity) 6060h (mode selection) 60B8h (touch probe function) 60E0h (positive torque limit value) 60E1h (Negative torque limit value)
1B03h (Inputs)	Mapping objects (10 mapping objects, 29 bytes)
	603Fh (error code) 6041h (status word) 6064h (position actual value) 6077h (torque actual value) 60F4 (following error actual value) 6061h (Mode display) 60B9h (probe status) 60BAh (probe 1 positive edge) 60BCh (probe 2 positive edge) 60FDh (DI state)

Control Mode	PP/PV/PT/CSP/CSV/CST
1704h (Outputs)	Mapping objects (9 mapping objects, 23 bytes)
	6040h (control word) 607Ah (target position) 60FFh (target velocity) 6071h (target torque) 6060h (mode selection) 60B8h (touch probe function) 607Fh (max. profile velocity) 60E0h (positive torque limit value) 60E1h (Negative torque limit value)

Control Mode	PP/PV/CSP/CSV
1705h (Outputs)	Mapping objects (8 mapping objects, 19 bytes)

	6040h (control word) 607Ah (target position) 60FFh (target velocity) 6060h (mode selection) 60B8h (touch probe function) 60E0h (positive torque limit value) 60E1h (negative torque limit value) 60B2h (torque offset)

Variable PDO mapping

SV680N-INT provides two variable RPDOs and two variable TPDOs.

Variable PDO	Index	Max. Length of the Byte	Default Mapping Object
RPDO1	1600h 1601h	40	6040h (control word) 607Ah (target position) 60B8h (touch probe function)
TPDO1	1A00h 1A01h	40	603Fh (error code) 6041h (status word) 6064h (position actual value) 60BCh (probe 2 positive edge) 60B9h (probe status) 60BAh (probe 1 positive edge) 60FDh (DI state)

Sync Manager PDO assignment

The process data can contain multiple PDO mapping data objects during cyclic EtherCAT data communication. The CoE protocol defines the PDO mapping object list of the Sync Manager using data objects 1C10 to 1C2Fh. Multiple PDOs can be mapped to different sub-indexes. The SV680N-INT supports assignment of one RPDO and one TPDO, as described in the following table.

Index	Sub-index	Description
1C12h	01h	One of 1600h, 1601h and 1701h to 1705h used as the actual RPDO.
1C13h	01h	One of 1A00h, 1A01h and 1B01h to 1B04h used as the actual TPDO.

PDO configuration

PDO mapping parameters include pointers of process data that corresponds to PDO and that is to be sent or received by PDO, including index, sub-index, and mapping object length. The sub-index 0 indicates the number (N) of mapping objects in the PDO, and the maximum length of each PDO is 4 x N bytes. One or multiple objects can be mapped simultaneously. Sub-indexes 1 to N indicate the mapping content, defined as follows.

Places	31	...	16	15	...	8	7	...	0
Description	Index			Sub-index			Object Length		

The index and sub-index together define the position of an object in the object dictionary. The object length indicates the bit length of the object in hexadecimal, as shown below.

Object Length	Bit Length
08h	8-bit
10h	16-bit
20h	32-bit

For example, the mapping parameter of the 16-bit control word 6040.00h is 60400010h.

- PDO mapping steps:
  Abide by the following procedures for PDO mapping:

  1. Configure the mapping group of PDO. Write 0 to sub-index 00h of 1C12h (or 1C13h).

     a. Clear the original mapping group. Write 0 to sub-index 00h of 1C12h (or 1C13h) to clear the original mapping group.
     b. Write the PDO mapping group. Write the mapping group according to application needs. Pre-write values of 1600h/1701h...1705h to 1C12h and values of 1A00h/1B01h...1B04h to 1C13h. Note: Only 1600h and 1A00h, and 1601h and 1A01h are configurable mapping groups.
     c. Write the total number of this PDO mapping group to sub-index 0 of 1C12h (or 1C13h).

  2. Configure the mapping objects of PDO. Write 0 to sub-index 00h of 1600h (or 1A00h) and 1601h(or 1A01h).

     a. Clear the original mapping objects. Write 0 to sub-index 00h of 1600h (or 1A00h), and 1601h (or 1A01h) to clear the original mapping objects.
     b. Write the PDO mapping content. Write the mapping content to sub-index 1...10 of the mapping parameter based on object parameter definitions in XML file. Only mappable objects can be configured as PDO mapping content.
     c. Write the total number of mapping objects. Write the number of mapping objects in step b to sub-index 0.

Note

- Configure the PDO only when the EtherCAT state machine is in pre-operational state ("2" displayed on the keypad). Otherwise, an error will be reported.
- Do not save the PDO configuration parameters to EEPROM. Configure the mapping objects again each time upon power-on. Otherwise, the mapping objects are the default parameters of the servo drive.

An SDO fault code will be returned when the following operations are under execution:

- Modify PDO parameters in status other than pre-operational.
- Write a value outside the range of 1600h/1601h/1701h...1705h to 1C12h. Write a value outside the range of 1A00h/ 1A01h/1B01h...1B04h to 1C13h.

19.4.4.2 Mailbox Data

The EtherCAT SDO is used to transfer non-cyclic data, such as communication parameter configuration and servo drive parameter configuration. The CoE service types of EtherCAT include:

- Emergency message
- SDO request:
- SDO response:
- TxPDO
- RxPDO
- Remote TxPDO transmission request
- Remote RxPDO transmission request
- SDO information.

The SV680N-INT series supports SDO request and SDO response.

19.4.5 Communication Parameters

Parameter address structure

Parameter access address: index+subindex, both are hexadecimal.

The CiA402 protocol establishes the following restrictions on the parameter address:

Index (Hex)	Description
0000h to 0FFFh	Data type description
1000h to 1FFFh	CoE communication object
2000h to 5FFFh	Manufacturer-specific object
6000h to 9FFFh	Profile object
A000h–FFFFh	Reserved

System Parameter Setting

Set related parameters to allow the SV680N-INT servo drive to be connected to the EtherCAT fieldbus network.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H02.00	2002-01h	Control mode	0: Velocity mode 1: Position mode 2: Torque mode 7: Technology segment 9: EtherCAT mode	9	-	At stop
H0E.01	200E-02h	Save objects written through communication to EEPROM	0: Not save 1: Save parameters written through communication to EEPROM 2: Save object dictionaries written through communication to EEPROM 3: Save parameters and object dictionaries written through communication to EEPROM4: Save object dictionaries written before communication (OP) to EEPROM 255: Determine through H0E03 and H0E04	4	-	Real-time
H0E.21	200E-16h	EtherCAT slave alias	0–65535	0	-	At stop

Note

Before saving parameters to EEPROM, set H0E.01 to a proper value. Otherwise, parameters will be restored to default values at next power-on. It is recommended to set H0E.01 to 0 after parameters are set properly. This is to prevent damage to the EEPROM device caused by prolonged writing process.

19.5 Communication Configuration Instance

19.5.1 Modbus Communication Configuration Case [P]

19.5.1.1 Communication Overview

The following describes the Modbus RTU communication connection between Inovance H5U and the SV680P-INT series servo drive. It can be achieved by a

configuration table or program. In this case, H06.03 (Write speed) and H0b.00 (Read speed) are used for illustration.

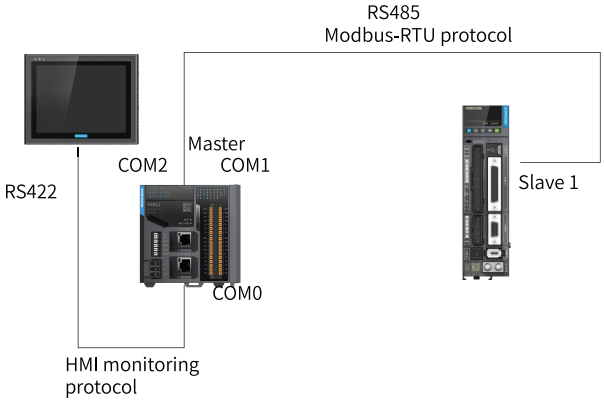


Figure 19-35 Schematic and wiring

19.5.1.2 Wiring of Modbus RTU Communication Between SV680P-INT and Third-Party PLCs

Inovance H5U and SV680P-INT

Name	Model	Quantity	Remarks
PLC	H5U-1614MTD	1 piece	-
Inovance SV680P-INT series servo drive and applicable motor	SV680PT012I-INT MS1H3-*******	1 set	-

COM1 Terminal Layout on PLC Side		CN3/CN4 Terminal Layout on Drive Side	
Signal Name	Pin No.	Signal Name	Pin No.
RS485+	1	RS485+	4
RS485-	2	RS485-	5
-	-	PE (shield layer)	Enclosure

Siemens PLC and SV680P-INT

Siemens S7200 PLC		CN3/CN4 Terminal Layout on Drive Side	
PLC PORT0-RS485	Pin No.	Signal Name	Pin No.
Data+	3	RS485+	4
Data-	8	RS485-	5
PE (shield layer)	Enclosure	PE (shield layer)	Enclosure

Mitsubishi FX3U and SV680P-INT

Mitsubishi FX3U PLC		CN3/CN4 Terminal Layout on Drive Side	
FX3U-485-BD	Pin No.	Signal Name	Pin No.
SDA	Short	RS485+	4
RDA			
SDB	Short	RS485-	5
RDB			
SG	Enclosure	PE (shield layer)	Enclosure

Setting communication parameters through GX PLC software (initialization of communication port 1):

1. Communication port 1 parameter setting (RS485, 19200, 7, N, 1)
2. LD M8002
3. Initial ON
4. MOV H0C91 D8120
5. Communication port 1 setting
6. SET M8161
7. Communication format: 8-bit

Using two major commands (See the user guide for FX3U communication.)

- RS D100 K8 D120 K8
  - D100: station No. being "?"
  - D120: starting address for data receiving (8 bytes)
- CRC D100 D106 K6
  - D100: station No. being "?"
  - D106: CRC checked address

Omron PLC and SV680P-INT

Omron CP1L		CN3/CN4 Terminal Layout on Drive Side	
PLC PORT0-RS485	Pin No.	Signal Name	Pin No.
SDB+	-	RS485+	4
SDA-	-	RS485-	5
PE (shield layer)	Enclosure	PE (shield layer)	Enclosure

Note

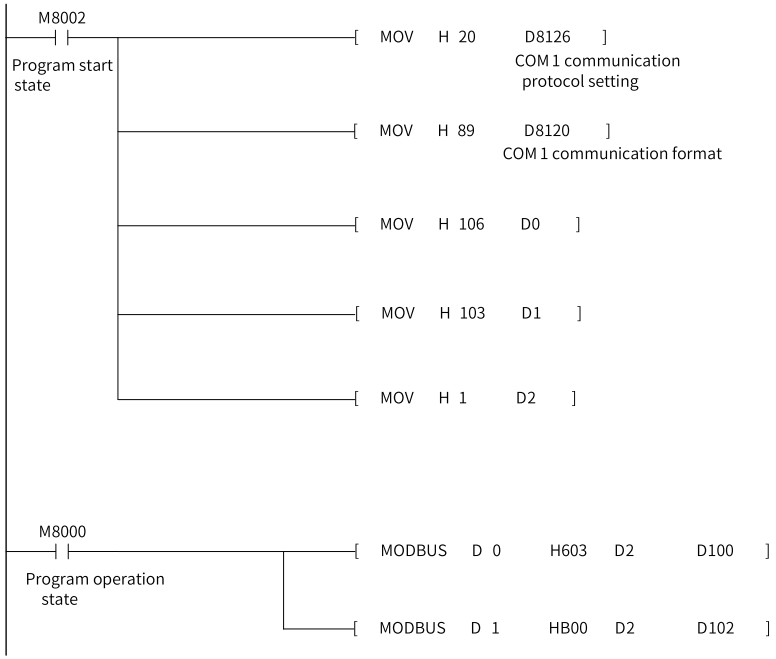
Set 2, 3, 5, and 6 on the DIP switch to ON, and others to OFF. The DIP switch is on the back of PLC communication card.

19.5.1.3 Related Parameter Settings

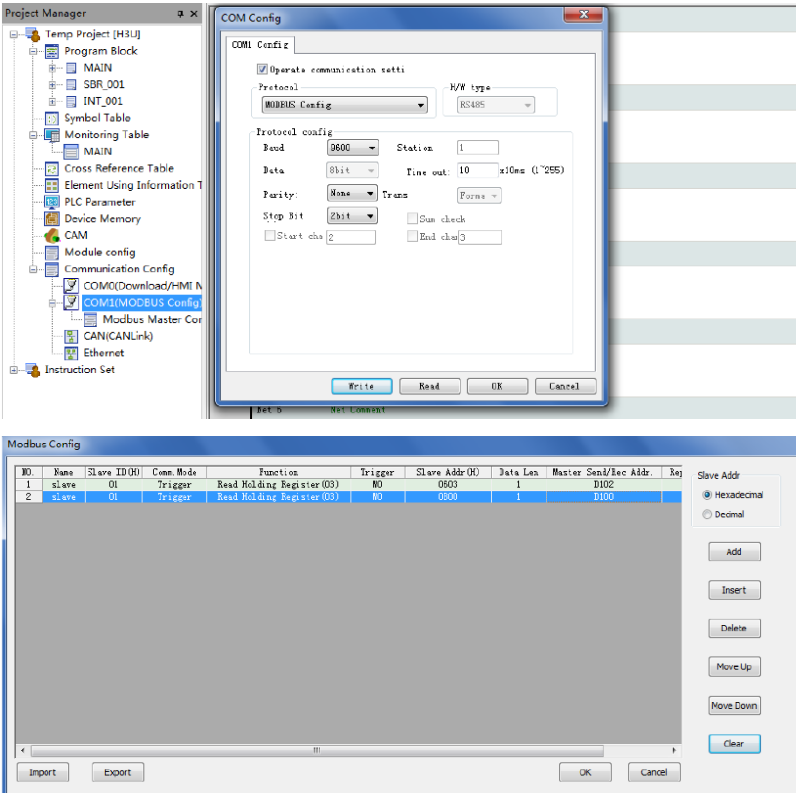
Parameter	Value	Description	Remarks
H0E.00	1	Drive axis address	-
H0E.80	5	Modbus baud rate	5: 9600 bps
H0E.84	1	Sequence of Modbus communication data bits	0: High 16 bits before low 16 bits 1: Low 16 bits before high 16 bits

19.5.1.4 PLC Program Examples

Communication connection implemented through program



Communication connection implemented through configuration table



19.5.2 CANopen Communication Configuration Case [P]

19.5.2.1 Connecting SV680P-INT to Schneider 3S Master

The following takes the position control mode as example. For details on the position control mode, see section "Position Control Mode" in SV680-INT Series Servo Drive Function Guide.

In the position control mode, assignment of objects used as PDO are listed in the following table.

Table 19–29 PDO mapping allocation

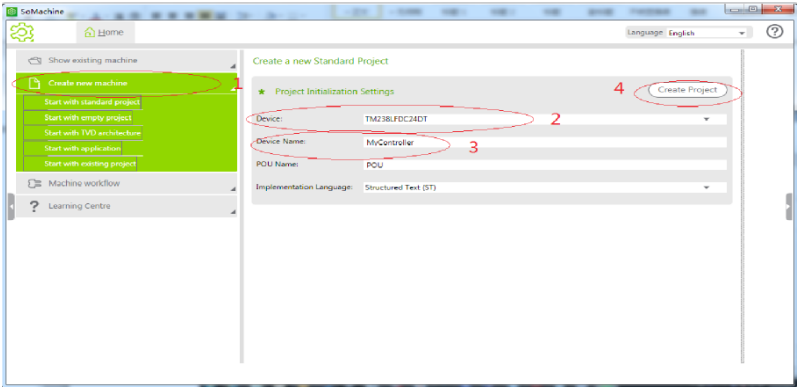
PDO	Object	Description	Bit Length
RPDO1	6040.00h	Control word	Uint16
	6060.00h	Mode selection	Int8
RPDO2	6081.00h	Profile velocity	Uint32

PDO	Object	Description	Bit Length
	607A.00h	Target position	Int32
TPDO1	6041.00h	Status word	Uint16
	6061.00h	Operation mode display	Int8
TPDO2	606C.00h	Speed feedback	Int32
	6064.00h	Position actual value	Int32
TPDO3	H0b.26	Phase current feedback	Uint16

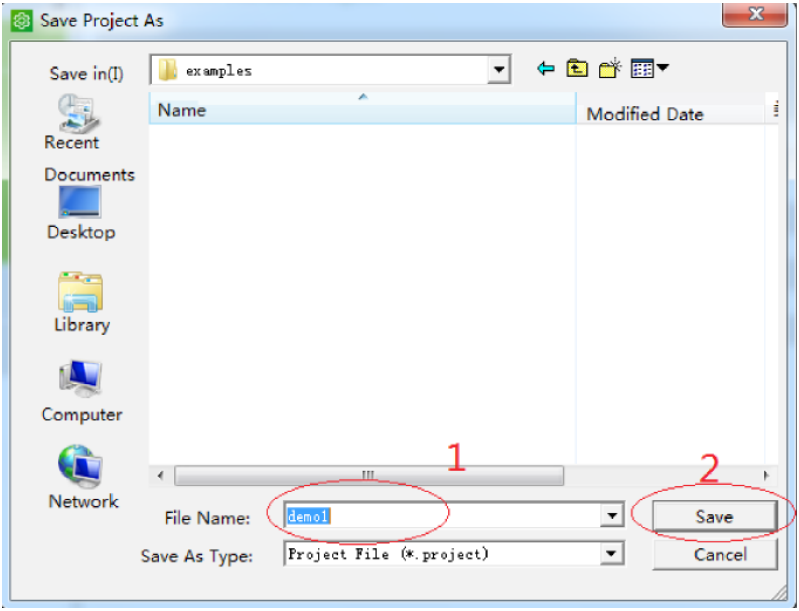
SDO is used to write acceleration 6083h, deceleration 6084h and emergency stop 605Ah.

SoMachine is the software tool of Schneider 3S series master. This section describes how to connect the SV680P-INT servo drive to Schneider M238.

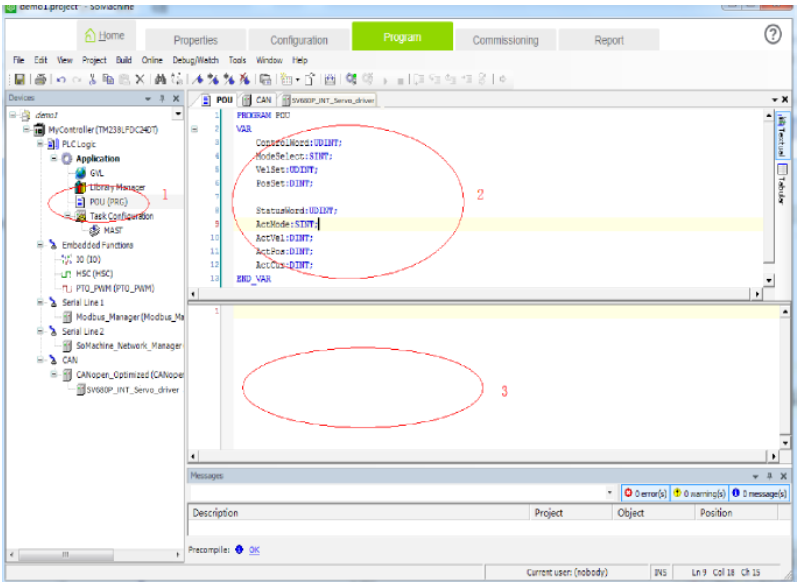
1. Start SoMachine and click **Create new machine** based on a standard project. Select a master device, for example, TM238LFDC24DT, modify the device name, and click **Create Project**, as shown below.



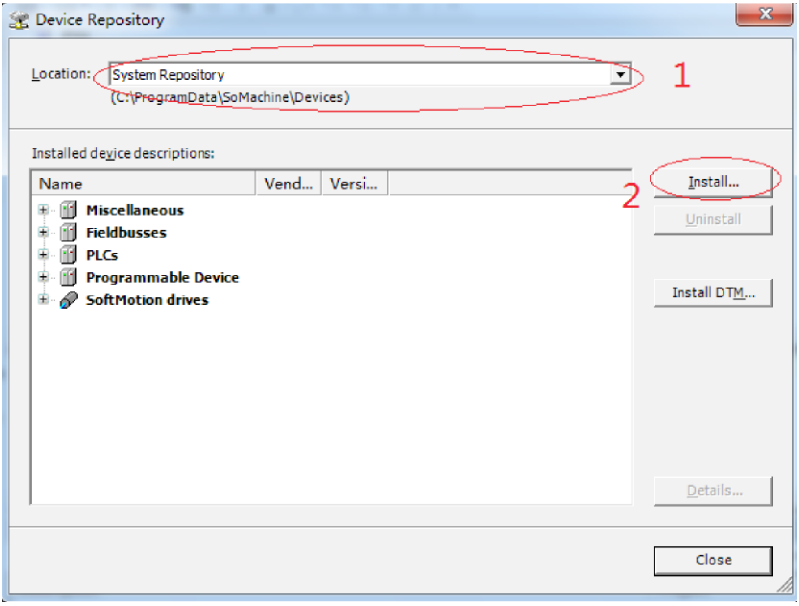
2. Enter the file name and click **Save** in the dialog box displayed.



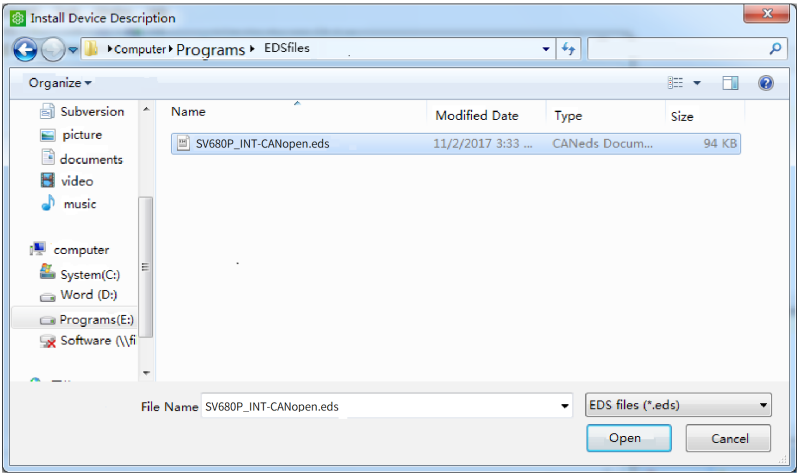
3. The following interface appears.



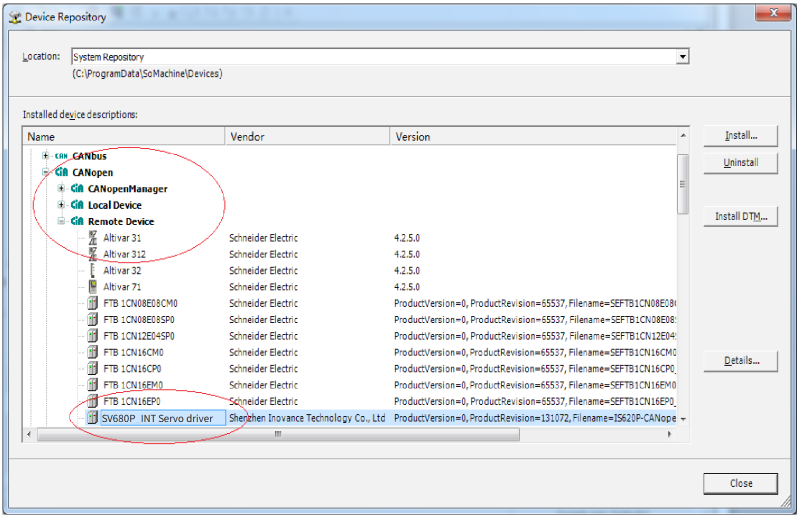
4. Choose **Tools** > **Device Repository** in the toolbar. The **Device Repository** dialog box is displayed. (If the EDS file is imported, steps 4 to 6 can be omitted.)



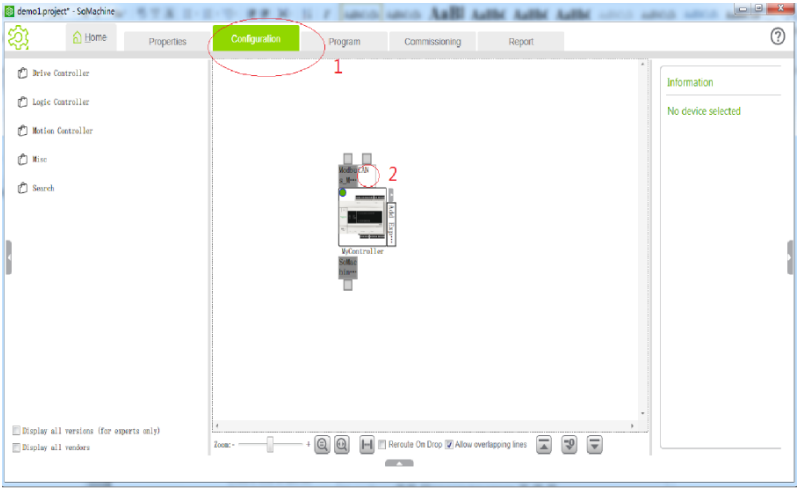
5. As shown in the preceding interface, select **System Repository** and click **Install**. Select a directory for saving the EDS file, as shown below.



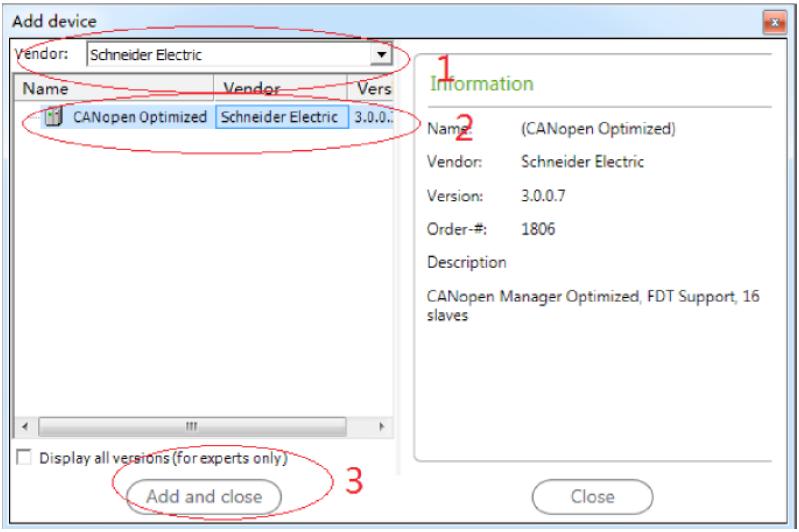
6. Click **Open**. The EDS file of the SV680P-INT servo drive is imported into SoMachine. In the **Device Repository** dialog box, you can choose **Field Bus** > **CANopen** > **Remote Device** to view devices.



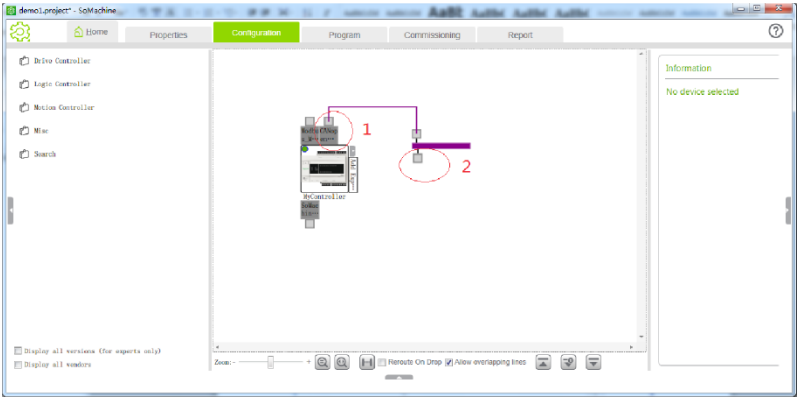
7. Close the preceding dialog box and click **Configuration**. In the interface displayed, only M238 master is available. Click **CAN** on the master station.



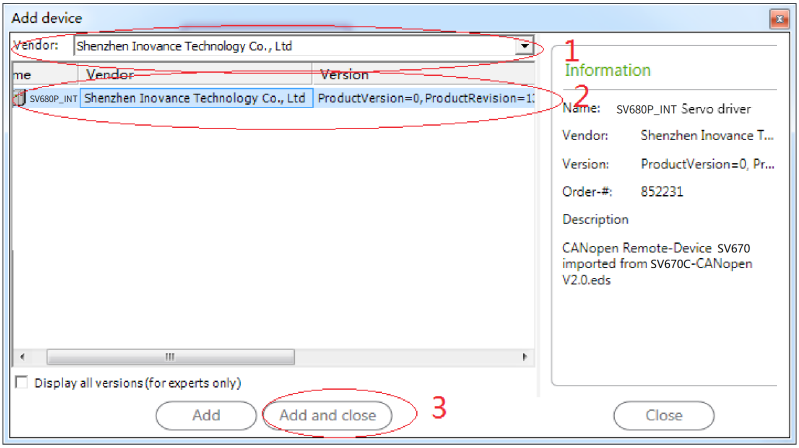
8. The **Add device** dialog box is displayed. Add a CANopen gateway, select **Schneider Electric** for **Supplier**, select **CANopen Optimized**, click the **Add and close**.



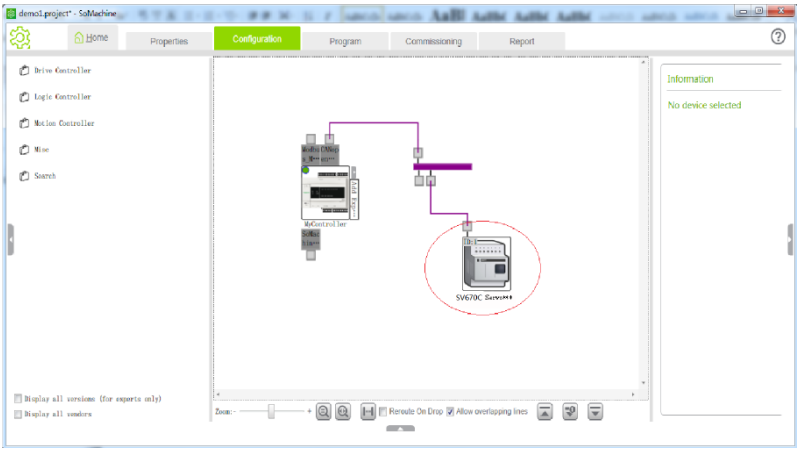
9. Now, the CANopen gateway appears in the interface. Click the position indicated by **2**.



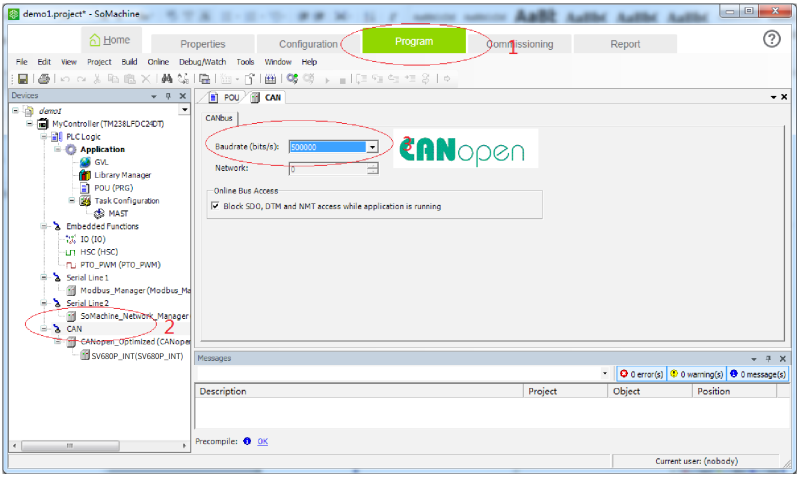
10. The **Add device** dialog box appears again. Select **Inovance** as the vendor and **SV680** as the device, and then click **Add and close**.



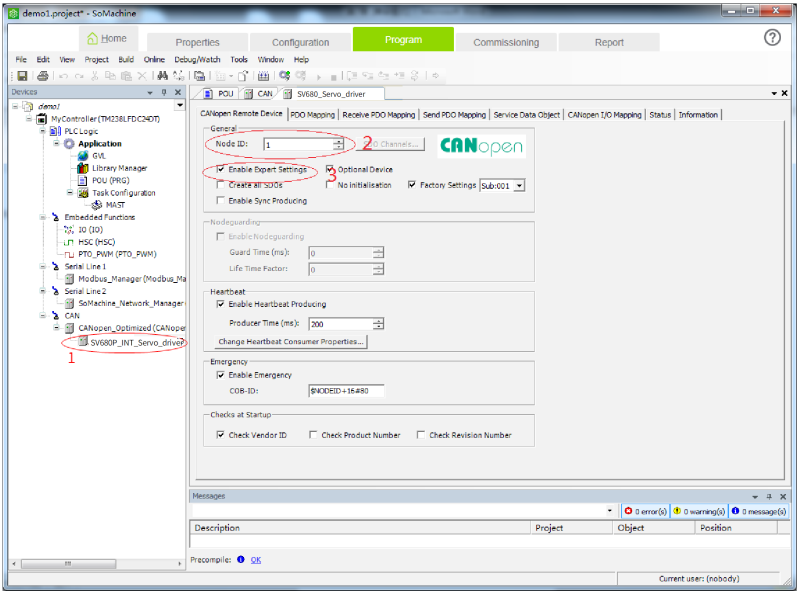
11. Now, the SV680P-INT servo drive appears in the interface.



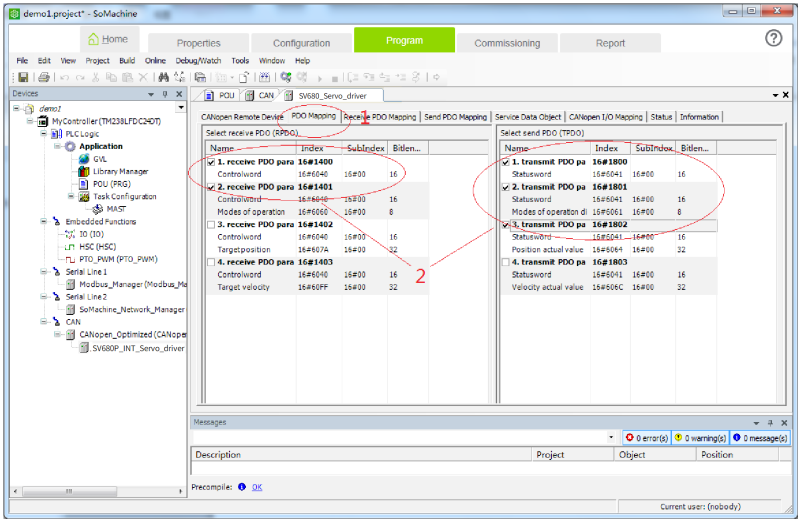
12. Click **Program** and double-click **CAN** on the left to select a proper baud rate. 500 Kbps is selected here.



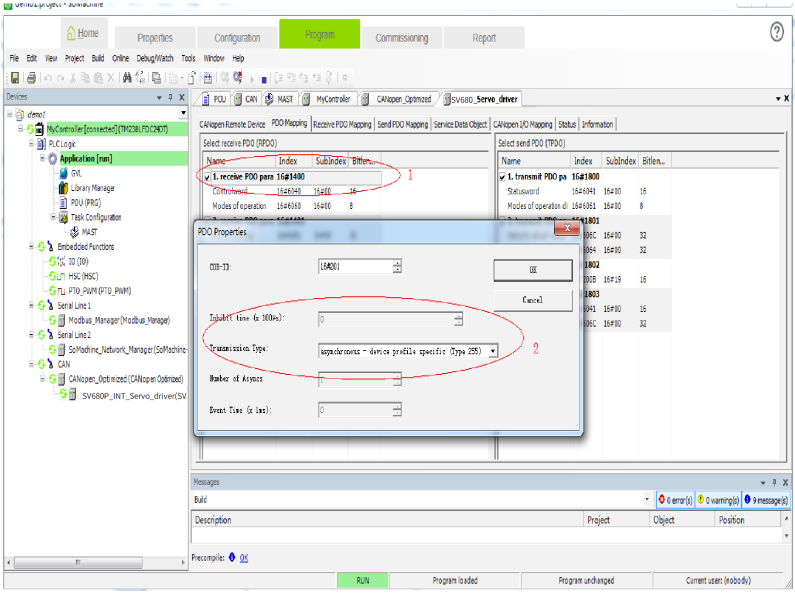
13. Double-click **SV680P_INT_Servo_Driver** on the left. The node ID can be modified. Check **Enable Expert Settings**.



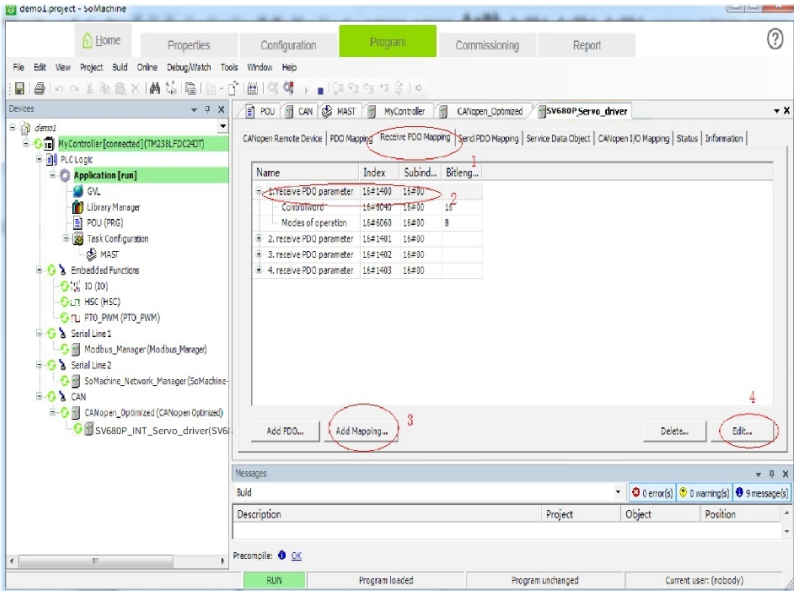
14. Click **PDO Mapping** and check two RPDO and three TPDO.



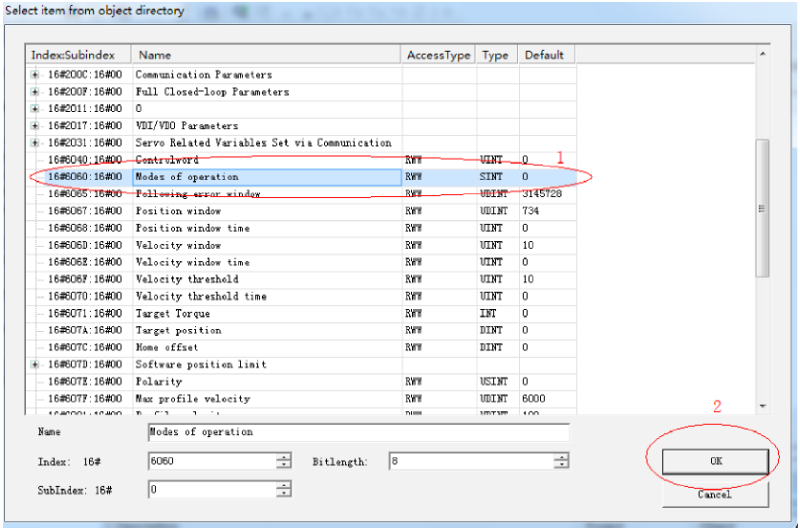
15. Double-click **RPDO1**. The **PDO Properties** dialog box is displayed. Modify **Transmission Type** to **Type 255**. Perform the same operation for other PDOs.



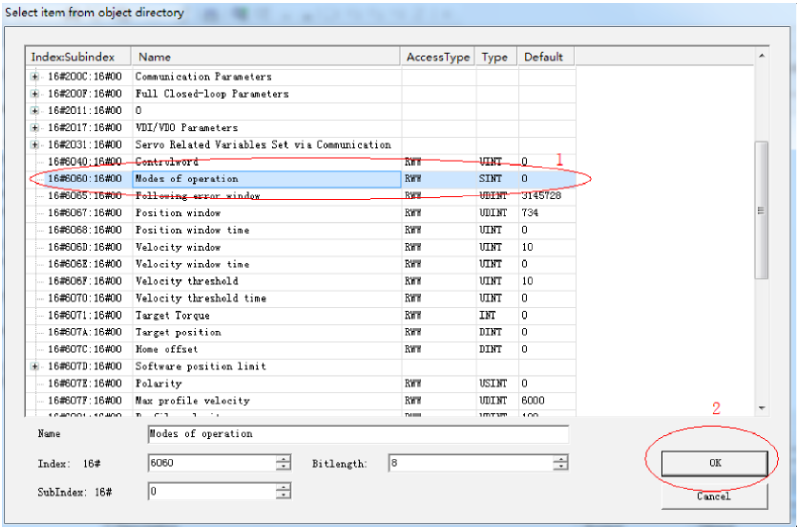
16. Select **Receive PDO Mapping** and click **receive PDO parameter**. Click **Add Mapping** or select a mapping and click **Edit**.



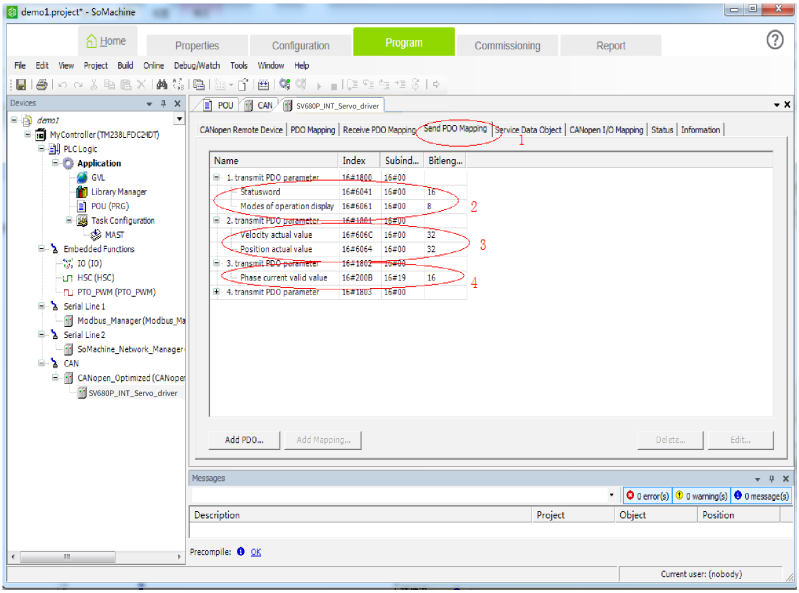
17. Select the proper mapping object in the dialog box displayed according to *"Table 19–29 " on page 959*.



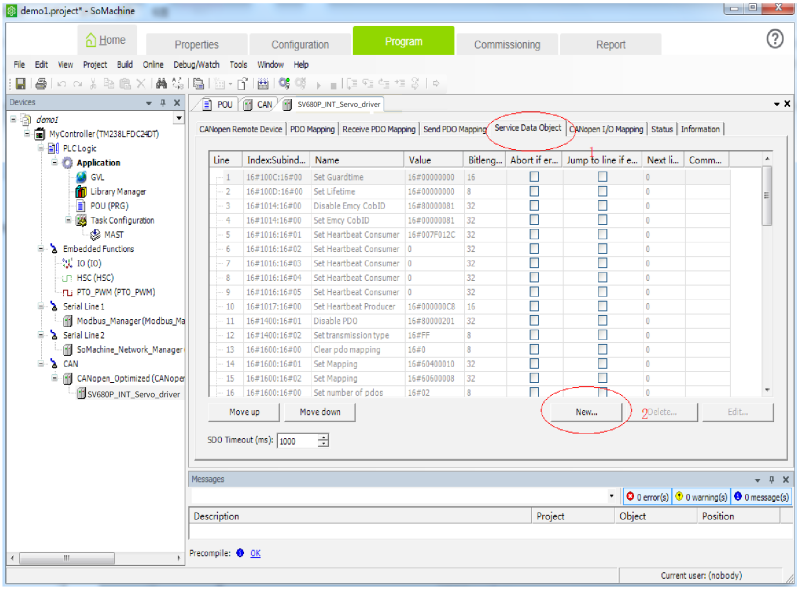
18. After the mapping object is added, the RPDO mapping is shown as follows.



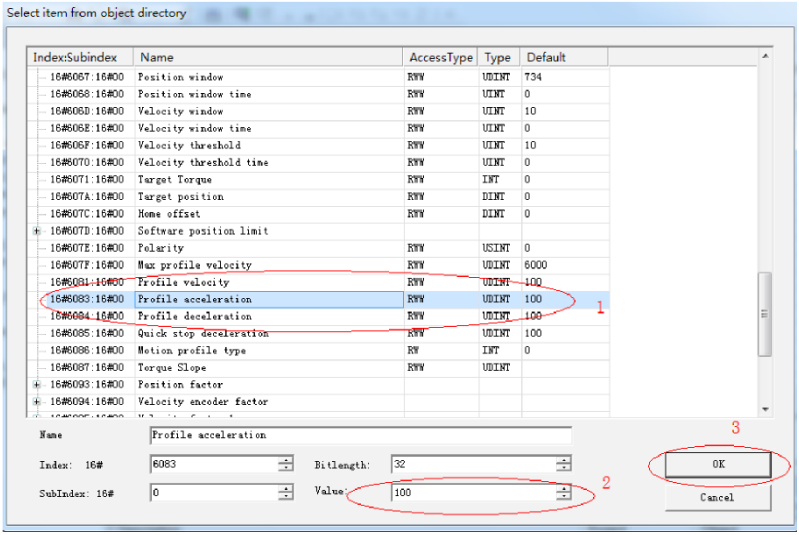
19. Similarly, click **Send PDO Mapping** and perform configuration according to *"Table 19–29 " on page 959*, as shown below.



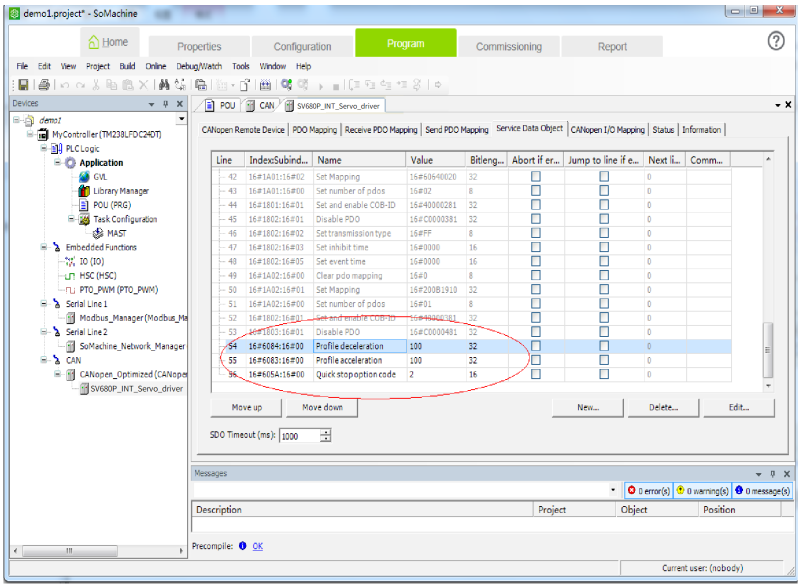
20. Click **Service Data Object**, and then click **New** to add the SDO needed. If default values are used, skip steps 20 to 22. (Optional)



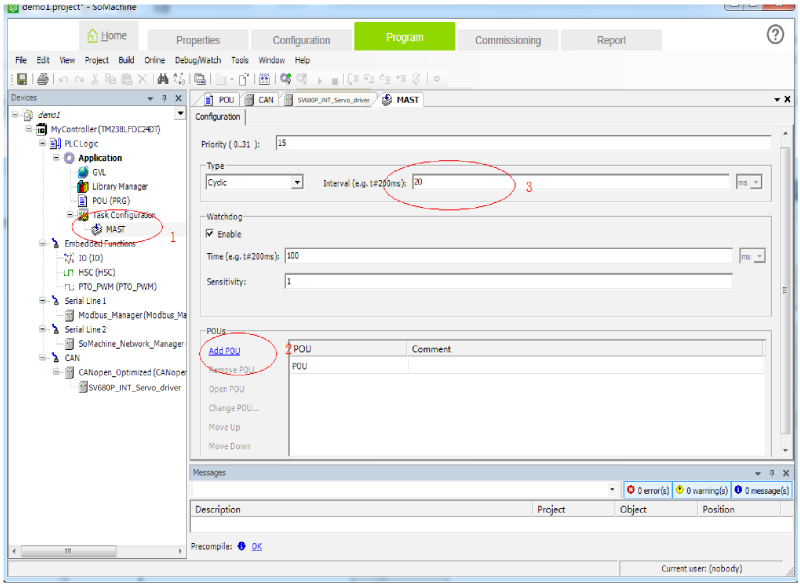
21. Select the corresponding SDO in the list. You can modify the value and click **OK**. (Optional)



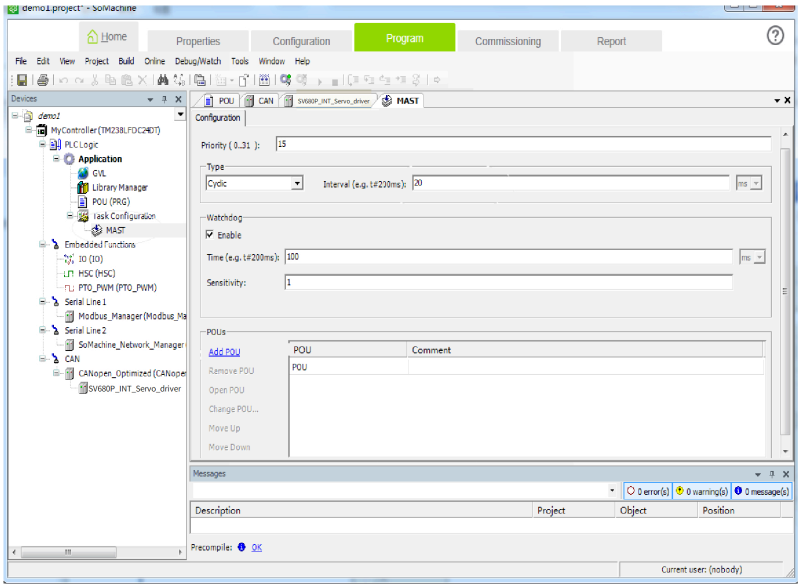
22. The newly added SDO is shown as below. (Optional)



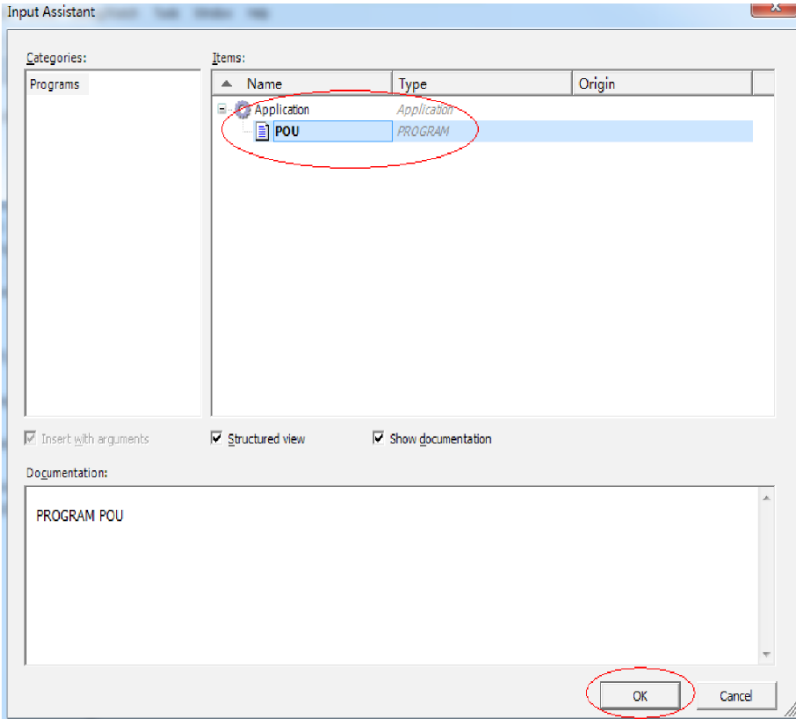
23. Double-click **POU** on the left. Add variable definitions in **2** and add PLC program logic in **3**. Click **Edit** or press “F11”. If no error occurs, go to the next step.



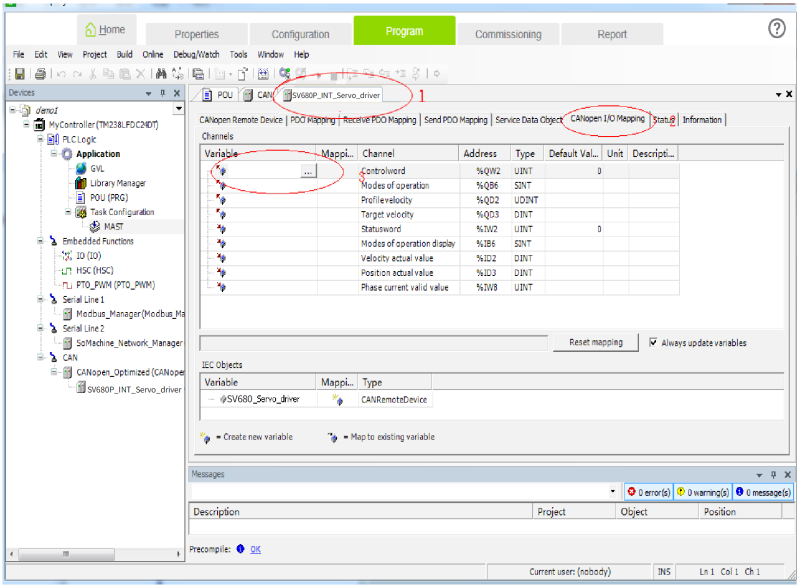
24. Double-click **MAST** to add the PDO, and set the program circulation interval.



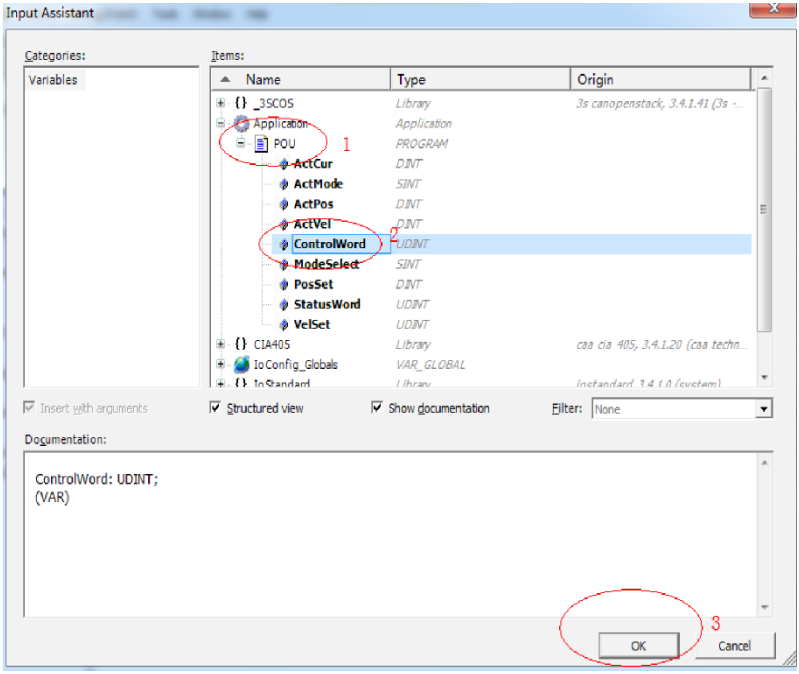
25. Select the POU added based on the following dialog box and click **OK**.



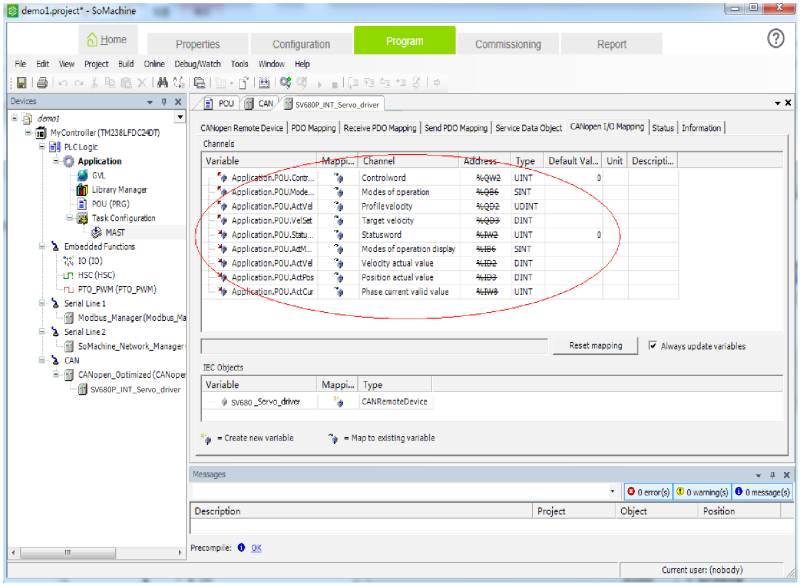
26. Select **CANopen I/O Mapping** under **SV680P_INT...** and double-click the variable to display the ... button, and then click the ... button.



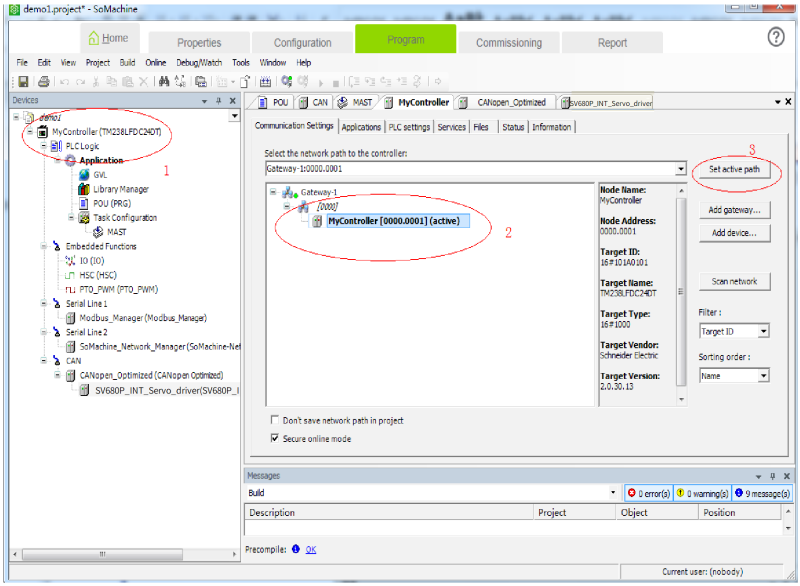
27. Select the PLC-defined variable based on the following steps.



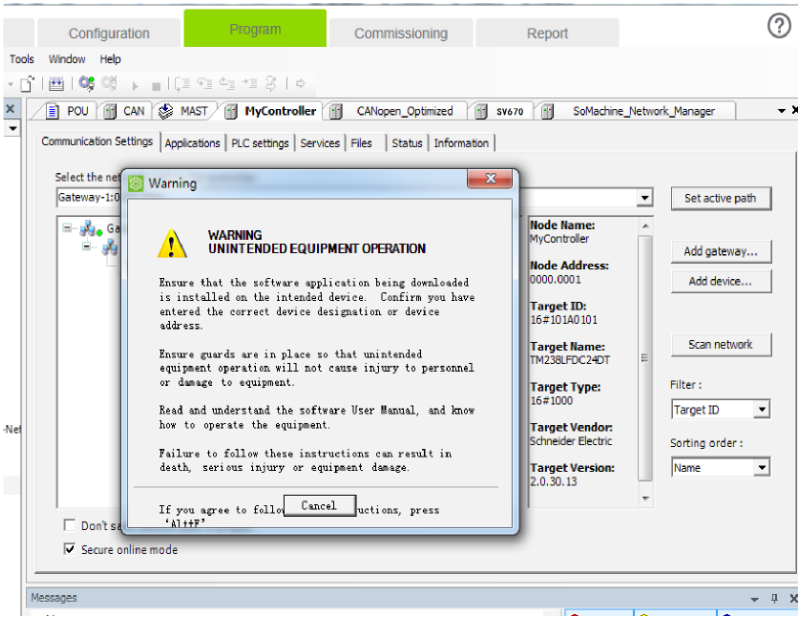
28. Add other variables in the similar way, and the mapping is shown below.



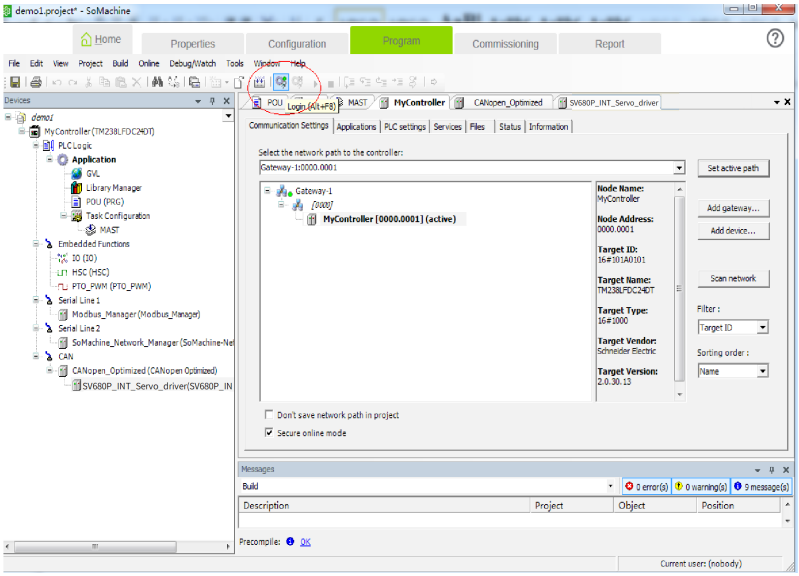
29. Double-click the master name on the left. Select **MyController** and click **Set active path** on the right.



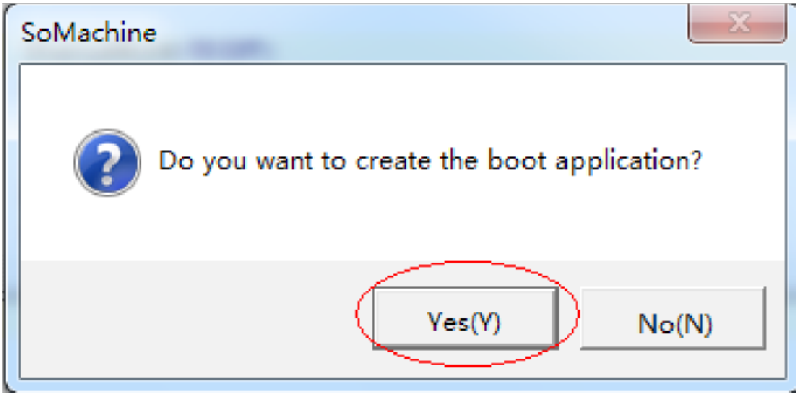
30. The following warning displays. Press Alt+F according to the instructions.



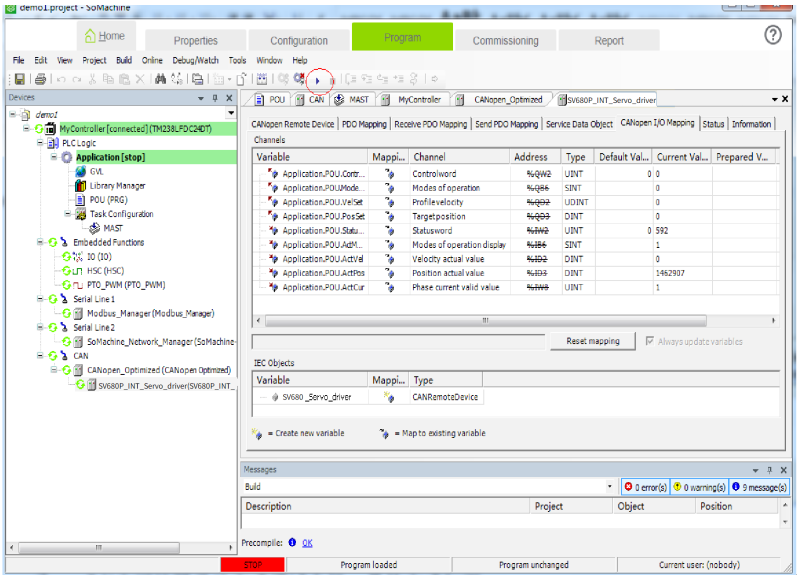
31. Click the icon circled out or select **Online** > **Login** or press Alt+F8.



32. Click **Yes** in the dialog box displayed.

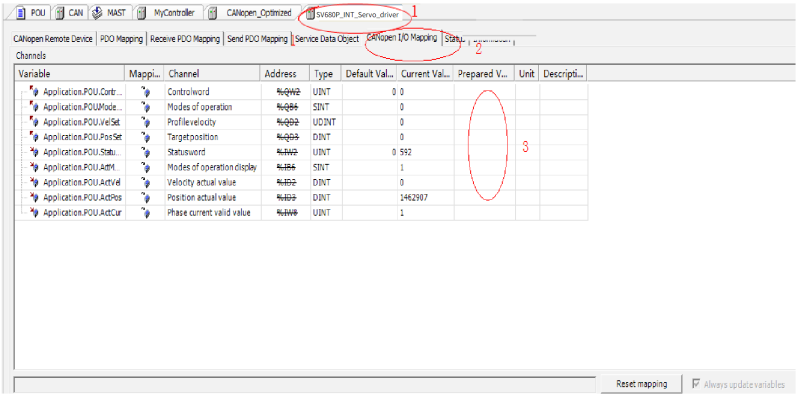


33. After download is done, click the ▶ circled out or click **Online** > **Start** or press F5 to start the PLC program written by the user. The motor operates in the mode defined by the user.



34. You can also perform motor commissioning manually according to the following steps.
    Select **CANopen I/O Mapping** under **SV680P_INT...** and enter the value needed in the **Prepared V...** column. Next, click **Debug/Watch** > **Forced Value** or press F7 to modify the variable manually.

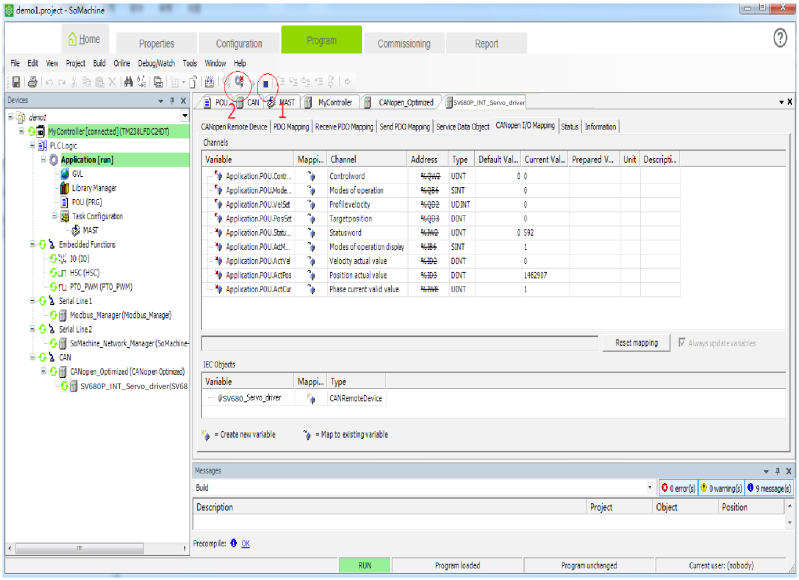
35. Write 1 to 6060h, 100 to 6081h, and 671088640 (10 revolutions) to 607Ah. Write 6 (0x06), 7 (0x07), 47 (0x2f), and 63 (0x3f) to 6040h in sequence to make the motor run.



Note

- The "Forced value" command must be executed for each written value of a variable. You can enter values for different variables and execute the "Force Values" reference once.
- When a new position or velocity reference is required, write the new reference and set 6040h to 47(0x2f)–63(0x3f) in turn. The motor runs to the position according to the new reference no matter whether execution of the previous reference is complete.
- To stop the motor, set 6040h to 0.
- Do not enter values forcibly. In the toolbar, choose Debug/Watch > Release Values or press “Alt + F7”. Variables are no longer entered and follow the logic of the PLC program.

36. Execute **1** marked in the following figure, or select **Online** > **Stop** in the toolbar or press Shift + F8 to stop the PLC program. Click **2** marked in the following figure, or select **Online** > **Exit** or press Ctrl + F8 to exit from the online function.



19.5.2.2 Connecting SV680P-INT to Beckoff CANopen Master

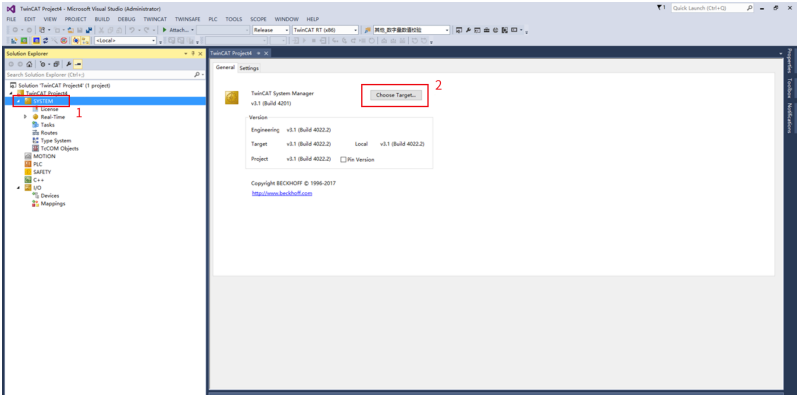
Assign PDO according to *"Table 19–30 " on page 979* in the position control mode.

1. Before connecting the network, manually configure the PDO mapping. Based on the following table and the appendix, change the mapping by modifying parameters. The parameters to be modified are as follows:

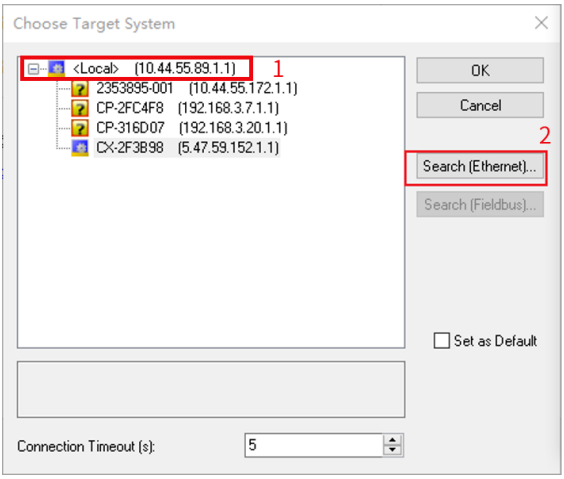
Table 19–30 Example of PDO mapping of Beckhoff master

Parameter	Object	Mapping Object	Input
H2d.32	1600.00h	Number of mapped objects in RPDO1	2
H2d.33	1600.01h	6040.00h	60400010h
H2d.35	1600.02h	6060.00h	60600008h
H2d.49	1601.00h	Number of mapped objects in RPDO2	2
H2d.50	1601.01h	6081.00h	60810020h
H2d.52	1601.02h	607A.00h	607A0020h
H2E.20	1A00.00h	Number of mapped objects in TPDO1	2
H2E.21	1A00.01h	6041.00h	60410010h
H2E.23	1A00.02h	6061.00h	60610008h
H2E.37	1A01.00h	Number of mapped objects in TPDO2	2
H2E.38	1A01.01h	606C.00h	606C0020h
H2E.40	1A01.02h	6064.00h	60640020h
H2E.54	1A02.00h	Number of mapped objects in TPDO3	1
H2E.55	1A02.01h	200B.19h	200B1910h
H2E.57	1A02.02h	-	0

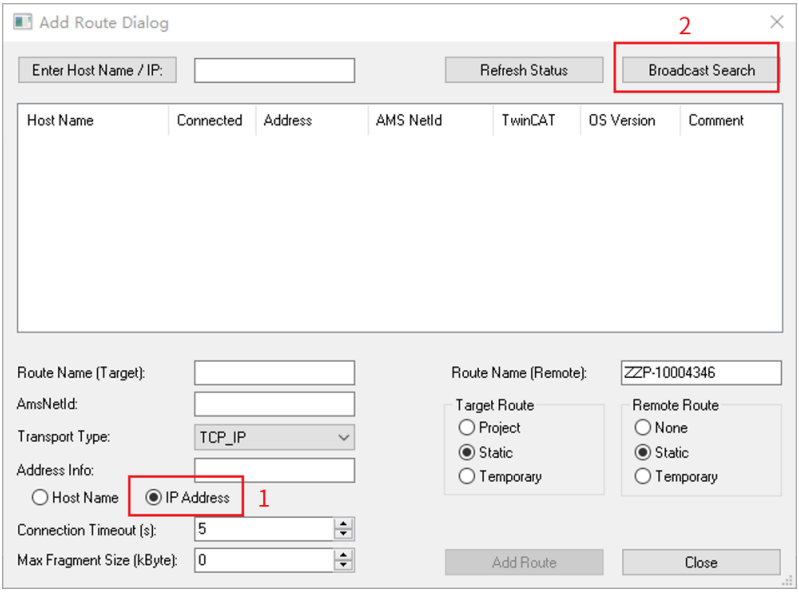
2. Connect Beckoff CX9020, as a master node, to the CANopen module of EL6751 and perform the test. Ensure that the IP address of CX9020 is in the same network segment as the IP address of the PC and the first four bytes of AMS Net (**Properties** > **AMS Router** > **AMS Net**) of Beckoff TwinCAT software are the same as the IP address of the PC.
3. Open TwinCAT System Manager and create an empty project. Click **SYSTEM** on the left and click **Choose Target...** on the right.



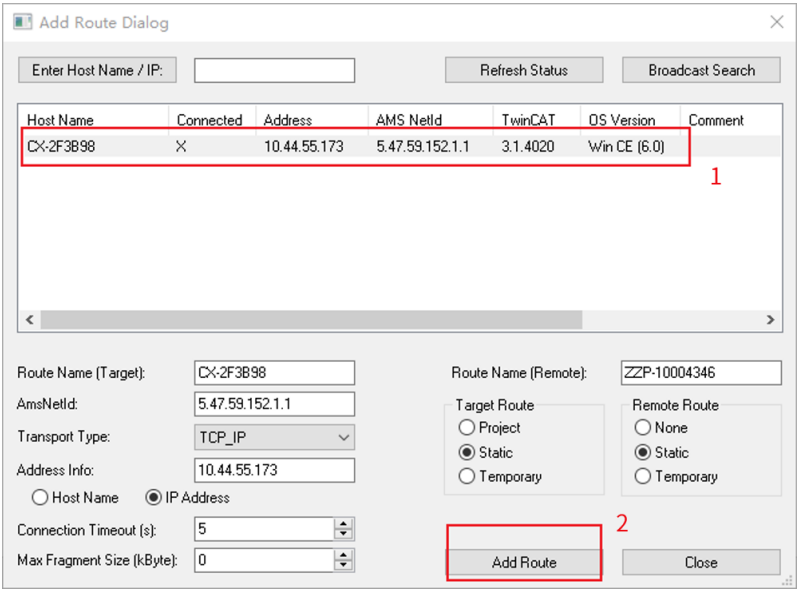
4. In the dialog box that is displayed, select **...local...** and click **Search (Ethernet)**.



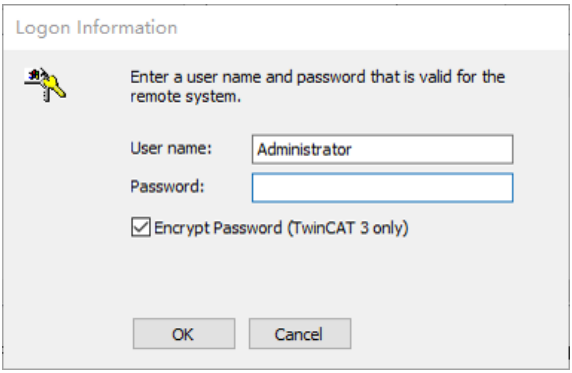
5. Select the **IP Address** as indicated by **1** and click **Broadcast Search**.



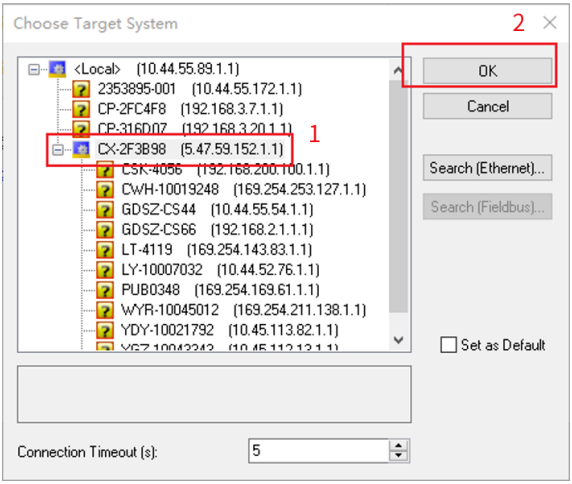
6. The master is displayed. Select the master and click **Add Route**.



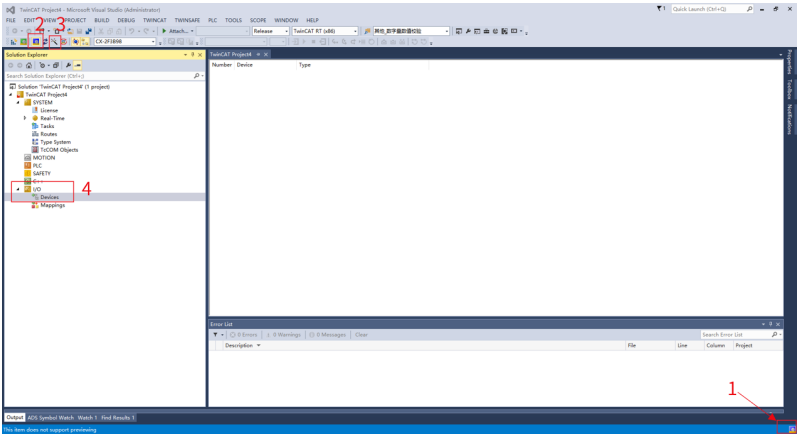
7. In the dialog box displayed, the account is the same with the **Host Name** and the password is empty. Click **OK**.



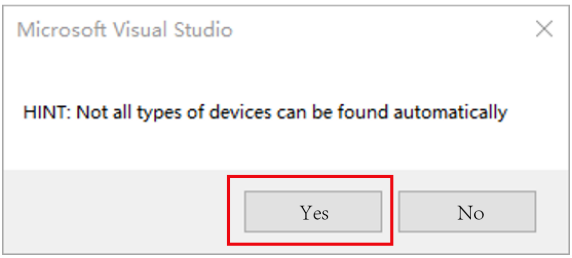
8. Click **Close** in the interface shown in Step 6, then you can click **+** in the **Choose Target System** dialog box to select the master. Finally, click **OK**.



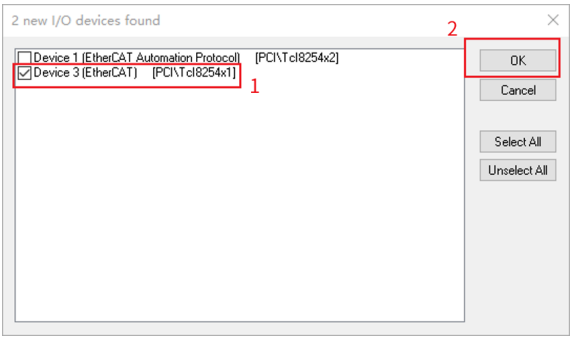
9. Check the bottom right corner (1) to ensure that the master station is in the configuration mode. If it is in the running state, click the button (2) to switch the state to the configuration mode. Click the button (3) or **I/O** (4), and then right-click **Devices** and choose **Scan Devices**.



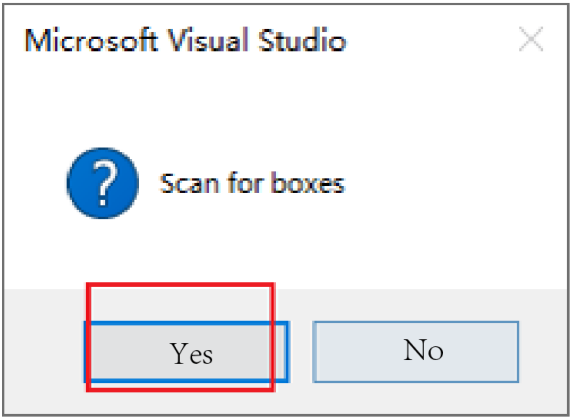
10. Click **OK** in the warning dialog box displayed.



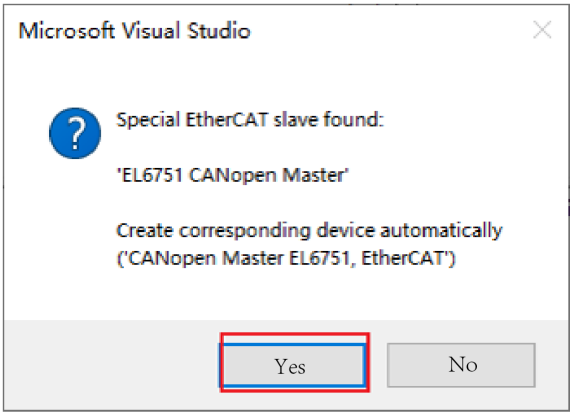
11. Check **Device EtherCAT** and click **OK** in the dialog box displayed.



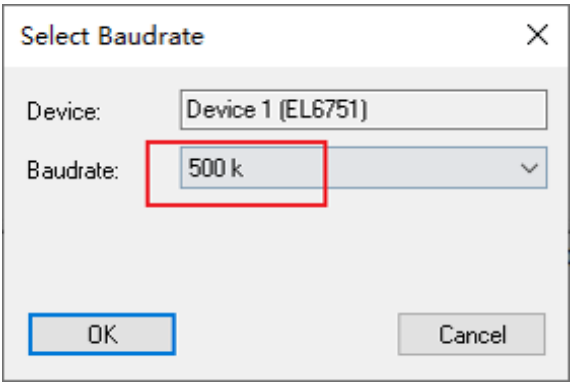
12. Click **Yes** in the dialog box asking whether to scan for boxes.



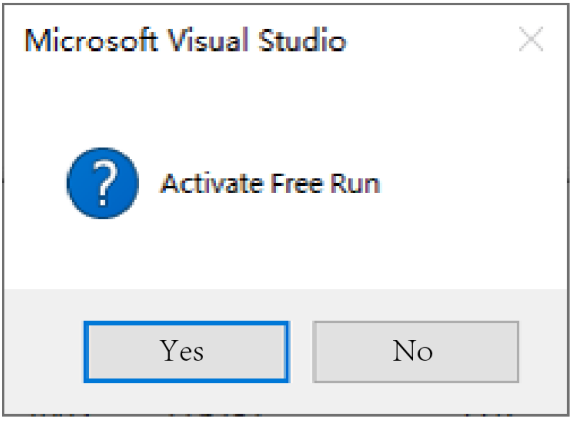
13. Click **Yes** in the dialog box asking whether to create 6751 master.



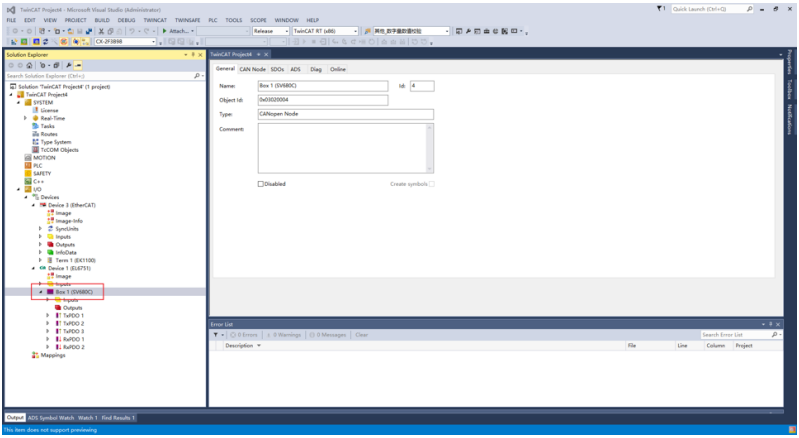
14. Select the baud rate (defaulted to 500 kbps) and click **OK**. The master starts device searching, which may take a while.



15. Click **Yes** in the dialog box asking whether to activate free run.



16. The Box of SV680P-INT series servo drive is now displayed on the left. Right-click to insert three TPDOs and 2 RPDOs. Right click **Disabled** to **uncheck it.**

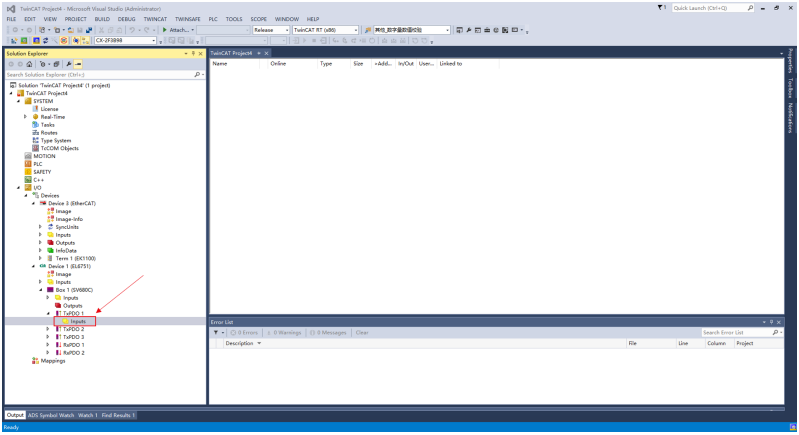


Note

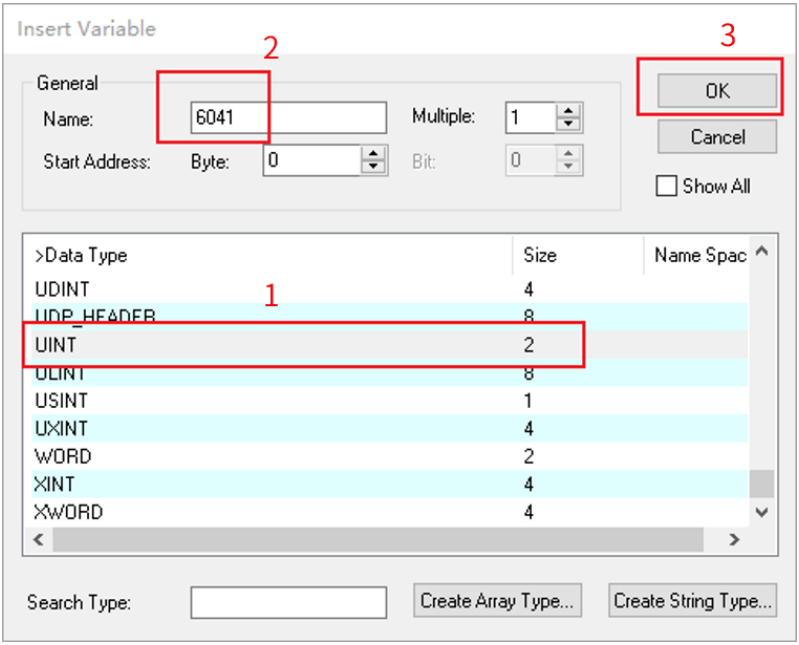
Only servo drives equipped with termination resistors can be scanned by the master.

The drive supports CANopen communication. The device name in the description file is SV680C. For description of the model number, see Section "Model Number".

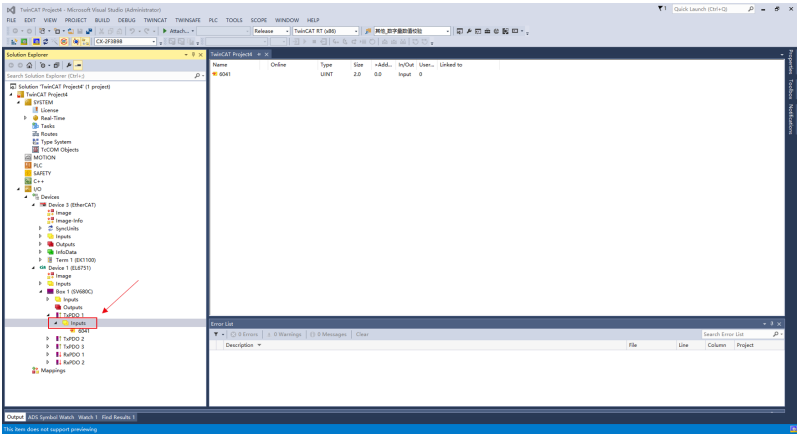
17. The following figure shows the result after the previous operation is complete. Choose **TPDO1** > **Inputs**, right-click, and choose **Insert Variable**.



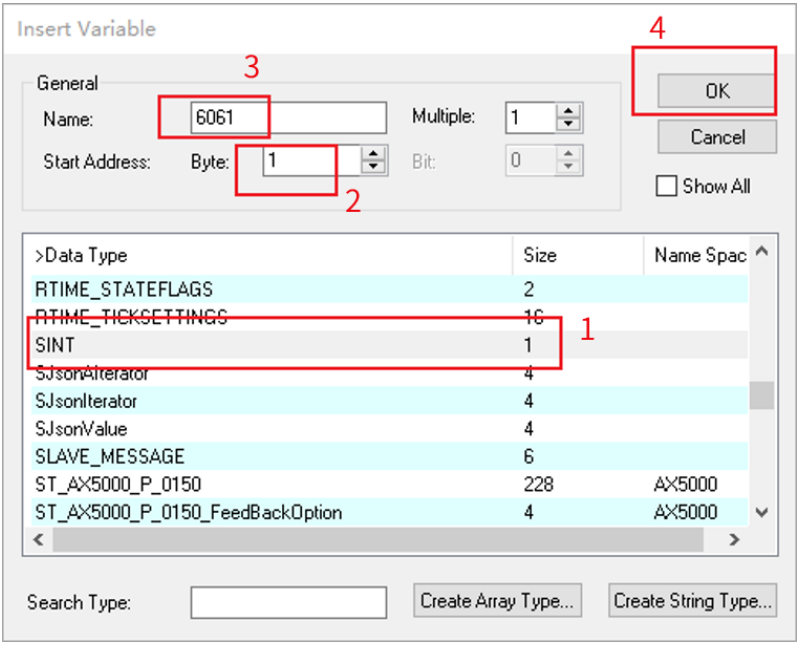
18. Map different variables in each PDO according to *"Table 19–30 Example of PDO mapping of Beckhoff master" on page 979*. TPDO1 maps 6041.00h and 6061.00h. To insert the first variable 6041h, select **UINT** in the **Variable Type** first, and then enter a proper name in the field **Name** and click **OK**.



19. Now 6041h has been added to TPDO1. Select **Inputs** again, right-click, choose **Insert Variable**, and insert the second variable.

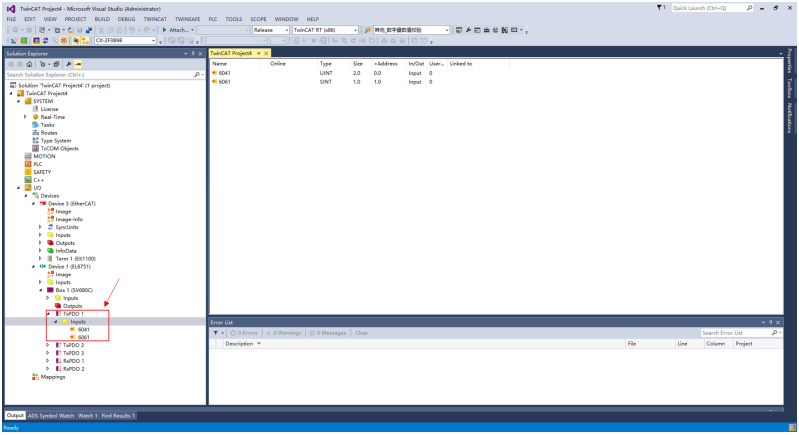


20. For the inserted variable 6061h, select **INT8** (the object dictionary can be queried) for **Variable Type**, enter a large value for **Byte** of **Start Address** to prevent 6061h from being inserted in front of 6041h, enter a proper name, Click **OK**.

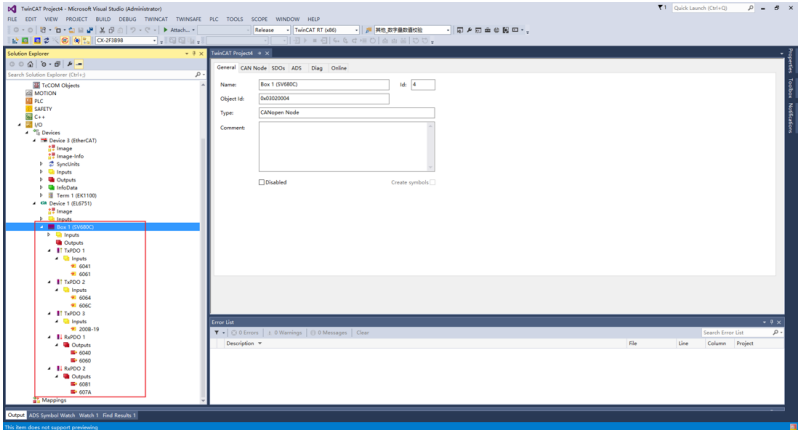


21. You can see that two objects are added to TPDO1. Note that the sequence of the two variables must be the same as that in *"Table 19–30 Example of PDO mapping of Beckhoff master" on page 979*. Otherwise, the second variable must be deleted and inserted again and a large value must be entered in **2** marked in the figure in Step 20.

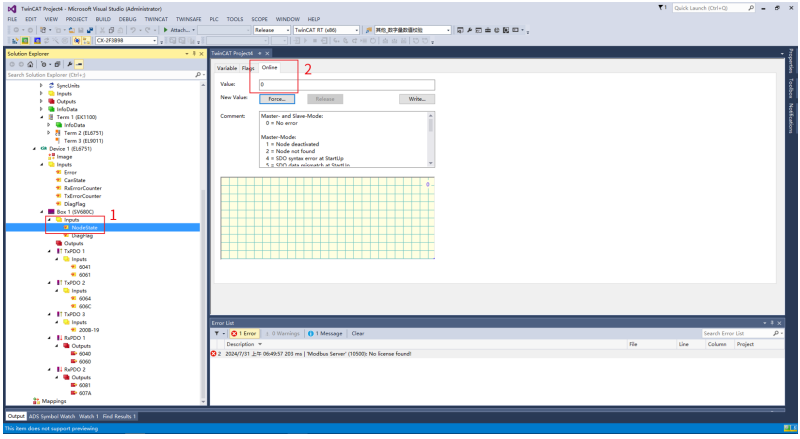
    After making sure that the variable sequence is correct, choose **TPDO1** > **Inputs**, right-click, and choose **Recalc Address** to allocate addresses. This step must be performed. Otherwise, addresses will be in mess.



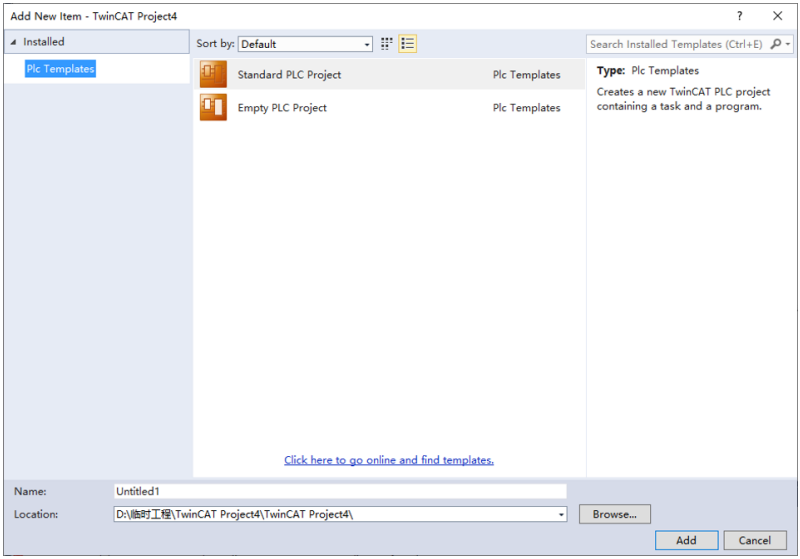
22. Repeat steps 17 to 21 for other PDOs. Add corresponding mapping variables according to *"Table 19–30 Example of PDO mapping of Beckhoff master" on page 979*. The interface after variables are added is shown below.



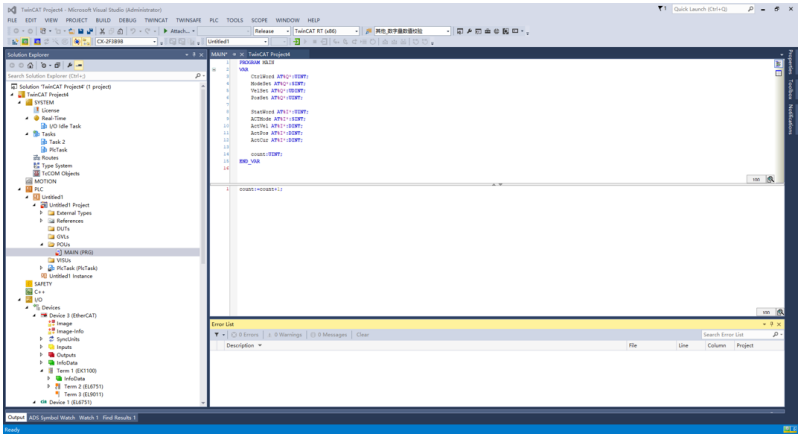
23. Click configuration mode.
24. Select the Box of SV680P-INT and select **Inputs** > **NodeState**. The node state in **Online** is 0, indicating the node is in a normal state.



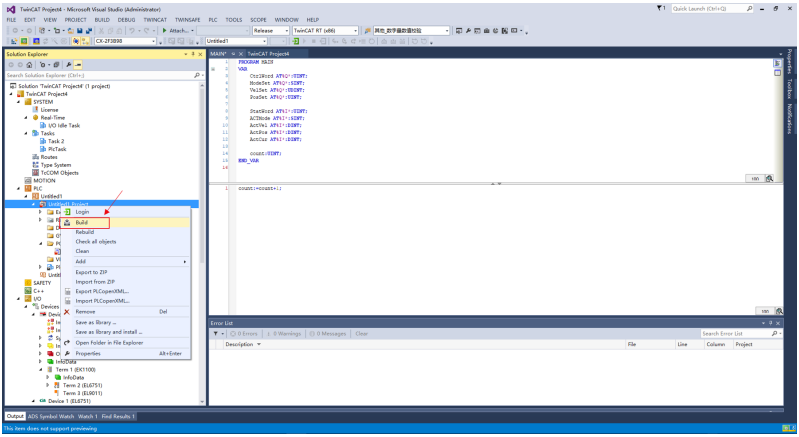
25. Create a PLC project.



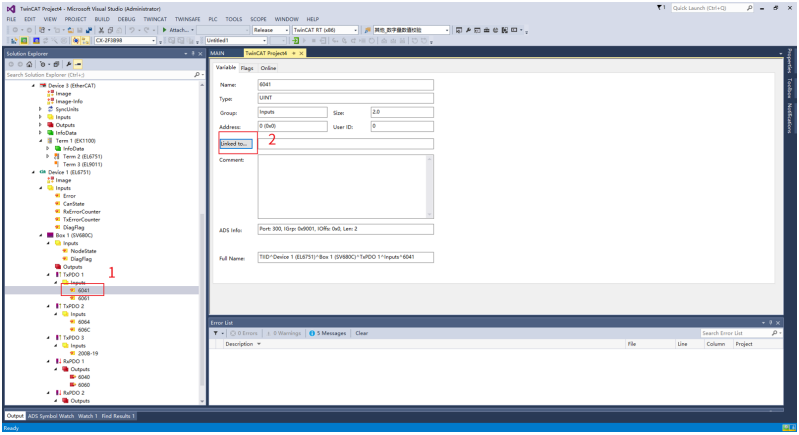
26. Enter corresponding variable definition and the PLC logic.



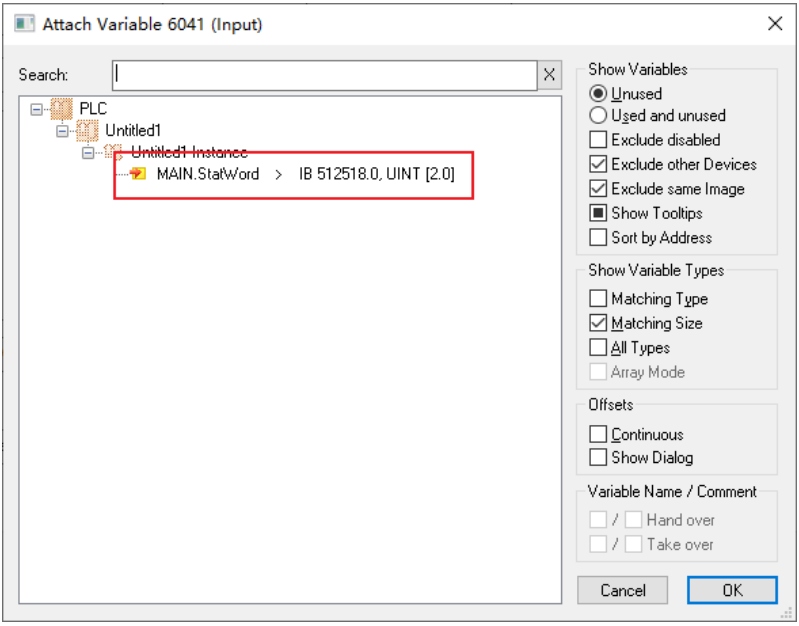
27. Right-click the new project and compile it.



28. After the PLC program is added, select the PDO variable and click **Linked to** or double-click the variable to link the variable to the PLC program.



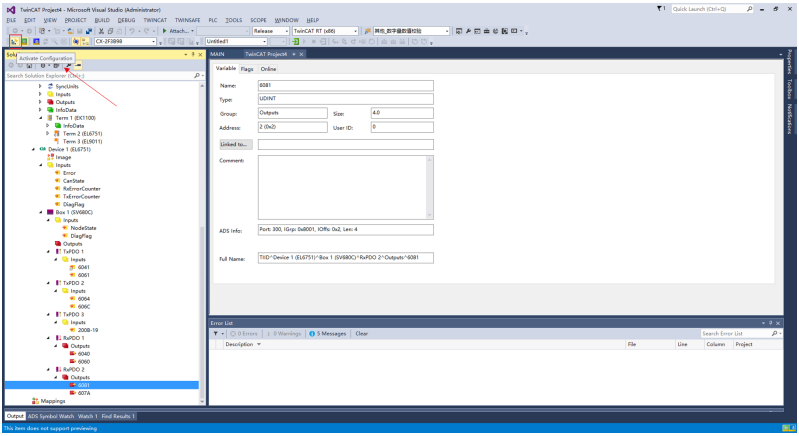
29. Select the corresponding PLC variable and click **OK**.



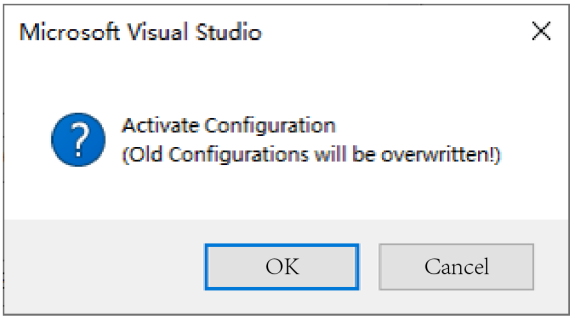
30. After the variable is linked, a small arrow appears beside the variable name.



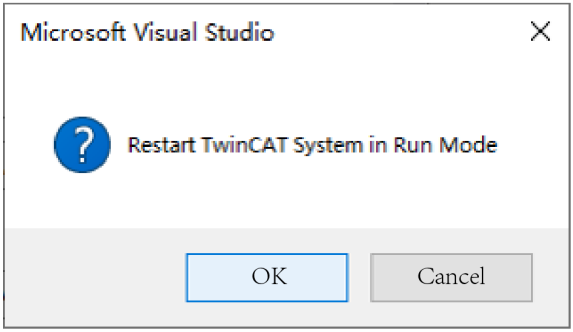
31. Click **Activate Configuration**.



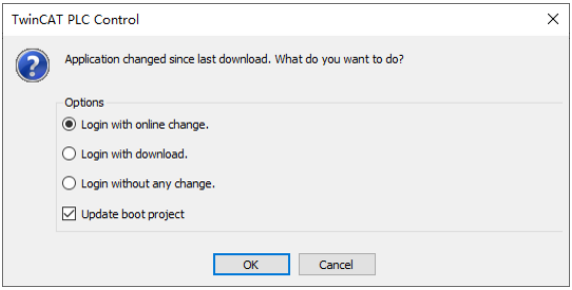
32. Click **OK** to activate configuration.



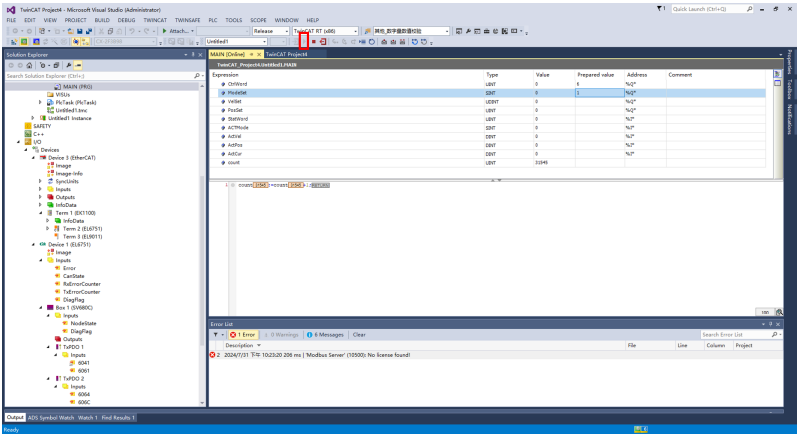
33. Click **OK** to restart TwinCAT system with the run mode.



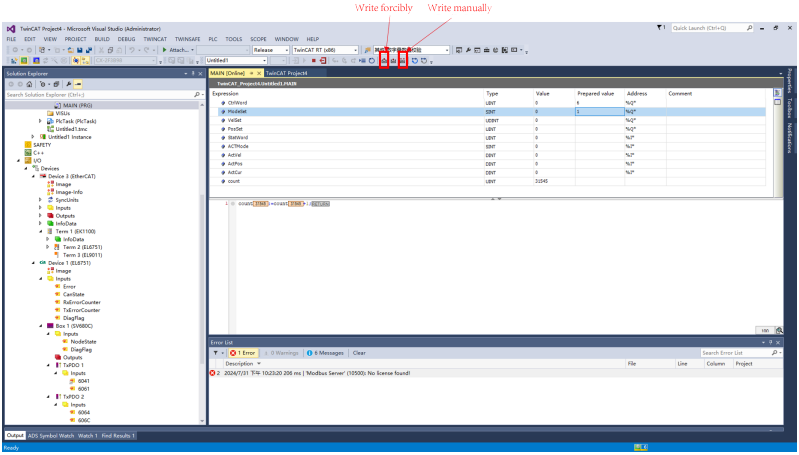
34. Open the project created by TwinCAT PLC Control software before, and click **Online** > **Login** to display the dialog box asking whether to download the new program.



35. Click the **Run** icon to run the PLC program.



36. Writing can be forced or manual. When manual write fails, you can press the **Forced write** button to forcibly write the value.



37. Enter the value and click **OK**.
    The value entered is displayed in the square brackets behind the original variable. Click **Online** → **Forced Value** to write the value forcibly.

    Write 1 to 6060h, 100 to 6081h, and 10485760 (10 revolutions) to 607Ah. Write 6 (0x06), 7 (0x07), 47 (0x2f), and 63 (0x3f) to 6040h in sequence to make the motor run.

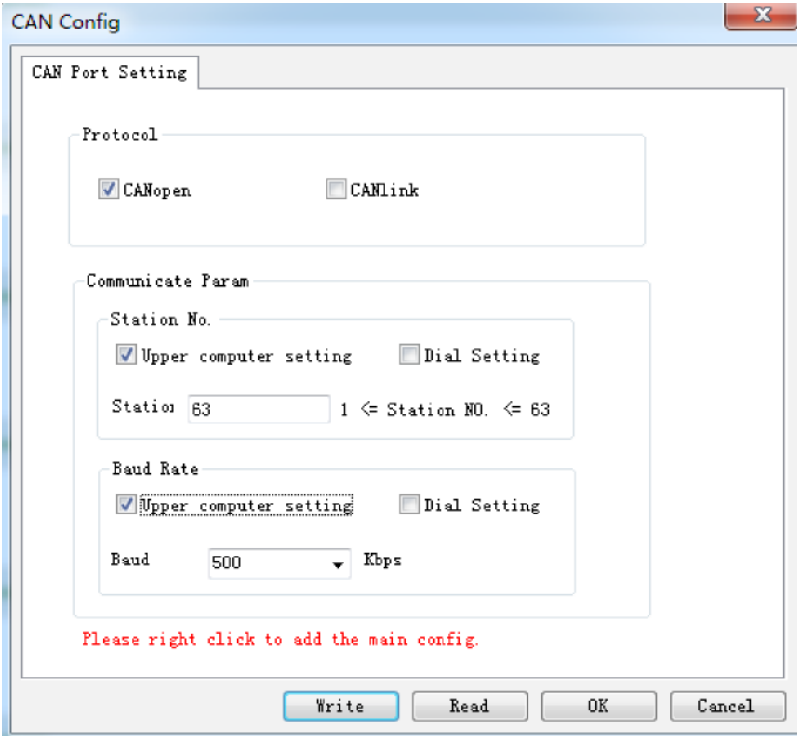
Note

- The "Forced value" command must be executed for each written value of a variable. You can enter values for different variables and execute the "Force Values" reference once.
- When a new position or velocity reference is required, write the new reference and set 6040h to 47(0x2f)–63(0x3f) in turn. The motor runs to the position according to the new reference no matter whether execution of the previous reference is complete.
- To stop the motor, set 6040h to 0.
- Do not forcibly input the value any more. In the toolbar, choose Online > Release Force. Variables are no longer entered and follow the logic of the PLC program.

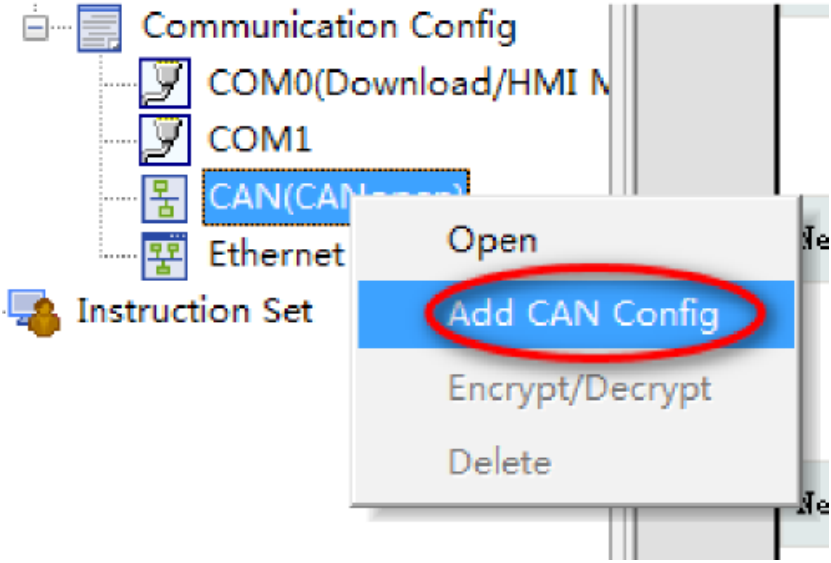
38. In the toolbar, choose **Online** > **Stop** to stop executing the PLC program. Choose **Online** > **Logout** to continue editing the PLC program or exit.

19.5.2.3 Connecting SV680P-INT to Inovance H3U CANopen Master

1. Open AutoShop, double-click "CAN" in Communication Port of the project management interface or right-click "Open" to pop up the "CAN Config" window. Select the CANopen master as the protocol and set **Station No.** and **Baud Rate** of the master.

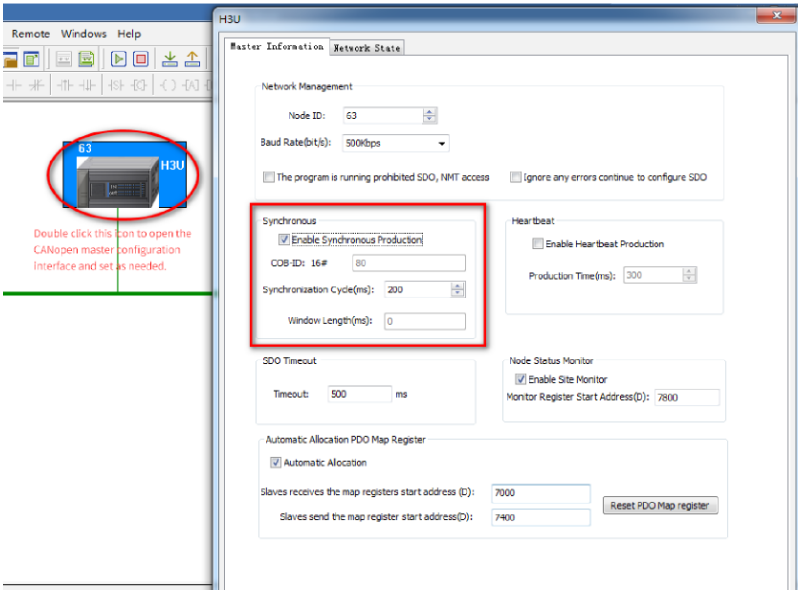


2. Right-click **CAN (CANopen)** and select **Add CAN Config** in the short-cut menu.

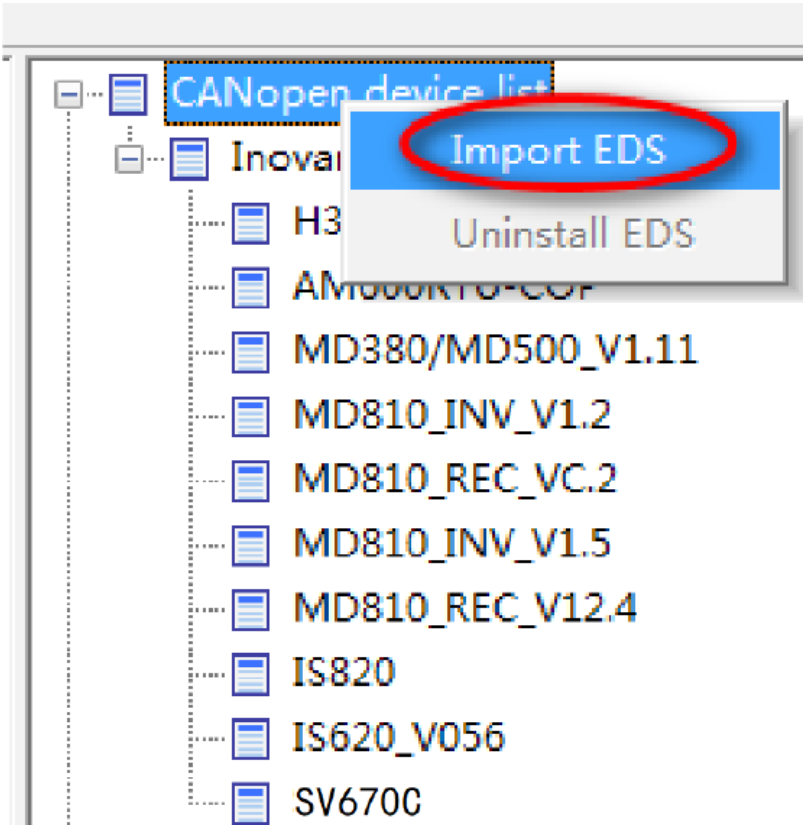


3. Double click CANopen Config.
   You can see the H3U master icon in the CANopen configuration interface. Double-click this icon to open the master configuration interface, in which you can set parameters such as synchronization and heartbeat.

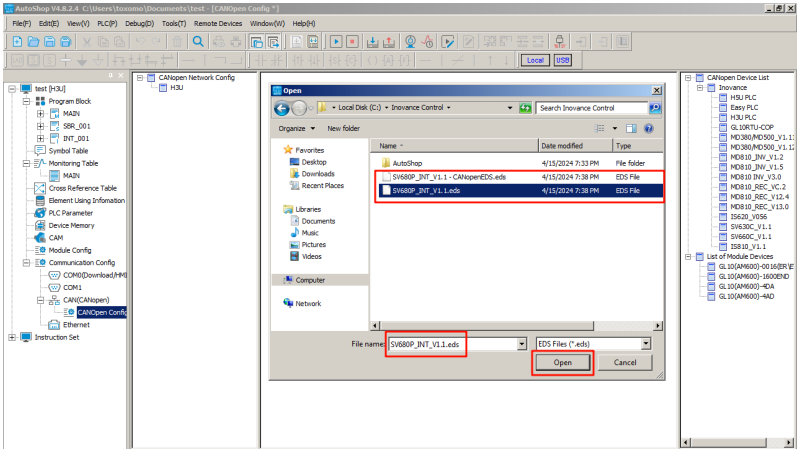
   H3U axis-control commands control the servo drive through PDO communication. The PDO adopts synchronization mode by default when the drive is working with an H3U master. Therefore, you need to check **Enable Synchronous Production** in this interface and set the synchronization period (15ms for 8 axes generally) as needed. For other servo drive models, this option also needs to be checked if the PDO also adopts synchronization mode.



4. If the EDS files needed is not in the CANopen device list, add the device EDS file.
   a. Click **CANopen device list** and right-click on it to display the short-cut menu. In the short-cut menu, select **Import EDS**.

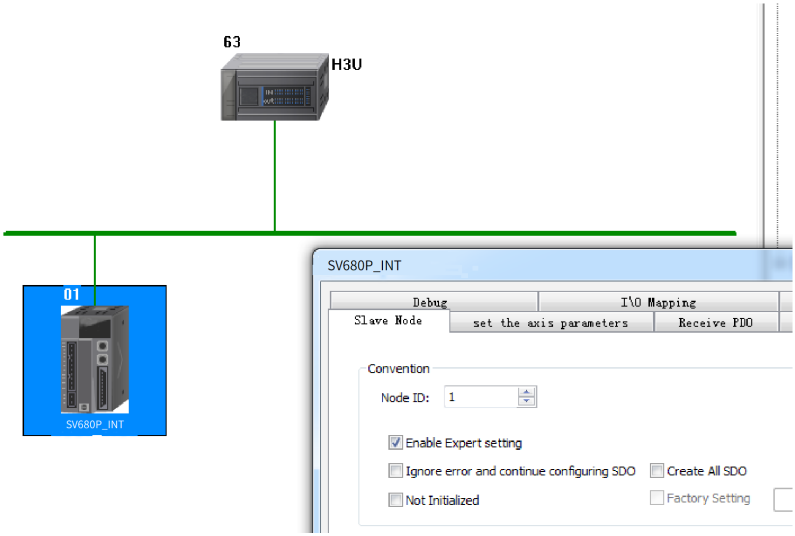


b. In the dialog box displayed, select the EDS file needed and click **Open**.

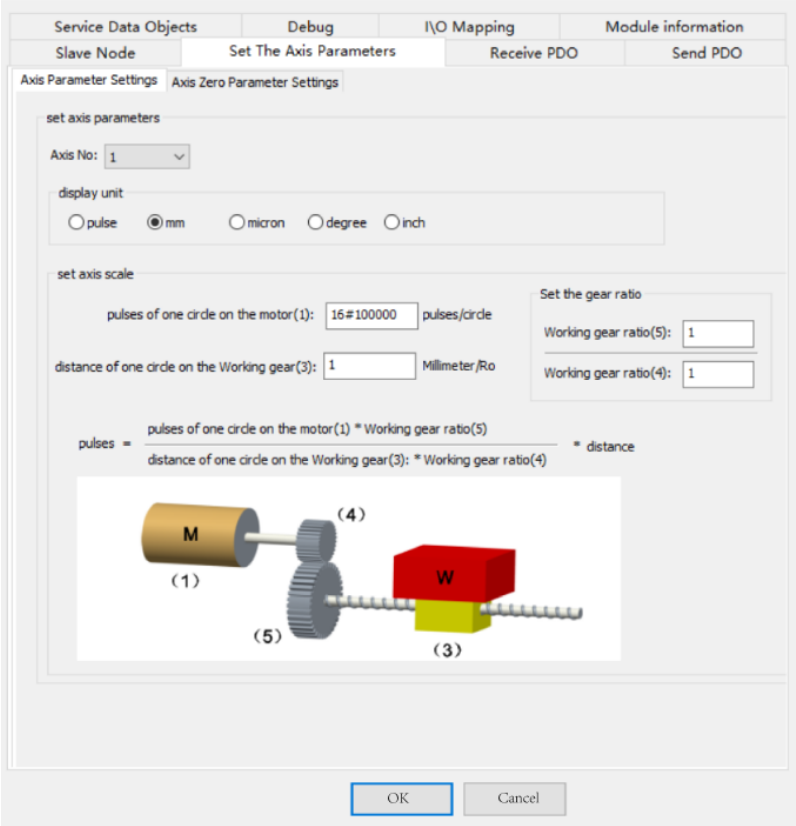


c. The device added will be displayed in the CANopen device list on the right.

5. Double-click the **SV680P** in the **CANopen device list** to add CANopen slaves. Then, double-click the **SV680P-INT** icon in the configuration to open the slave configuration parameter list.



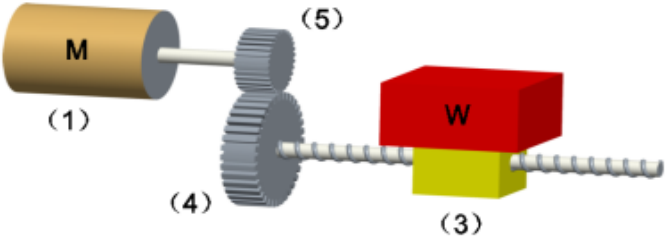
6. The **axis parameters setting** interface is shown as follows, which include **axis parameter setting** and **homing parameter setting**.
   Setting axis parameters



- For devices without reducers, set the gear ratio to 1:1. Set the pulses per motor revolution and distance per motor revolution correctly. The calculation formula is as follows.

$$\text{Number of pulses} = \frac{\text{Number of reference pulses per motor revolution}}{\text{Distance per motor revolution (3)}} \times \text{Travel distance (displayed unit)}$$

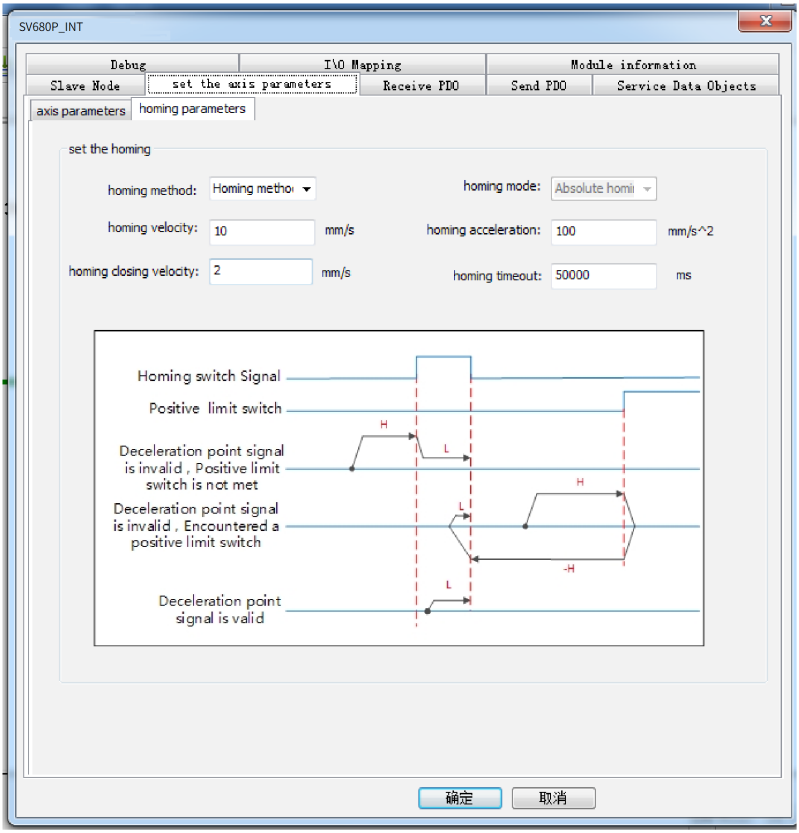
- Applications with reducers are shown as follows.



The calculation formula for devices with reducers is as follows.

$$\text{Number of pulses} = \frac{\text{Number of reference pulses per motor revolution (1) x Motor gear ratio (5)}}{\text{Travel distance per motor revolution (3) x Operating gear ratio (4)}} \text{ x Travel distance (displayed unit)}$$

Setting axis homing parameters



The range of the homing method is 1 to 35. The calculation formula for parameters and object dictionaries of the homing speed, homing acceleration, and homing proximity speed is shown as follows.

$$\text{Value of object dictionary} = \frac{\text{Number of reference pulses per motor revolution (1) x Motor gear ratio (5)}}{\text{Travel distance per motor revolution (3) x Operating gear ratio (4)}} \times \text{Setpoint in the software tool (displayed unit)}$$

The relation between preceding parameters and object dictionaries is as follows.

Index	Sub-index	Data type	Description	Unit
6098h	00	SINT	Homing method	-
6099h	01	UDINT	Speed during search for switch	Reference unit/s
6099h	02	UDINT	Speed during search for zero	Reference unit/s
609Ah	00	UDINT	Homing acceleration	Reference unit/s^2
60E6h	00	USINT	Homing method	-

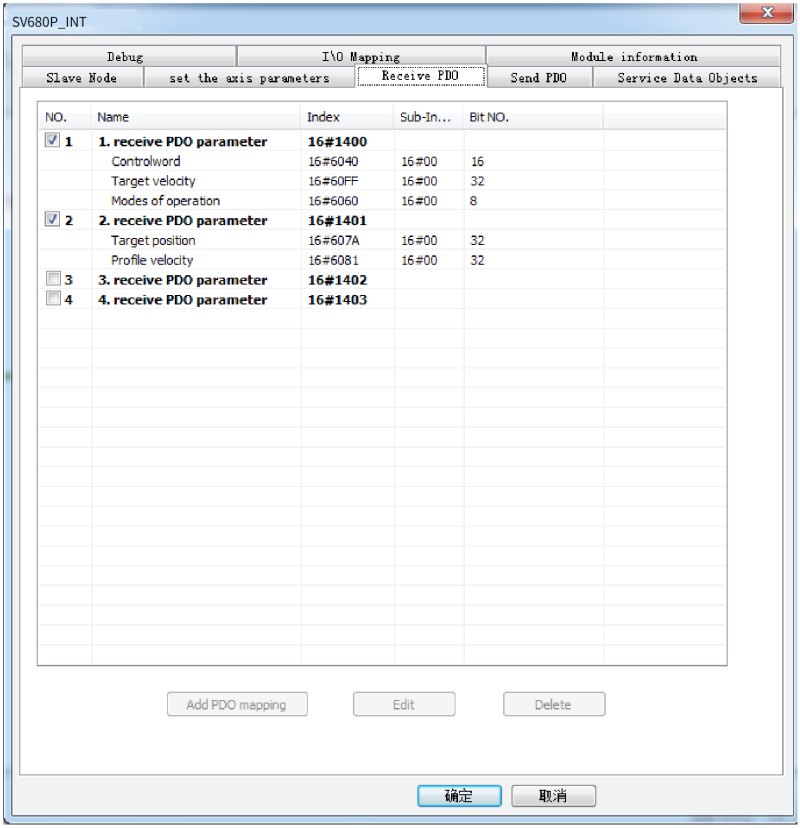
7. The object dictionaries involved in CANopen CiA402 motion control commands interact with the slave in the PDO mode. These object dictionaries, which include 6040h (Control word), 6041h (Status word), 6060h (Modes of operation), 6061h (Modes of operation display), 6081h (Profile velocity), 607Ah (Target position), 60FFh (Target velocity), 6064h (Position actual value), and 606Ch Velocity actual value), must be configured as required below. Otherwise, axis configuration failure may occur during calling axis control commands.

Note

It is recommended to configure the PDO communication to synchronous mode to prevent frame loss caused by interference during communication. In synchronous mode, synchronous production needs to be enabled in the master station configuration. To ensure stable communication, the network load rate must be lower than 70%.

$$\text{Network load rate} = \frac{328 \times \text{Number of axes} + 79}{\text{Baud rate} \times \text{Sync cycle}} \times 100\%$$

Configuring the RPDOs



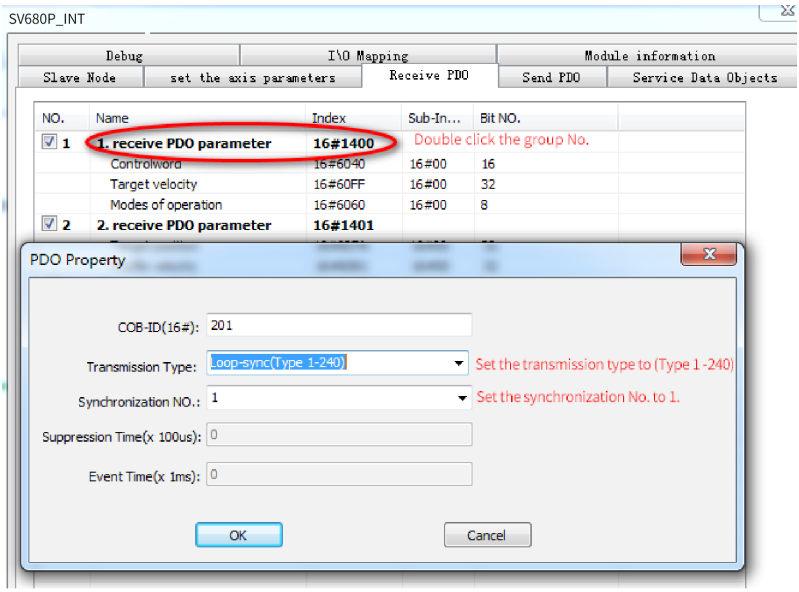
Configure the RPDOs in the following sequence.

Index	Sub-index	Name
6040h	00	Control word
60FFh[1]	00	Target velocity
6060h	00	Modes of operation
607Ah	00	Target position
6081h	00	Profile velocity

Note

[1]: The object dictionary can be replaced by other object dictionaries with a length of 0x20.

It is recommended to use synchronous mode for PDO communication. The method for setting synchronous PDO communication of the slave is as follows.



Note

When MCMOVVEL and MCJOG are not in use，this object dictionary can be replaced by other object dictionaries with a length of 0x20.

Where:

- 1. Double-click the group No., and a dialog box appears.
- 2. Set the Transmission Type to Type1-240.
- 3. Set the synchronization NO. to 1.

Configuring TPDOs:

Configure the TPDOs in the following sequence.

Index	Sub-index	Name
6041h	00	Status word
60FDh[1]	00	Digital inputs
6061h	00	Modes of operation
6064h	00	Position actual value
606Ch	00	Velocity actual value

Note

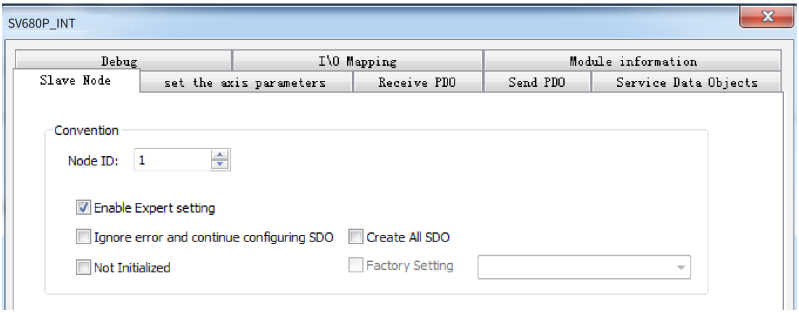
[1]: The object dictionary can be replaced by other object dictionaries with a length of 0x20.

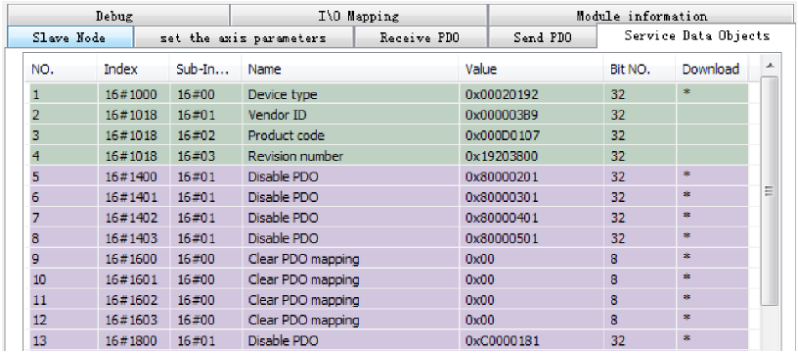
The mode for setting TPDOs is similar to that for RPDOs.

Caution

The EDS is configured based on the preceding sequence by default. Pay attention to the preceding configuration sequence when adding new objects. A wrong sequence will cause failure of H3U axis control commands. When using a PLC from any other manufacturer, you are not necessary to follow the sequence.

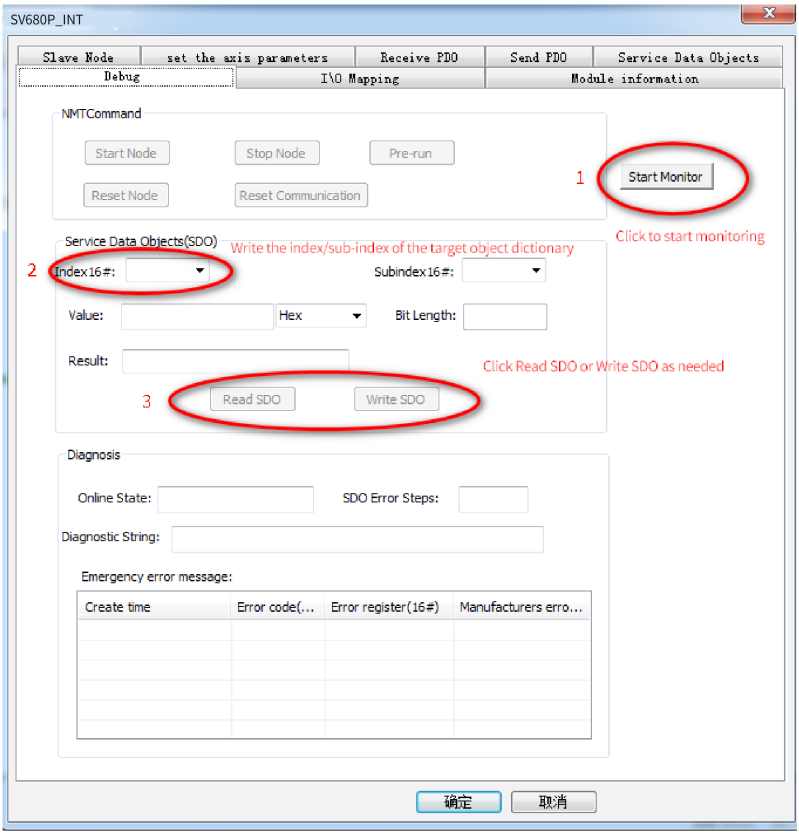
8. Download the CANopen configuration to H3U. The H3U starts slave configuration based on the previous configurations. Configuration is performed based on the object dictionaries listed in the **Servo Data Object** interface. To view this list, check **Enable Expert setting** in the **Slave Node** interface first.





NO.	Index	Sub-In...	Name	Value	Bit NO.	Download
1	16#1000	16#00	Device type	0x00020192	32	*
2	16#1018	16#01	Vendor ID	0x000003B9	32	
3	16#1018	16#02	Product code	0x000D0107	32	
4	16#1018	16#03	Revision number	0x19203800	32	
5	16#1400	16#01	Disable PDO	0x80000201	32	*
6	16#1401	16#01	Disable PDO	0x80000301	32	*
7	16#1402	16#01	Disable PDO	0x80000401	32	*
8	16#1403	16#01	Disable PDO	0x80000501	32	*
9	16#1600	16#00	Clear PDO mapping	0x00	8	*
10	16#1601	16#00	Clear PDO mapping	0x00	8	*
11	16#1602	16#00	Clear PDO mapping	0x00	8	*
12	16#1603	16#00	Clear PDO mapping	0x00	8	*
13	16#1800	16#01	Disable PDO	0xC0000181	32	*

During commissioning, you can monitor the device status online and read/write the object dictionary of the slave through H3U, as shown below.

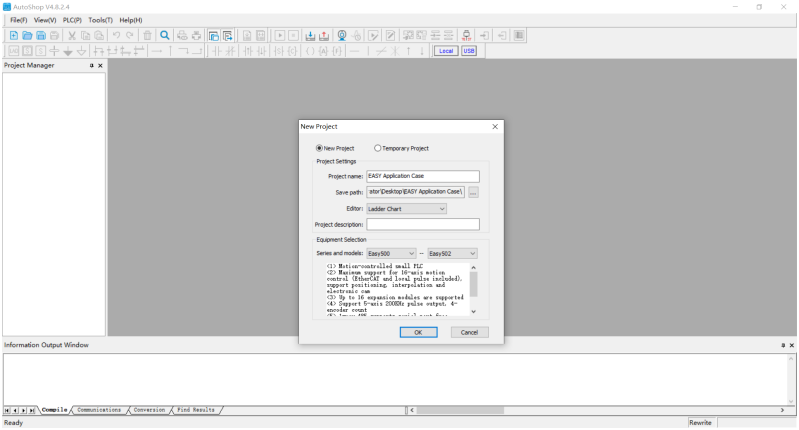


Where:

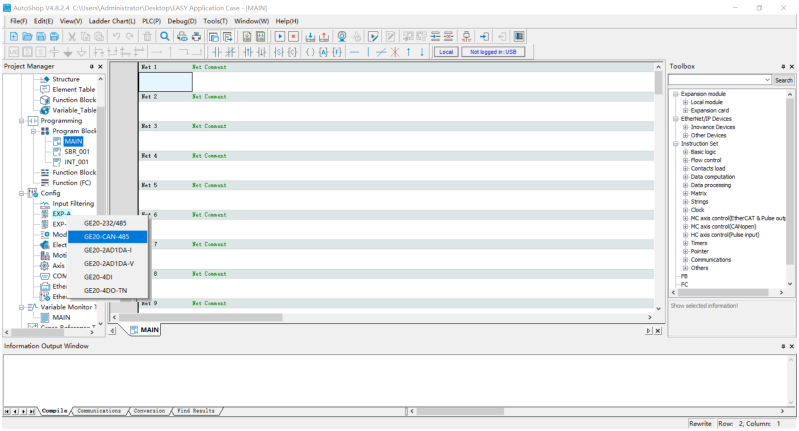
- 1. Click **Start Monitor**.
- 2. Write the index of the object dictionary to be operated in **Index** and the sub-index in **Subindex**.
- 3. Click **Read SDO** or **Write SDO** as needed.

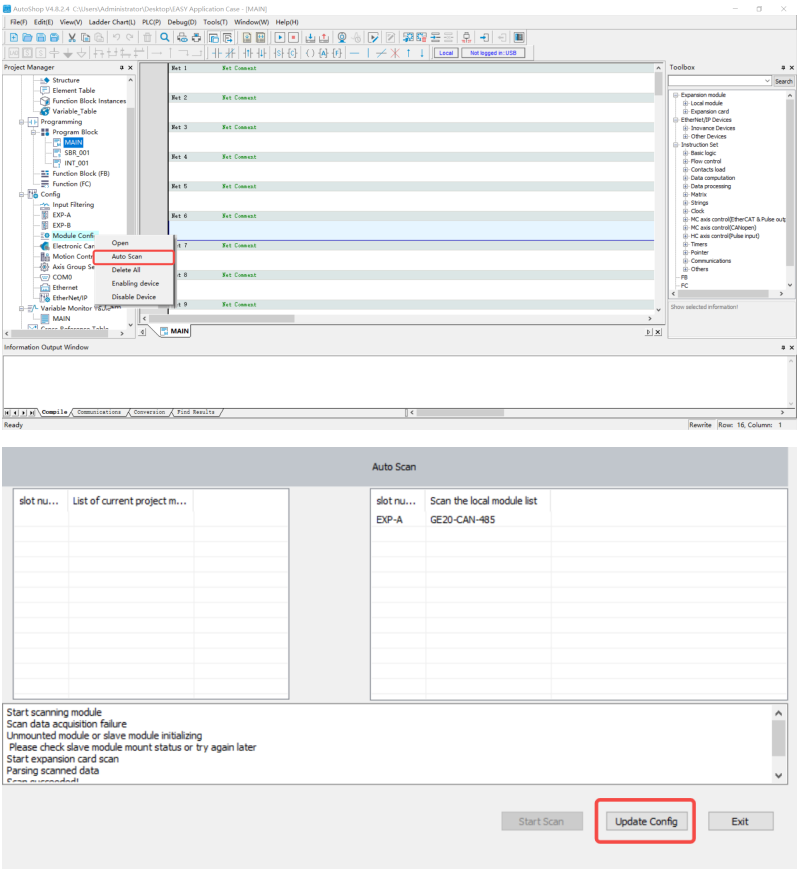
19.5.2.4 Connecting SV680P-INT to Inovance EASY CANopen Master

1. Open Autoshop and click **New Project**. In the popup dialog box, first select the editor type, and then select Easy300 as the PLC type. Enter the project name and select the save path, and then click "OK" to create a new project and enter the project main interface.

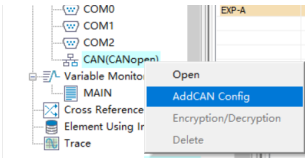


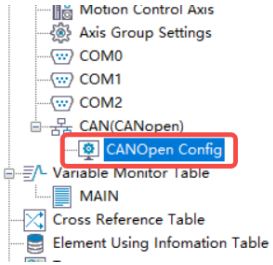
2. Select **GE20-CAN-485** on the right side of the navigation tree of **Configure EXP-A** in the Project Management window. Or select **Auto Scan** in the navigation tree of **Configuration** to add an GE20-CAN-485 expansion card, as shown in the following figure. The GE20-CAN-485 expansion card only supports EXP-A.



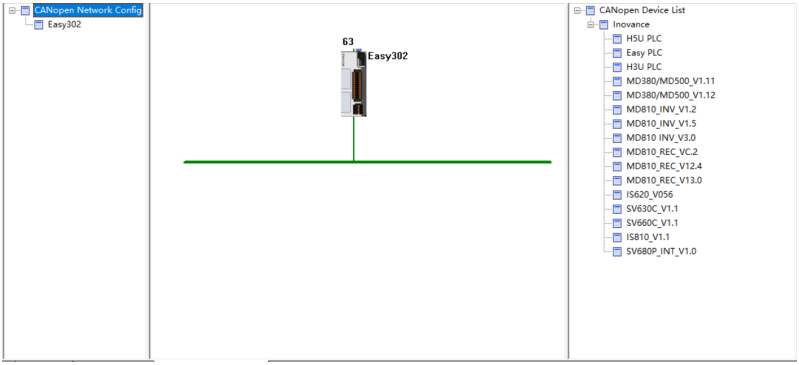


3. Double-click **CAN** in **Configuration** of **Project Management**, select CANopen in the pop-up window, set the station number and baud rate, and click OK. At this time, CAN is configured as a CANopen slave station,. Configure it as a CANopen master station by right-clicking **CAN** in **Configuration** of **Project Management** and selecting **Add CAN Configuration** in the pop-up menu, as shown in the following figure.

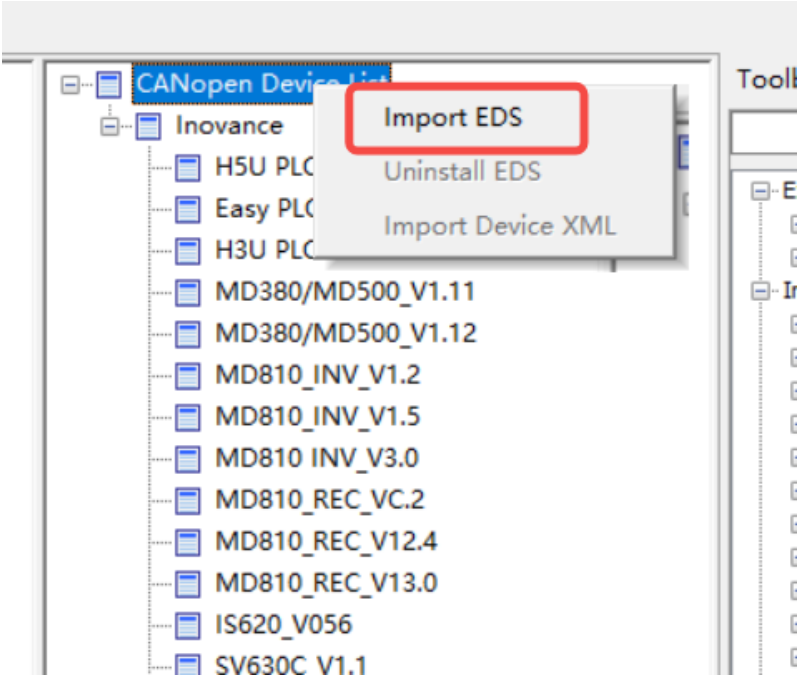




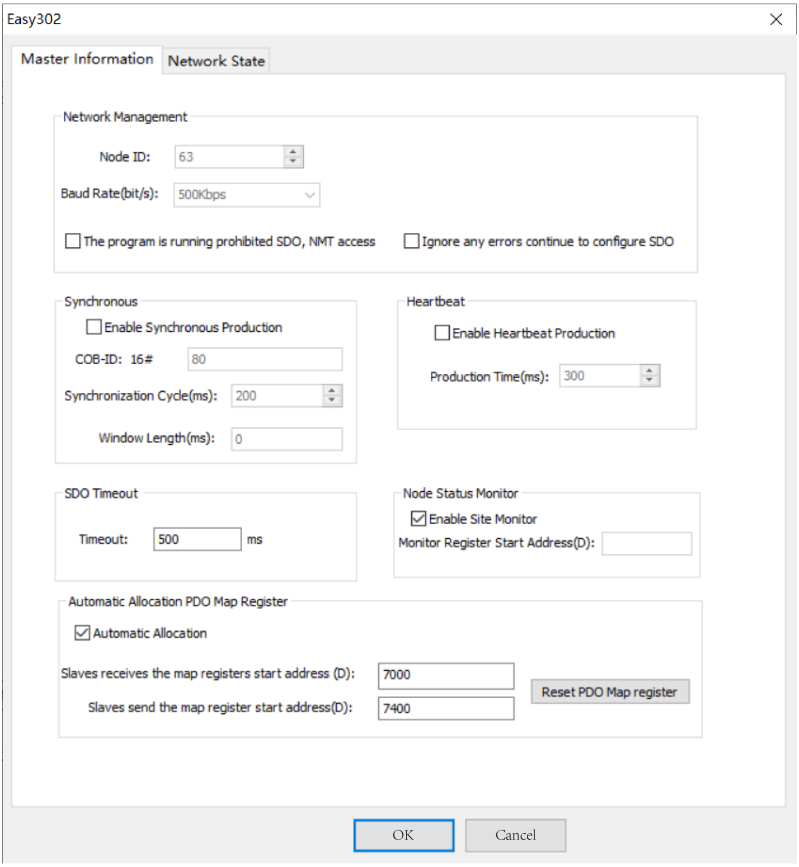
4. Double click CANopen Config to open the CANopen Configuration interface, as shown below:



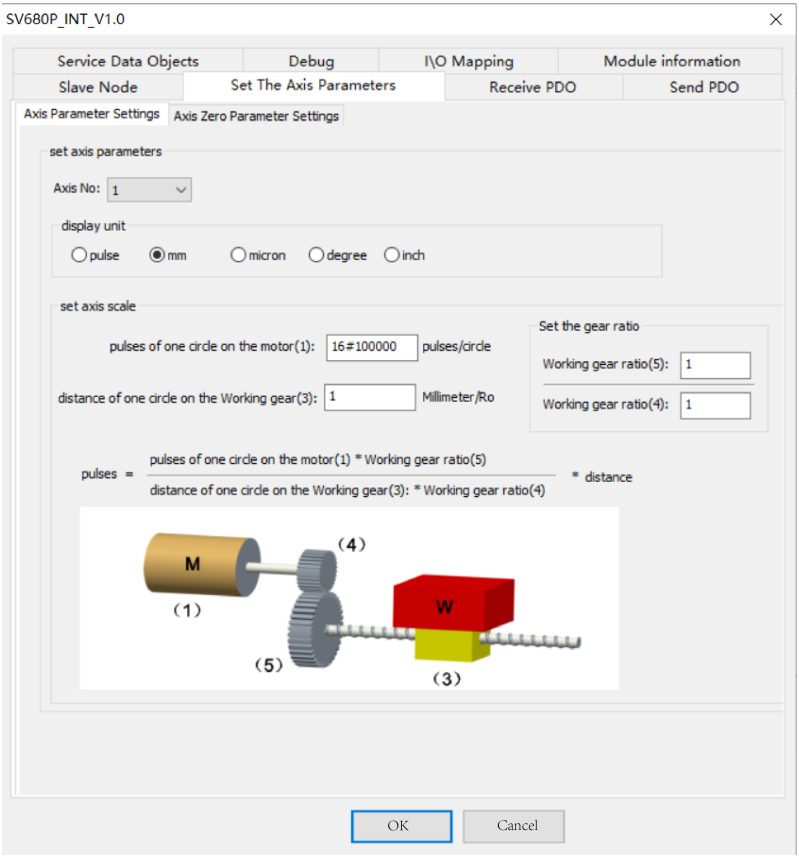
5. If the EDS files needed is not in the CANopen device list, add the device EDS needed. Click **CANopen device list** and right-click on it to display the short-cut menu. In the short-cut menu, select **Import EDS**. In the dialog box displayed, select the EDS device file needed and click **Open**. The device added will be displayed in the CANopen device list on the right.



6. Double-click the EASY master station to open the master configuration interface, in which you can set parameters such as synchronization and heartbeat.



7. Double-click the **SV680P_INT** in the **CANopen device list** to add CANopen slaves. Then, double-click the **SV680P_INT** icon in the configuration to open the slave configuration parameter list.
8. The **axis parameters setting** interface is shown as follows, which include **axis parameter setting** and **homing parameter setting**.

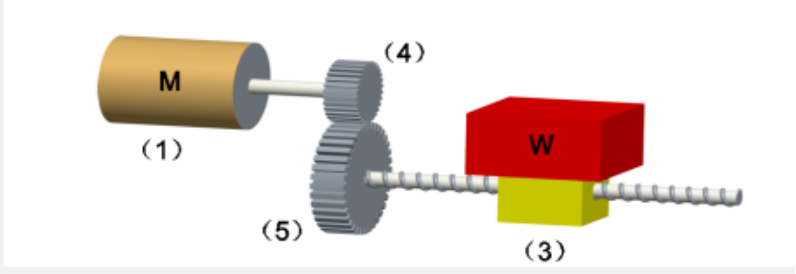


- **Setting axis parameters**

  For devices without reducers, set the gear ratio to 1:1. Set the pulses per motor revolution and distance per motor revolution correctly. The calculation formula is as follows.

  $$\text{Number of pulses} = \frac{\text{Number of reference pulses per motor revolution (1)}}{\text{Distance per motor revolution (3)}} \times \text{Displacement distance (displayed unit)}$$

  Applications with reducers are shown as follows.

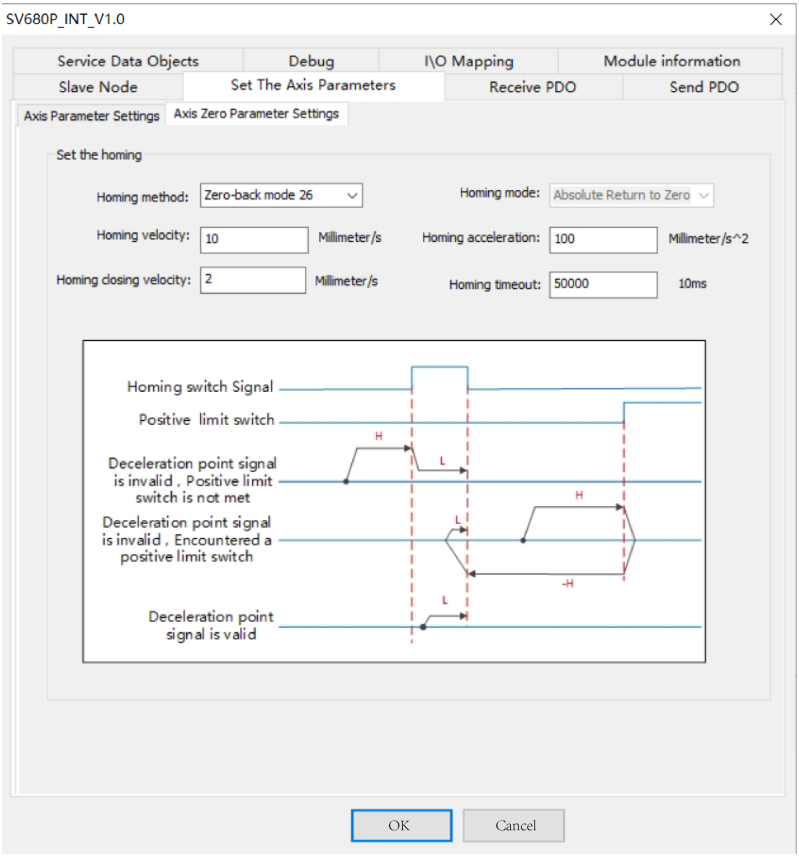


The calculation formula is as follows.

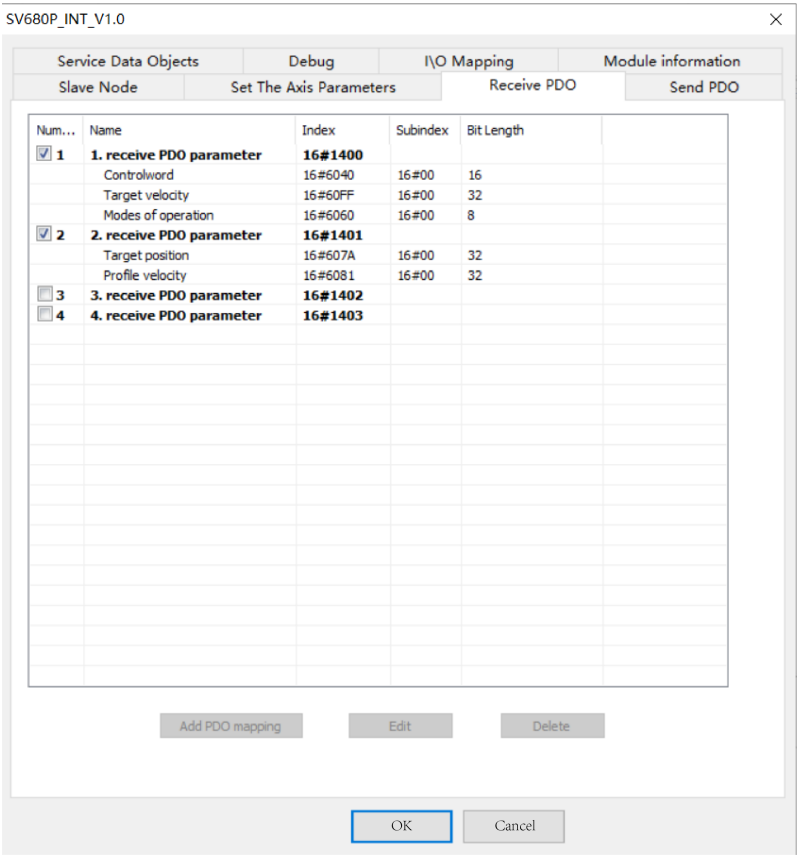
$$\text{Number of pulses} = \frac{\text{Number of reference pulses per motor revolution (1) x Motor gear ratio (5)}}{\text{Distance per motor revolution (3) x Operating gear ratio (4)}} \text{ x Displacement distance (displayed unit)}$$

- **Homing**

  The range of homing modes is 1-35. For details of each mode, see *SV680-INT Series Servo Drive Function Guide*.



9. Click **Receive PDO** or **Transmit PDO**. The following interface is displayed.

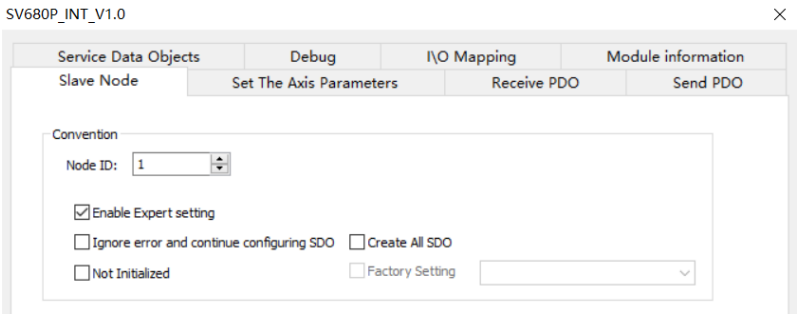


Receive PDO Parameter: Indicates the data sent by the master station to a slave station.

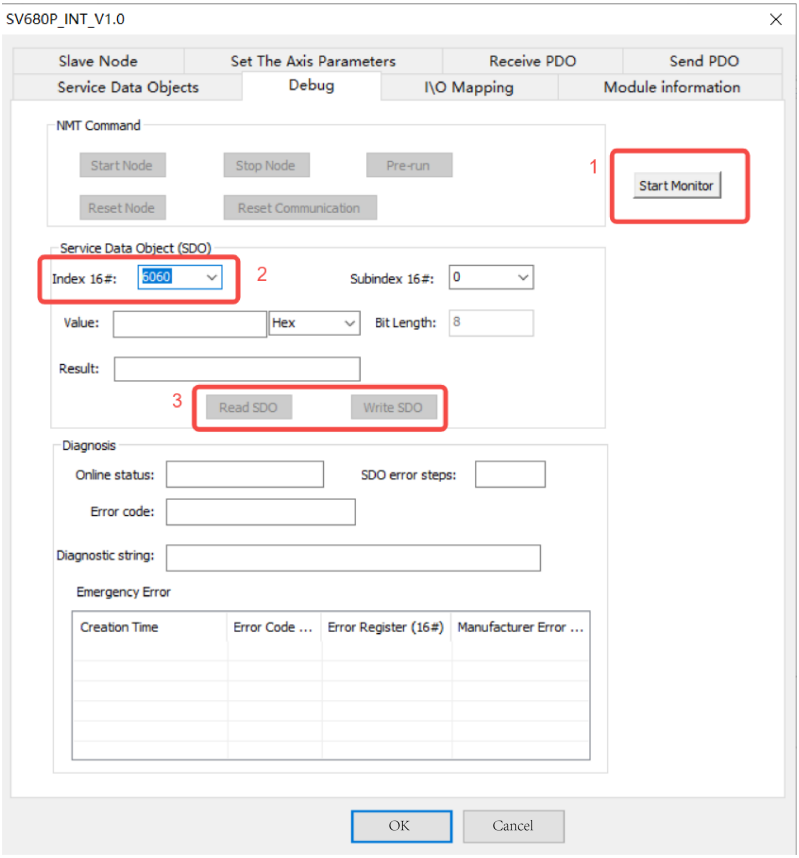
Send PDO Parameter: Indicates the data sent by a slave station to the master station.

You can check the box in front of the number to enable a PDO. The PDOs in the EDS file that take effect by default are already checked. You can click **Add PDO mapping**, **Edit**, or **Delete** to edit PDO mapping.

10. Download the CANopen configuration to EASY. The EASY starts slave configuration based on the previous configurations. Configuration is performed based on the service object list. To view this list, check **Enable Expert setting** in the **Slave Node** interface first.



During commissioning, you can monitor the device status online and read/write the object dictionary of the slave through EASY, as shown below.



19.5.3 EtherCAT Communication Configuration Case [N]

19.5.3.1 SV680N-INT and AM600 Controller

This section describes how to configure the SV680N-INT series servo drive for cooperation with the AM600 series controller.

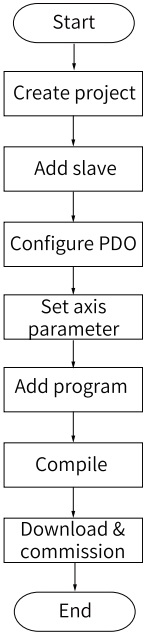
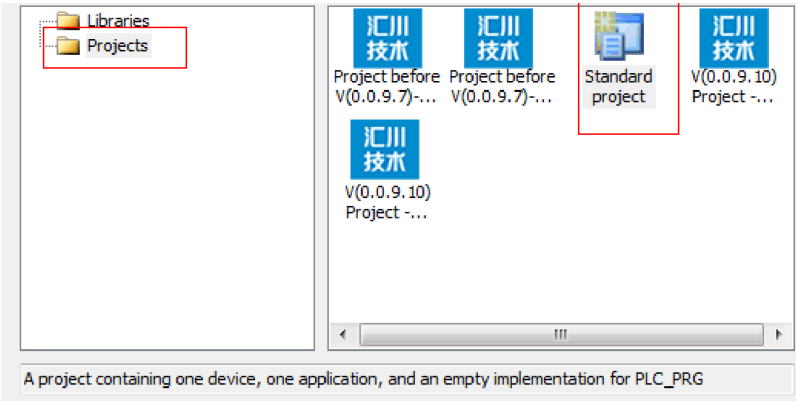
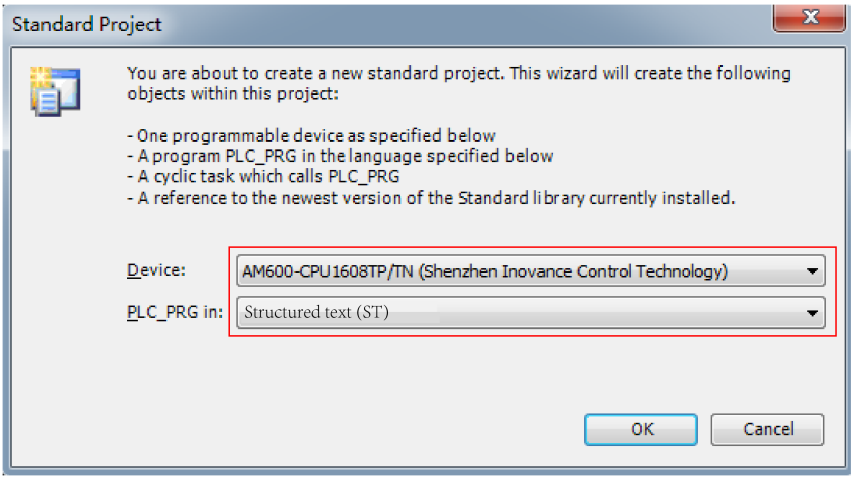


Figure 19-36 Configuration flowchart

Open the software and create an AM600 project.

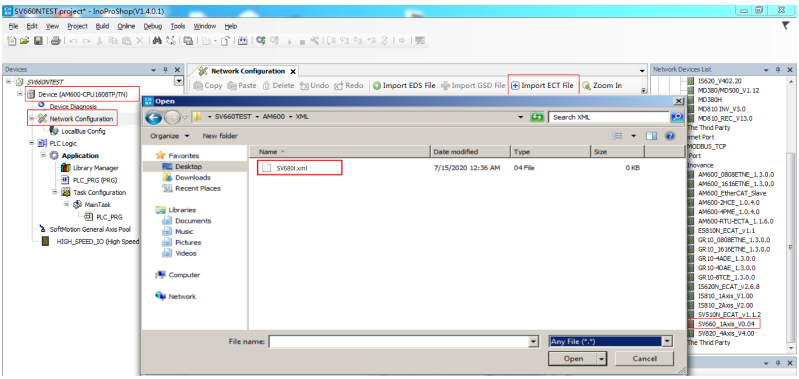
Select **AM600-CPU1608TP**, as shown in the following interface.

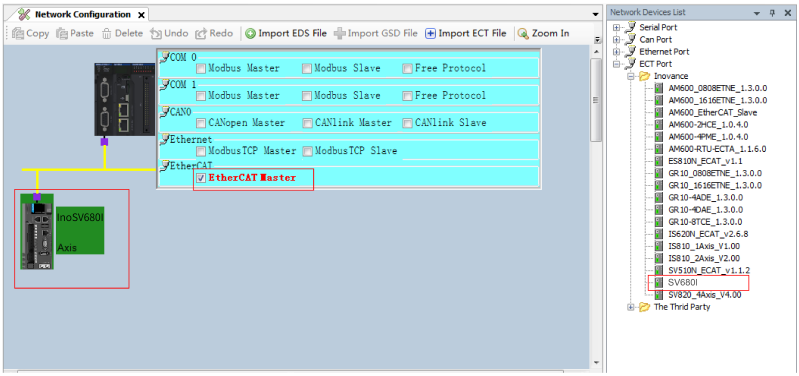




Adding the SV680N-INT servo drive as slave

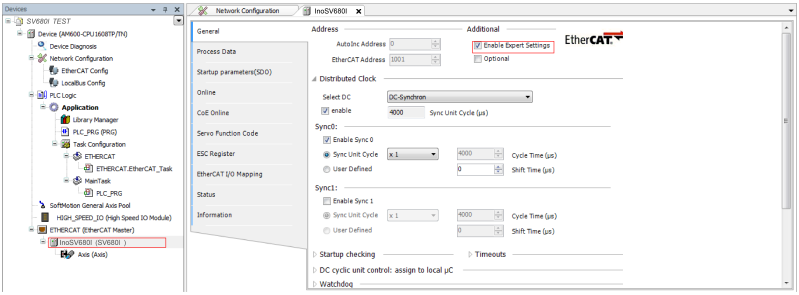
Open the network configuration and import the ECT file of SV680N-INT. Add an SV680N-INT as a slave, as shown in the following interface.

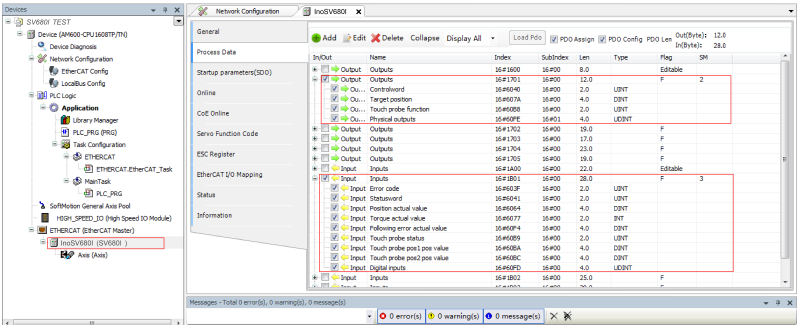




Configuring PDO

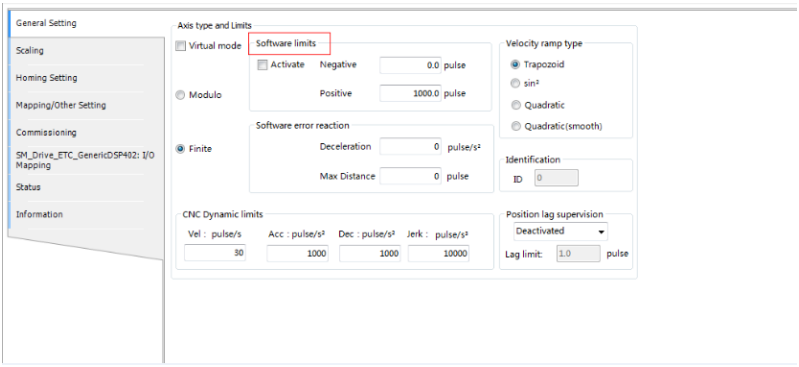
Select **Enable Expert Settings** and configure PDOs in the process data as needed. In this case, CSP is used as the operation mode and the default values of 1600 and 1A00 are used for PDO parameters.



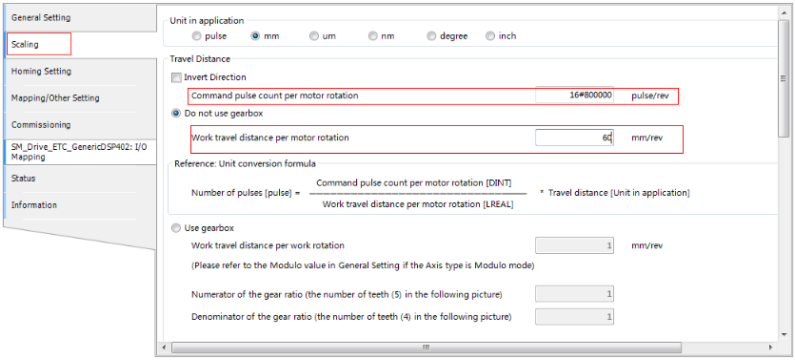


Configuring axis parameters

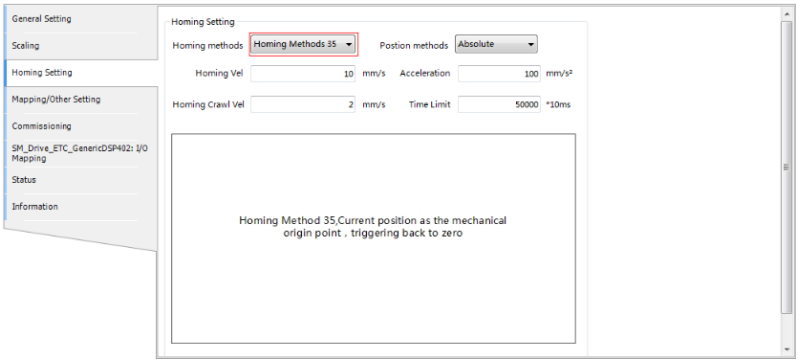
1. Set the software position limit and the operation mode in basic axis settings.



2. Select 16#4000000 for the 26-bit encoder, 16#800000 for the 23-bit encoder and 16#100000 for the 20-bit encoder during unit conversion. In this case, the single-turn travel distance is set to 60 mm and 1 mm/s equals to 1 RPM of the motor.

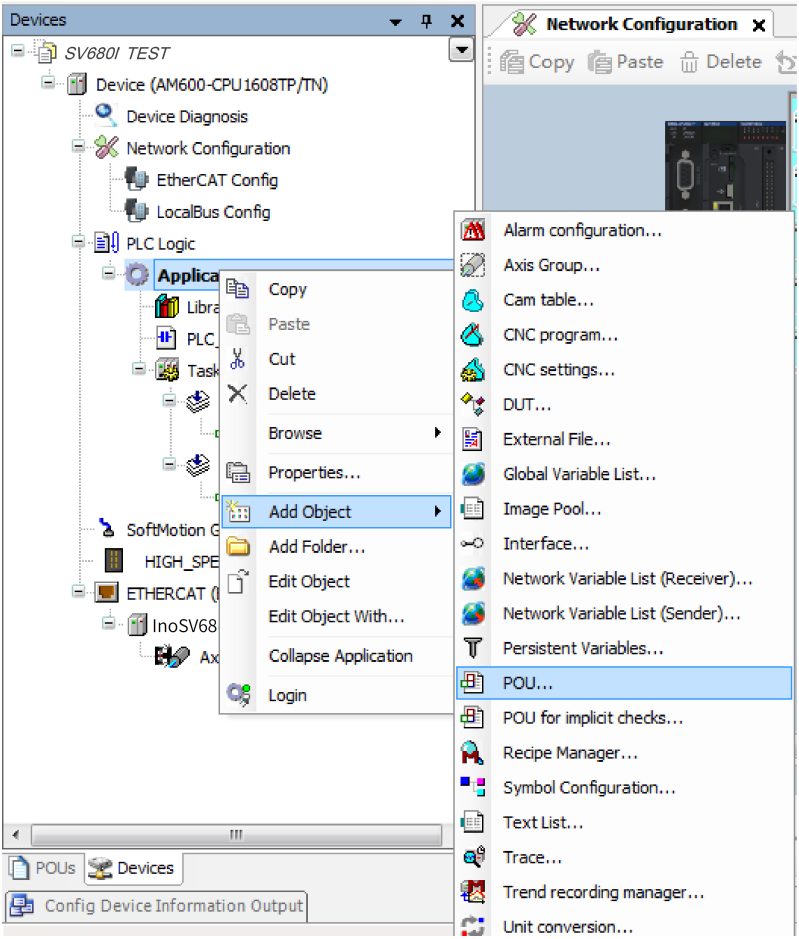


3. Select the homing mode according to actual needs. For details, see section *"Homing Mode"* in SV680-INT Series Servo Drive Function Guide for details.

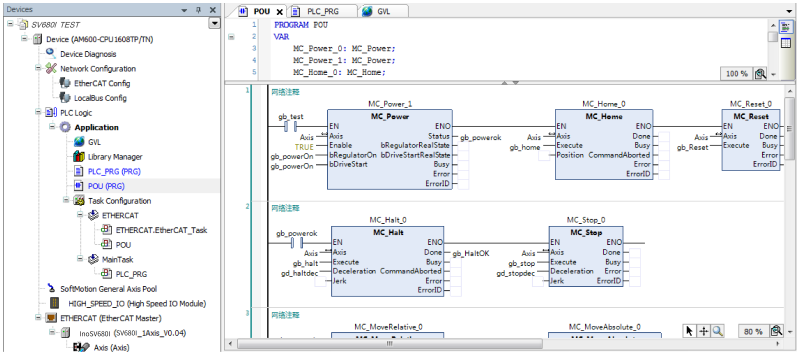


Adding a program

Add a program to control the servo axis position, as shown by the following interface. See the following figure.

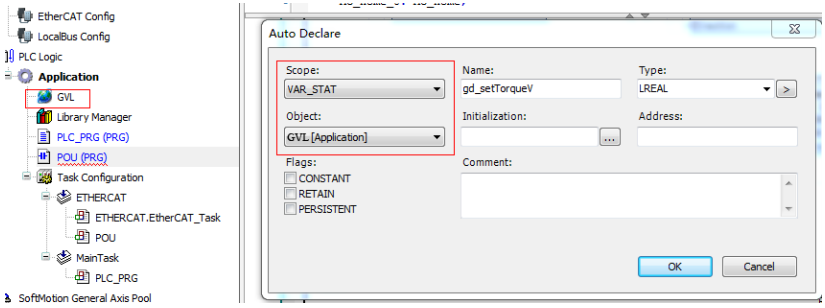


- Implement basic functions such as enabling, homing and positioning through adding function blocks.



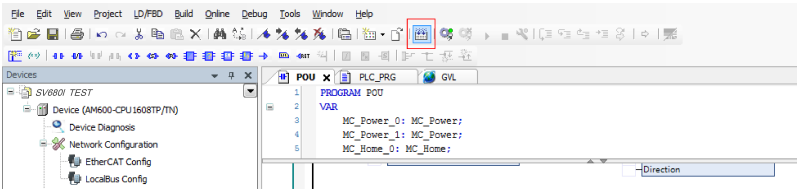
- To implement directed motion through the logic program, some variables may need to be called to different POUs. Therefore, set the variables as global variables.

```
CASE iStatus OF
    10:
    gb_powerOn:=TRUE;
    IF gb_powerok THEN
    iStatus:=20;
    END_IF
    20:
    gd_MoveAbsPos:=1000;gd_MoveAbsVel:=200;gd_MoveAbsVelacc:=200;gd_MoveAbsVeldec:=200;gb_moveAbs:=TRUE;
    IF gb_moveAbsOK THEN
    gb_moveAbs:=FALSE;iStatus:=30;
    END_IF
    30:
    gd_MoveAbsPos:=2000;gd_MoveAbsVel:=400;gd_MoveAbsVelacc:=400;gd_MoveAbsVeldec:=400;gb_moveAbs:=TRUE;
    IF gb_moveAbsOK THEN
    gb_moveAbs:=FALSE;iStatus:=40;
    END_IF
    40:
    gd_MoveAbsPos:=0;gd_MoveAbsVel:=1000;gd_MoveAbsVelacc:=1000;gd_MoveAbsVeldec:=1000;gb_moveAbs:=TRUE;
    IF gb_moveAbsOK THEN
    gb_moveAbs:=FALSE;iStatus:=50;
    END_IF
    50:
    gb_powerOn:=FALSE;
    iStatus:=0;
END_CASE
```



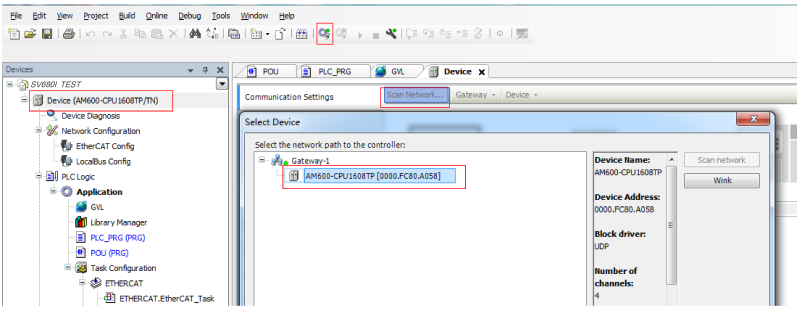
Compiling

After compiling the program, click the icon indicated by the red square box to check whether the program is correct.

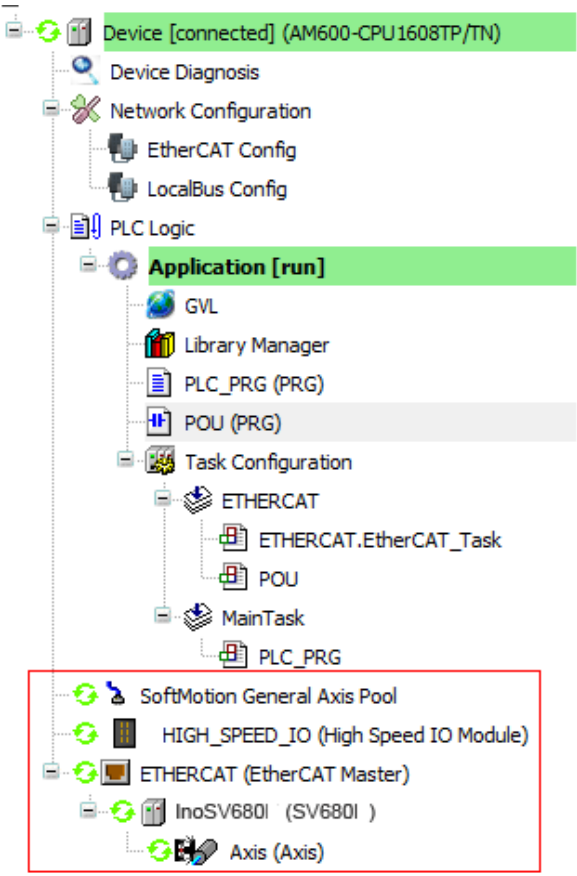


Downloading and commissioning

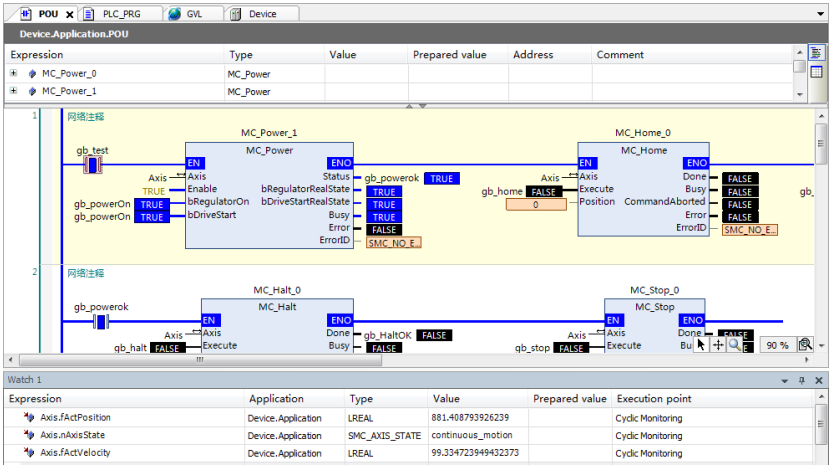
1. After checking that the program is correct, download the program to PLC. The program can be activated after running. Before downloading, scan the PLCs first to select the PLC to be downloaded, and then click the download icon, as shown in the following interface.



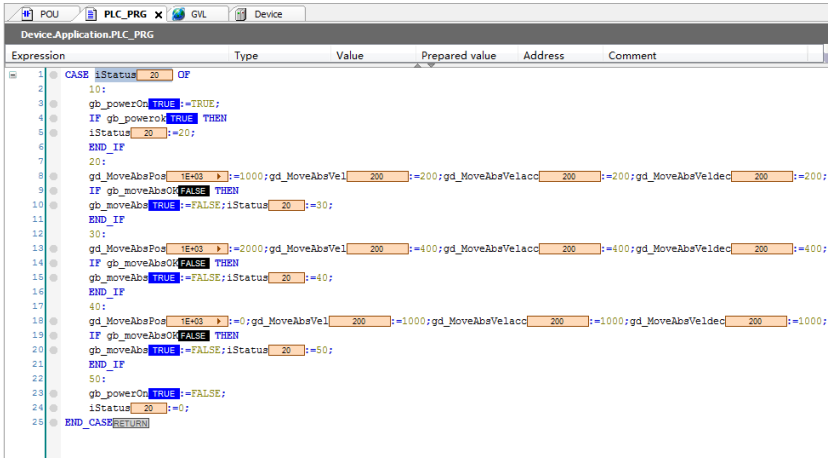
2. After log-in, ensure the servo drive and the axis are in normal state.



3. Monitor critical parameters through the monitoring function. Start the testing program to perform basic tests such as enabling, homing and positioning.



4. After the testing is done, perform directed running program.



19.5.3.2 SV680N-INT and Omron Controller

This section describes how to configure the SV680N-INT series servo drive for working with an Omron NX701 controller.

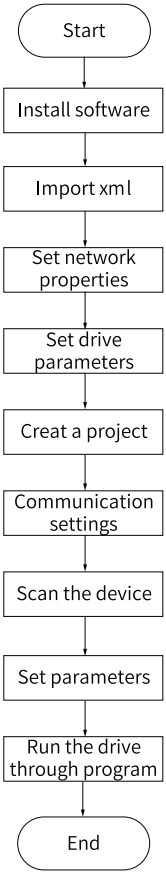


Figure 19-37 Configuration flowchart

Note

When more than 25 drives are networked with Omron NX701, you need to modify the cable length defined in the Omron master station. The cable length is calculated based on the fact that one drive needs a length of 36 m.

Installing the Sysmac Studio software

Install the Sysmac Studio software.

It is recommended to install V1.10 or above.

Importing the xml device description file

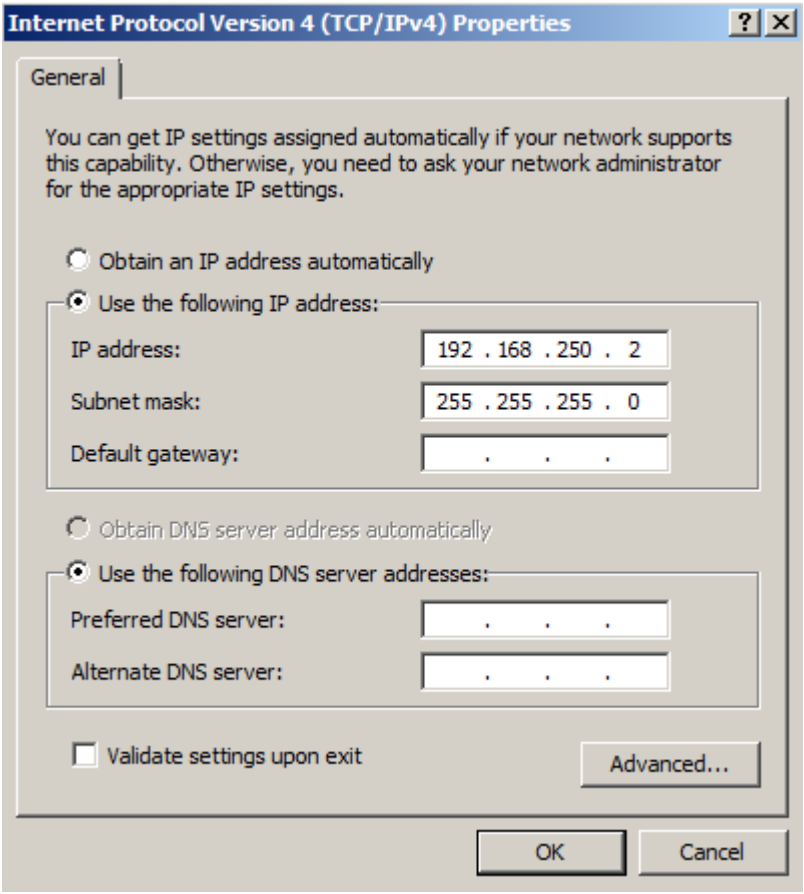
Importing the device description file (V2.5 or later recommended).

It is recommended to import the device description file of "SV680_INT_EOE_1Axis_02002_240110.xml" or later version. The file path is as follows: OMRON\Sysmac Studio\IODeviceProfiles\EsiFiles\UserEsiFiles.

If the xml file is saved under this path for the first time, the Sysmac Studio software must be restarted.

Setting the network connection attribute

- If the PC is connected to the controller through an USB, skip this step.
- If the PC is connected to the controller through EtherNet, set the TCP/IP attribute of the PC, as shown below.

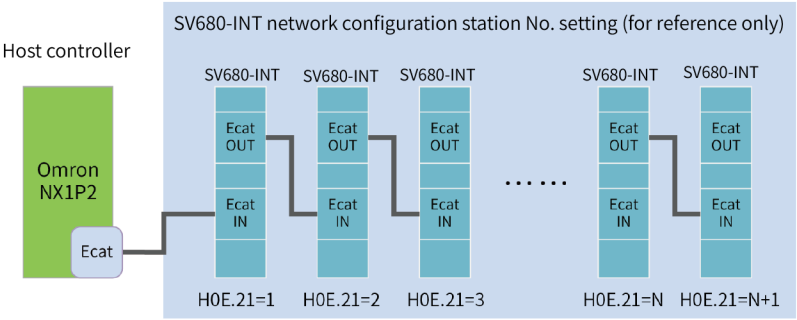


Configuring the servo drive

Pay attention to the setting of H0E.21.

Parameter	Name	Value range	Unit	Initial Value	Mode	Setting Condition	Effective Time	Value
H0E.21	EtherCAT slave alias	0–65535	-	0	-	Stop setting	Upon the next power-on	Non-zero

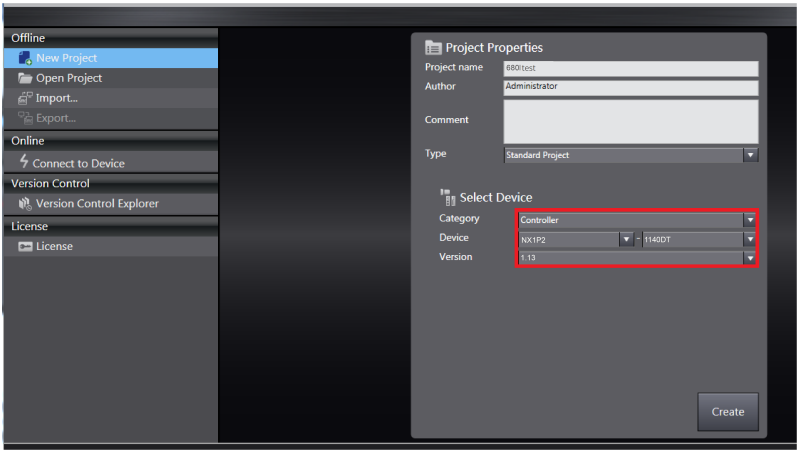
When an Omron controller is used, set the EtherCAT communication station number in H0E.21. It is recommended to set the station number according to the actual connection sequence for the convenience of configuration management.



Creating a project

Device: Set a device according to the actual controller model.

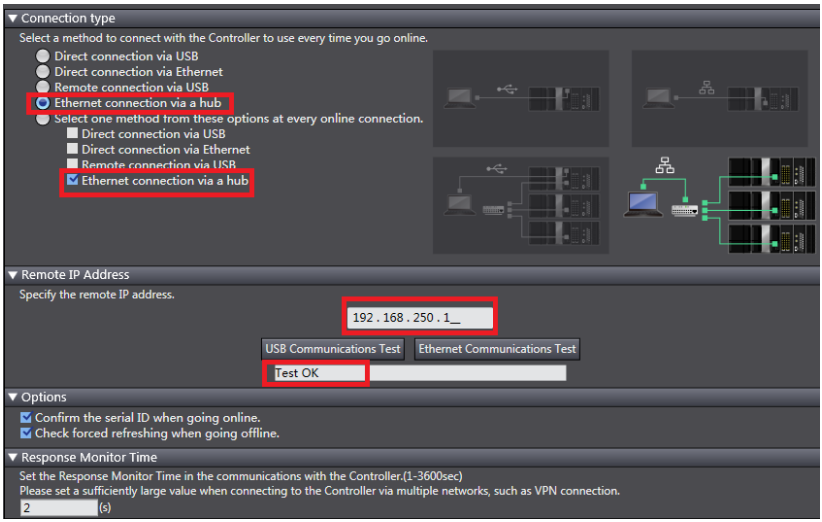
Version: Use V1.09 or later versions. For NX1P2-1140DT, only V1.13 is supported.



Communication setting

After entering the main interface, set the connection mode between the PC and the controller in Controller → Connection type.

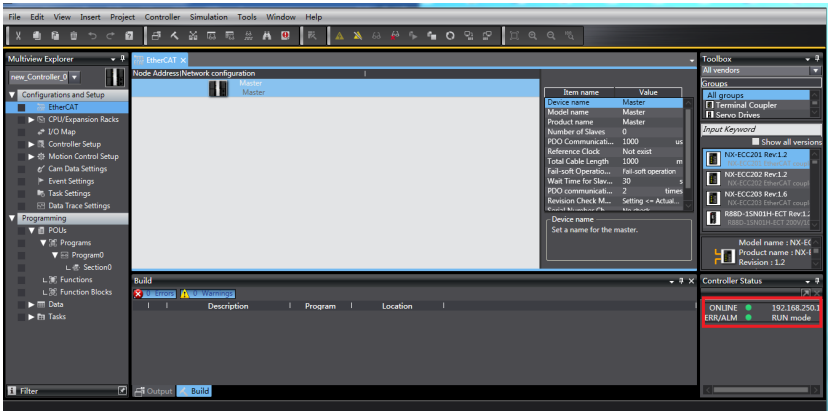
- Select **USB** → **Remote connection** to perform USB Communication Test directly. If the test is succeeded, proceed to the next step.
- Select **Hub→Ethernet** connection. In this case, set the IP address to 192.168.250.1 (controlled by NX), and then perform Ethernet Communication Test. If the test is succeeded, proceed to the next step.



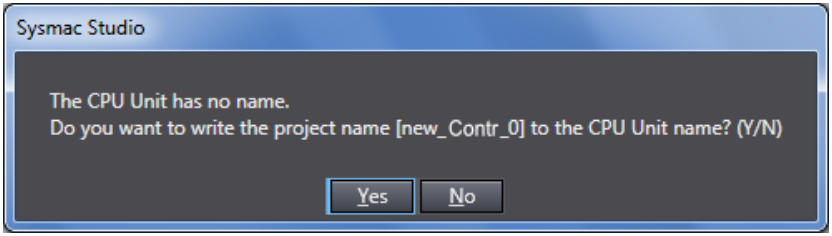
Scanning the device

Switch the controller to the online and running mode.

1. Check that the controller status in the lower right corner is online and running.

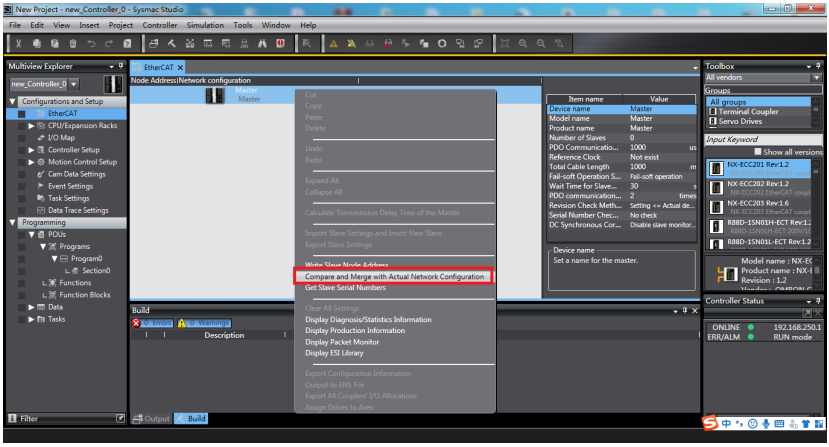


2. A confirmation dialog box appears if it is a new controller.



3. Click **Yes**. The name here is the project name.
   Scan the device and add the slave station.

   In **Configurations and Setup→EtherCAT**, right-click **Master**, and select **Compare and Merge with Actual Network Configuration**. The controller scans all the slaves in the network (an error will be reported if the station number is 0). After scanning, click Apply actual network configuration in the pop-up window to add the slave. You can view the added slave station in the main page.

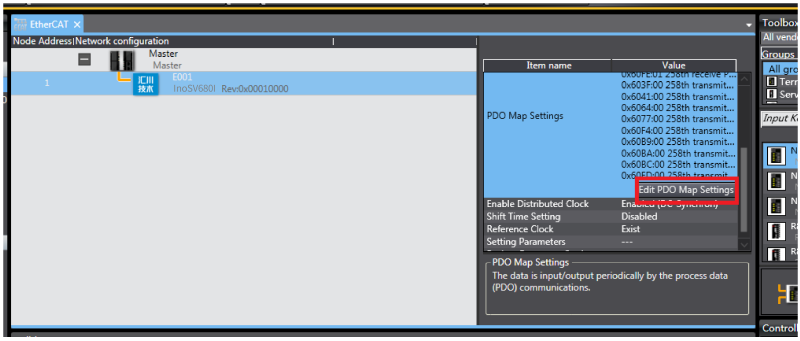


Setting parameters

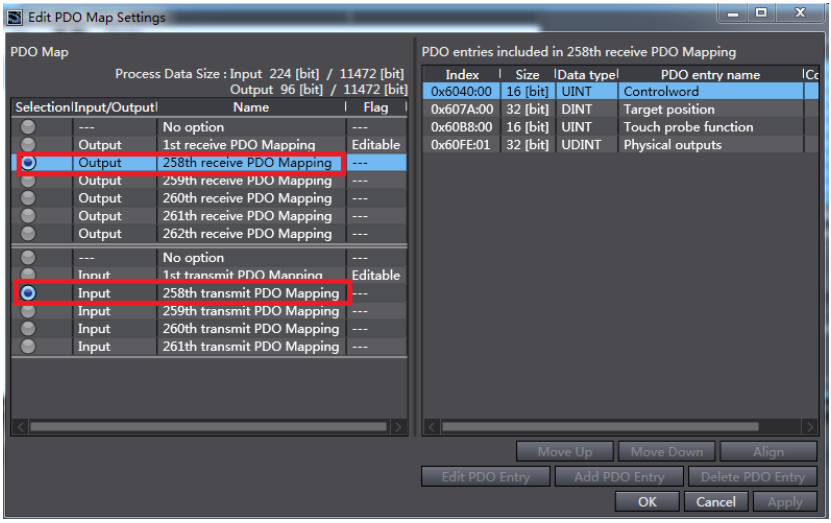
Switch the controller to the offline mode and set PDO mapping, axis parameters, and the DC clock.

Setting the PDO mapping

1. Edit the PDO mapping settings.



2. Select the editable RPDO and TPDO provided by the drive for configuration.

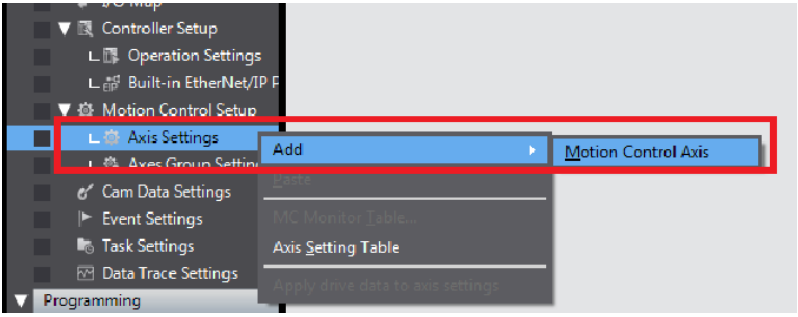


3. Modify the PDO mapping object through **Add PDO Entry** and **Delete PDO Entry**. The frequently used mapping parameters are shown below.

Index	Size	Data type	PDO entry name
0x603F:00	16 [bit]	UINT	Error code
0x6041:00	16 [bit]	UINT	Statusword
0x6064:00	32 [bit]	DINT	Position actual value
0x6077:00	16 [bit]	INT	Torque actual value
0x60F4:00	32 [bit]	DINT	Following error actual value
0x60B9:00	16 [bit]	UINT	Touch Probe Status
0x60BA:00	32 [bit]	DINT	Touch Probe pos 1 pos value
0x60BC:00	32 [bit]	DINT	Touch Probe pos 2 pos value
0x60FD:00	32 [bit]	UDINT	Digital inputs

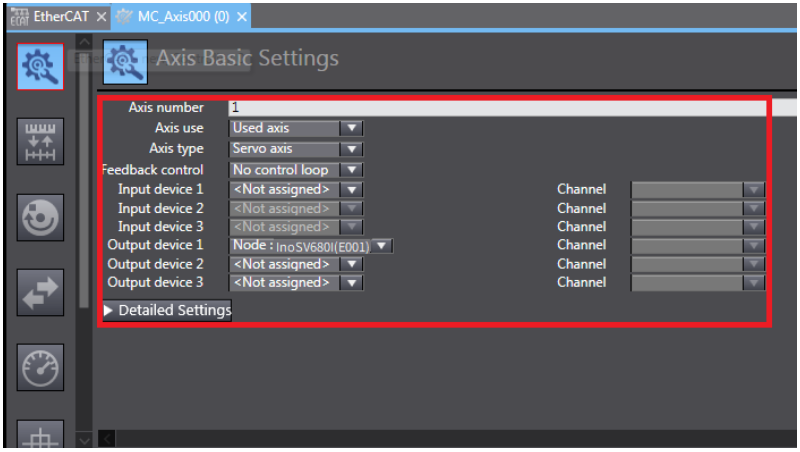
Setting axis parameters

1. Right click Motion Control Setup→Axis settings →Add→Motion Control Axis, as shown in the following interface.



2. MC_Axis000 can be renamed through a simple click. For example, if it is named as "Rewind axis", the axis variable "Rewind axis" used in the NX program represents control on this SV680N-INT servo axis.
3. Double-click **MC_Axis000** and configure an SV680N-INT device at the corresponding station in a corresponding **Axis Basic Settings** interface.

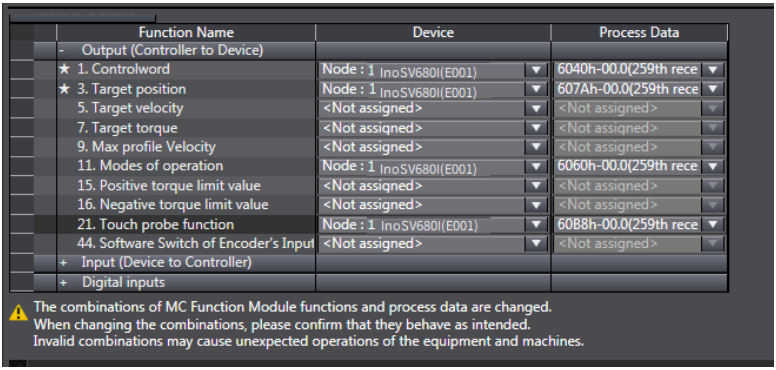
   a. Axis assignment

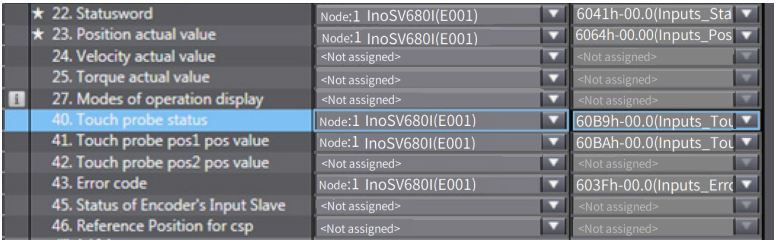


- Axis number: Ethernet communication station number of the servo drive, which is also the value of H0E.21.
- Axis use: Represents the axis in use.
- Axis type: Represents the servo axis.
- Output device 1: Select the servo drive.

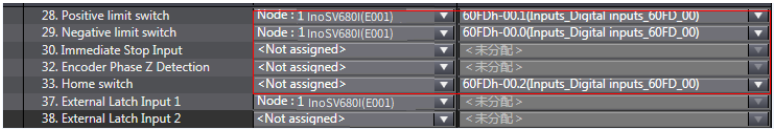
b. Detailed settings

- Select the PDO mapping objects according to step "setting parameters", which is to assign the output parameters (controller to device) and input parameters (device to controller). Note that the object name, node number, and index number must be set correctly. Each mapping object selected in step “parameter setting” must be assigned correctly. Otherwise, an error will be reported.





- 60FDh must be mapped to the same as that in the Omron controller, as shown in the following interface. bit0...bit2 of SV680-INT indicate the negative position limit, positive position limit, and the home respectively. bit16...bit20 indicate the status of DI1...DI5.

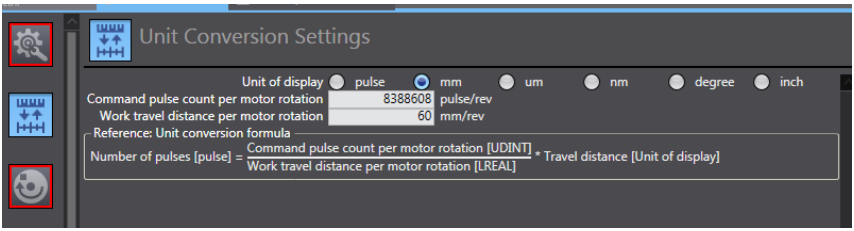


Note

The Omron software tool only allows you to configure axes for the SV680N-INT series manually.

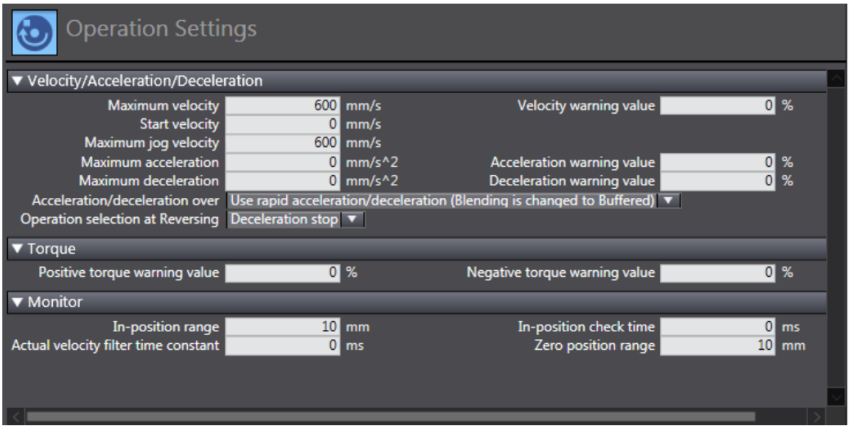
Setting unit conversion

Set Command pulse count per motor rotation based on the resolution of the motor encoder (example: 67108864 PPR for motor equipped with 26-bit encoder). For the convenience of commissioning, set the **Work travel distance per motor rotation** to 60 mm/rev, indicating 1 mm/s equals to 1 RPM of the motor.



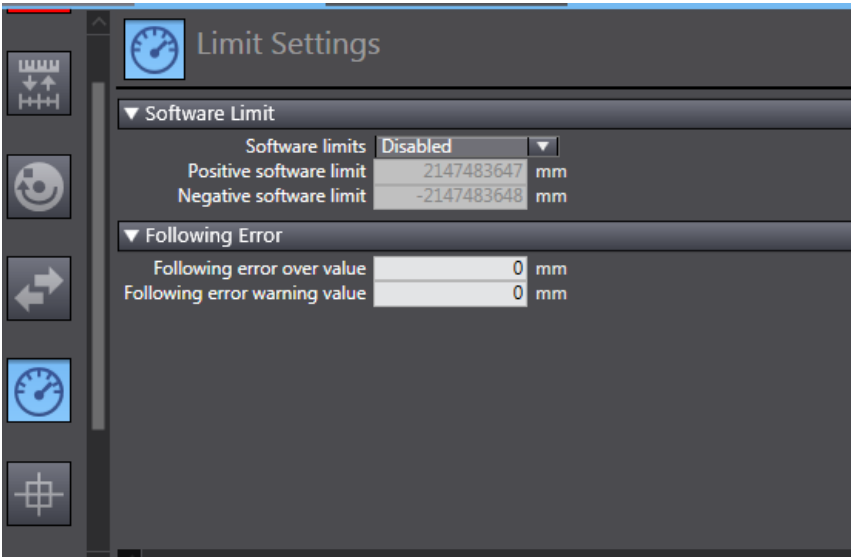
Select the Display Unit based on the actual running unit when setting the gear ratio. All the position-type parameters in the host controller will be displayed in this unit.

Operation settings



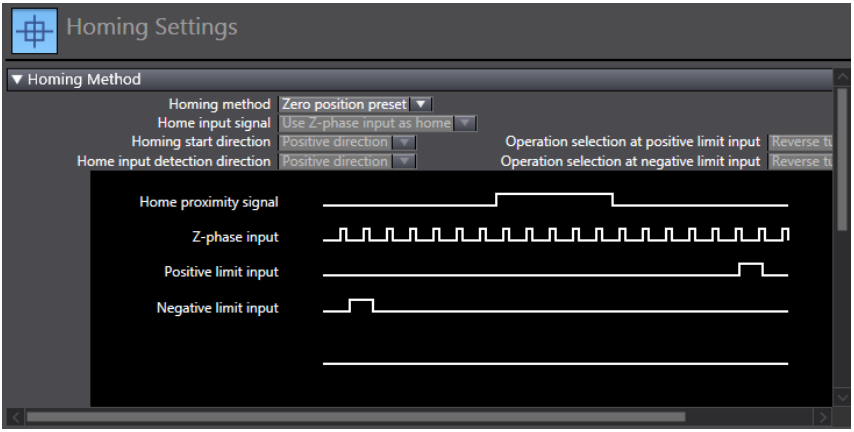
- Velocity/Acceleration/Deceleration: Set the maximum speed of the load (if the motor speed converted exceeds 1900 RPM, a parameter setting error) which is marked by a red box, will be reported by the host controller software) according to actual conditions. If the acceleration/deceleration rate is 0, the motion profile will be generated based on the maximum acceleration/deceleration rate (there is no need to set the acceleration/deceleration rate in general cases).
- Torque: If the warning value is set to 0, no warning will be reported. If there is no special requirement, this parameter may not be set.
- Monitor: Set Positioning Range and Zero Position Range based on actual motor and mechanical conditions. If the set value is too small, positioning or homing may not be completed.

Setting the position limit



You can use the function of software position limit. The software position limit will be activated after homing.

Setting the homing method



The homing mode involves cooperation between the servo drive and host controller. Set the homing mode according to the following table.

Description of NX Software	Servo Drive Function	Terminal Configuration
Home proximity signal	Home switch (FunIN.31)	-
Positive limit input	P-OT (FunIN.14)	DI1
Negative limit input	N-OT (FunIN.15)	DI2

Select the homing mode of the host controller and set the homing speed, acceleration, and home offset based on actual mechanical conditions.

- Introduction to homing
  Function block: MC_Home and MC_HomeWithParameter

  1. Set MC_Home in the preceding figure and MC_HomeWithParameter in the function block.
  2. The two function blocks both include 10 types of homing modes.

MC_Home	MC_HomeWithParameter
Proximity reverse turn/home proximity input OFF Proximity reverse turn/home proximity input ON Home proximity input OFF Home proximity input ON Limit input OFF Proximity reverse turn/home input mask distance Limit inputs only Proximity reverse turn/holding time No home proximity input/holding home input Zero position preset	Designate the homing action to be modified. 0: Proximity reverse turn/home proximity input OFF 1: Proximity reverse turn/home proximity input ON 4: Home proximity input OFF 5: Home proximity input ON 8: Limit input OFF 9: Proximity reverse turn/home input mask distance 11: Limit inputs only 12: Proximity reverse turn/holding time 13: No home proximity input/holding home input 14: Zero position preset

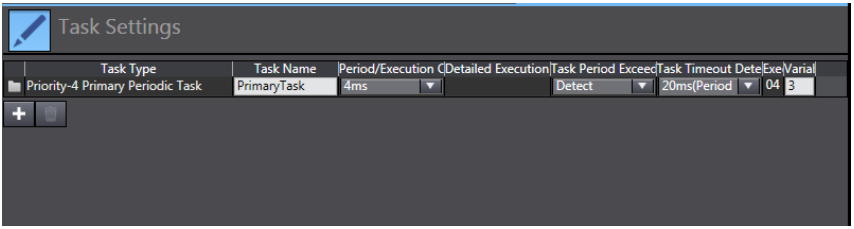
- Home proximity input OFF: The host controller searches for the home signal after reaching the falling edge of the home proximity switch.
- Home proximity input ON: The search for the home signal starts after the rising edge of the home proximity switch is reached.
- Proximity reverse turn: The home proximity signal is ON when homing starts, and reverse running applies after the falling edge of the home proximity signal is reached.
- Home input mask distance: The home signal is masked by the host controller within the set distance after receiving the homing signal (for example, edge change of home proximity signal), and the home signal is received only after the set distance passes.
- Holding time: The home signal is masked by the host controller within the set period of time after receiving the homing signal (for example, edge change of home proximity signal), and home signal is received only after the set period of time elapses.
- Zero position preset: The home offset is being written to the position reference/ position feedback in the host controller with current position as the home and motor at a standstill.

Note

The low-speed searching for the home signal applies in all the homing modes. In case of operations at high speed, the home signal is hidden during deceleration from high speed to low speed.

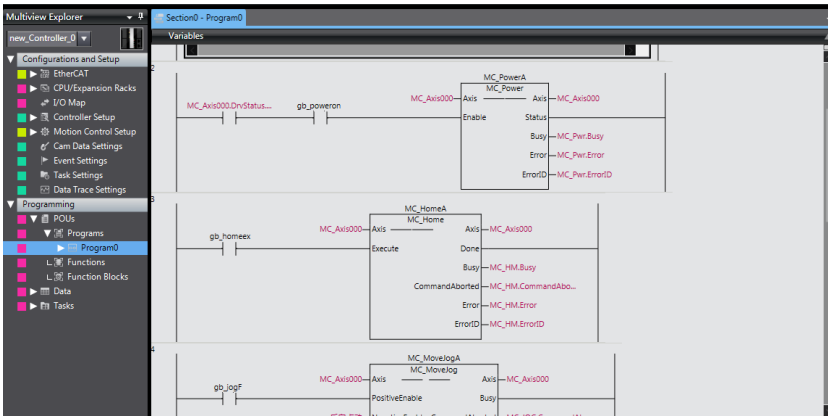
Setting the distributed clock

The default clock is 1 ms. The synchronization clock named "PDO communication cycle" (cycle of primary fixed cycle tasks) can be modified in the **Task settings** interface. The modification will be activated after switching to the online state at next power-on.



Program-controlled servo operations

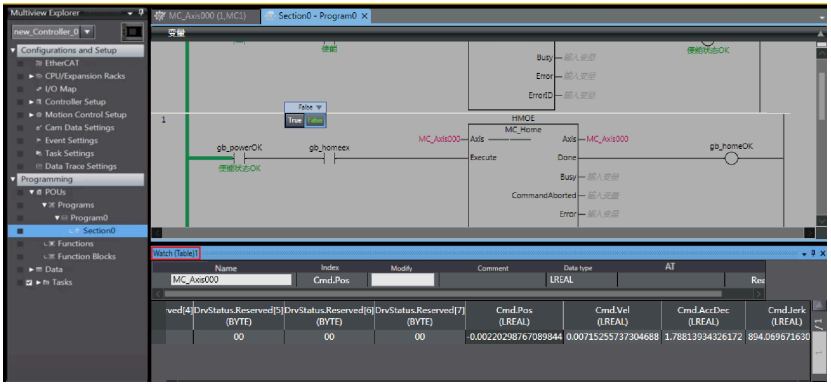
1. After configurations are done, you can control the servo drive operations through the PLC program.
   If the MC_POWER module is used, it is recommended to add the servo status bit MC_Axis000.DrvStatus.Ready (MC_Axis000 is the axis name). MC_Axis000 is the axis name. This is to prevent the situation where the PLC program is running but the communication configuration is not done.

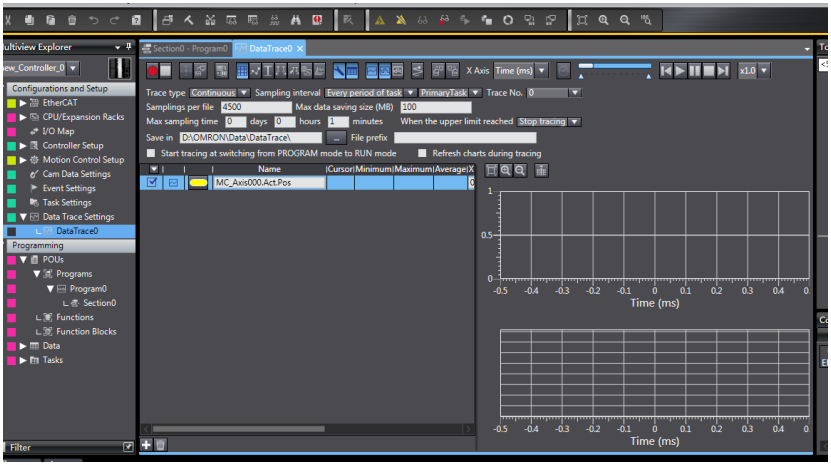


2. After all the settings and programming are done, switch to the online state, and click  to download the program to the controller.

   Click  to use the synchronization function. This function serves to compare the difference between the current program and the program in the controller, allowing users to determine whether to download the program to the controller, upload it from the controller "" or leave it unchanged based on the differences.

   You can monitor the data through the monitoring list or collect the data waveform by using the data tracking function during operation.





19.5.3.3 SV680N-INT and Beckhoff Controller

This section describes how to configure the SV680N-INT servo drive for working with Beckhoff TwinCAT3.

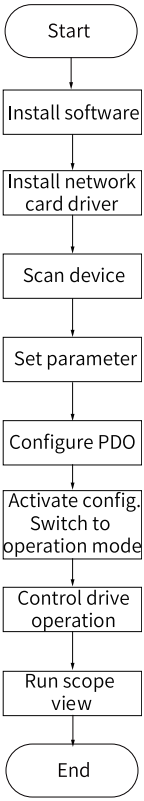


Figure 19-38 Configuration flowchart

Installing the TwinCAT software

The TwinCAT3 software, which can be downloaded from the official website of Beckhoff, supports 32/64-bit WIN7 systems.

Note

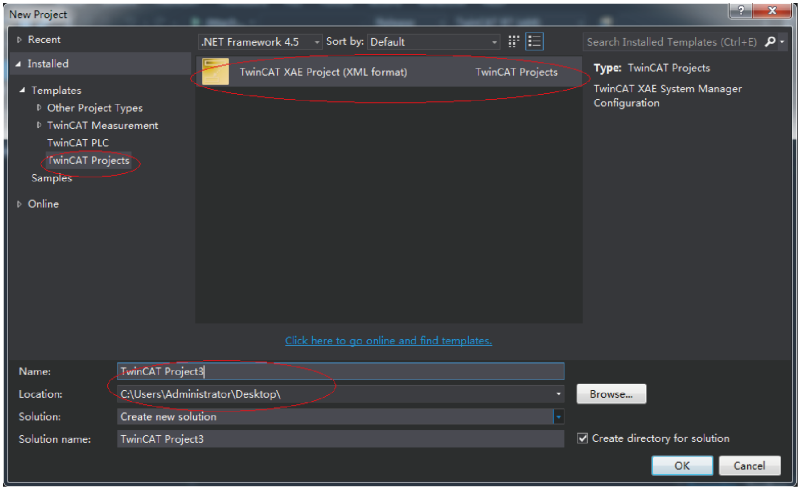
The 100 M network card with the Intel chip must be selected. If the network card of other brands is used, the EtherCAT communication may fail.

---

1. Copy the SV680N-INT EtherCAT configuration file (SV680_1Axis_V0.04-0506) to the TwinCAT installation directory: TwinCAT\3.1\Config\Io\EtherCAT.

2. Open TwinCAT3 and create a New Twincat3 Project.

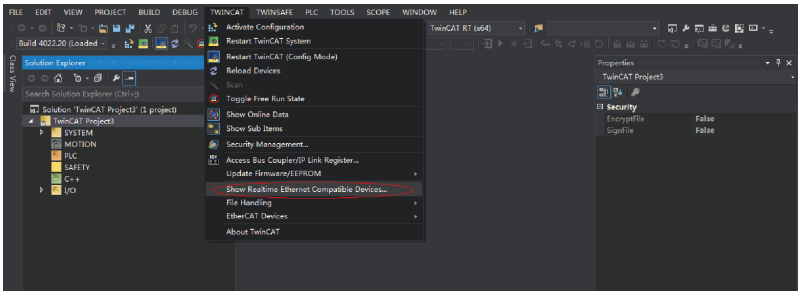




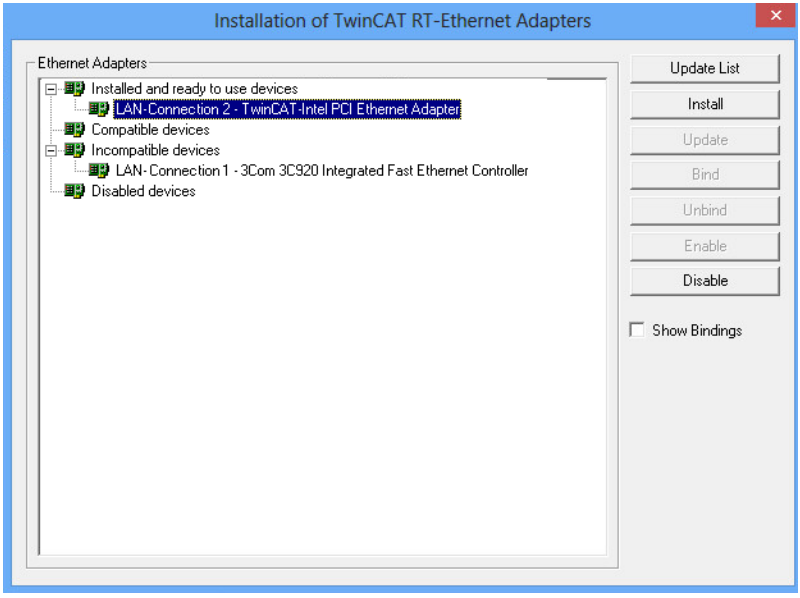
Installing the network adapter driver

Install the TwinCAT network adapter driver.

1. Open Show Real Time Ethernet Compatible Devices… in the menu shown in the preceding figure to display the following dialog box. Select local connection under Incompatible devices, and click Install.

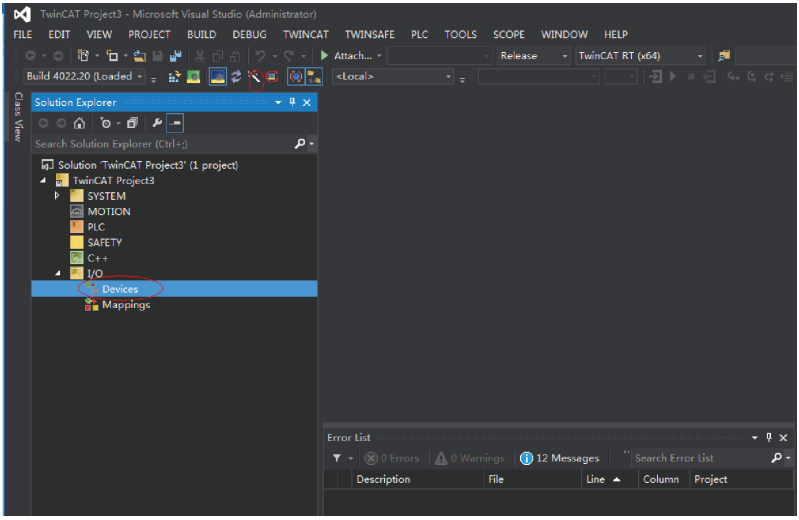


2. After installation is done, the network adapter installed will be displayed under **Installed and ready to use devices(realtime capable)**.

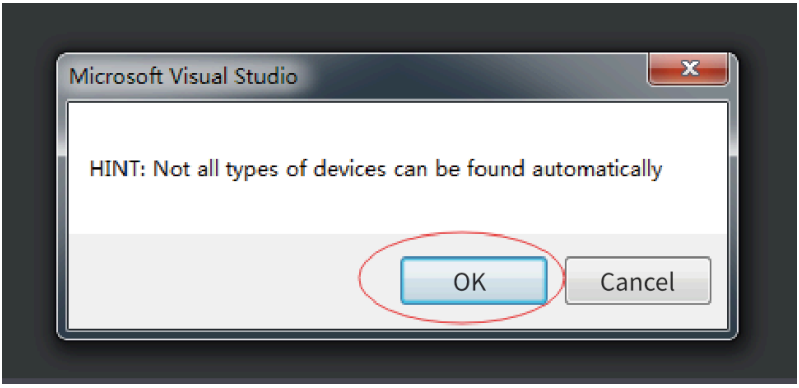


Search for devices.

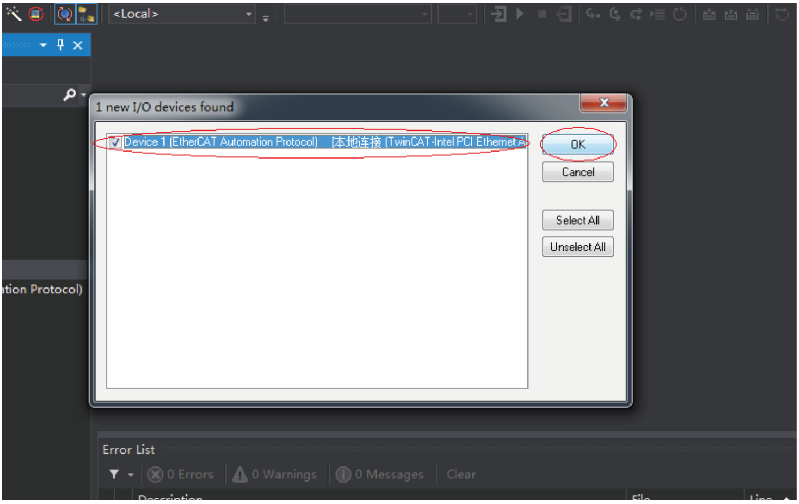
1. Create a project and start searching for devices. Select Devices, and click  as shown below. See the following figure for details.



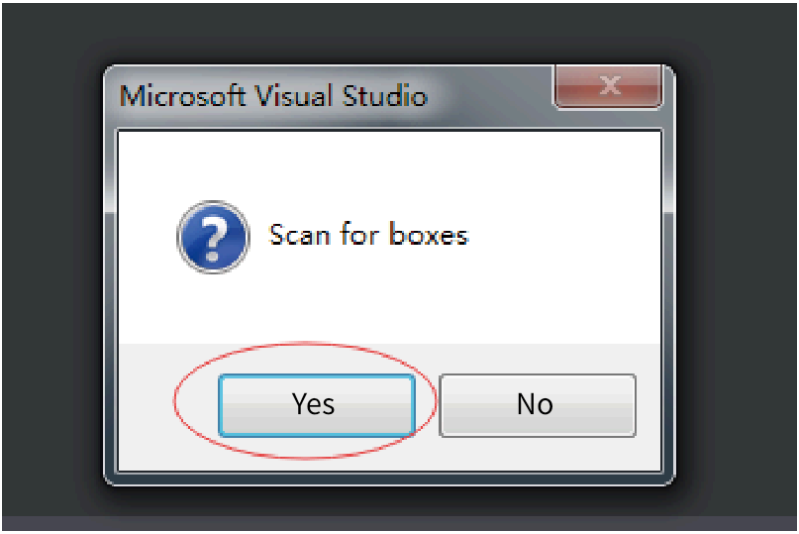
2. Click **OK**.



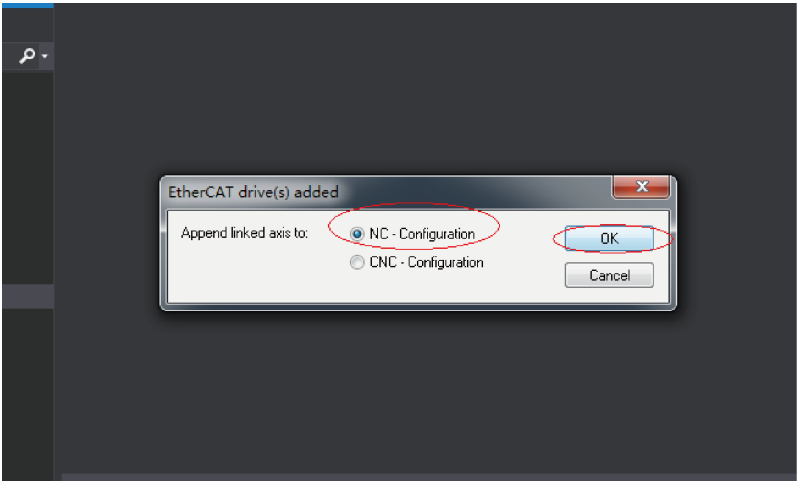
3. Click **OK**.



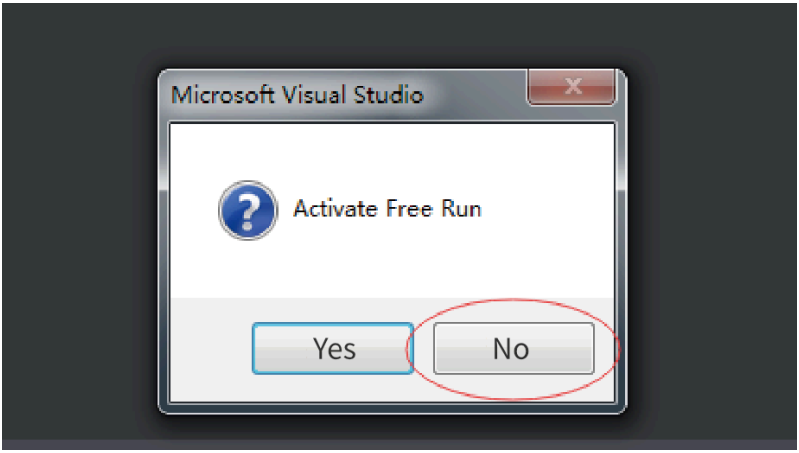
4. Click **OK**.



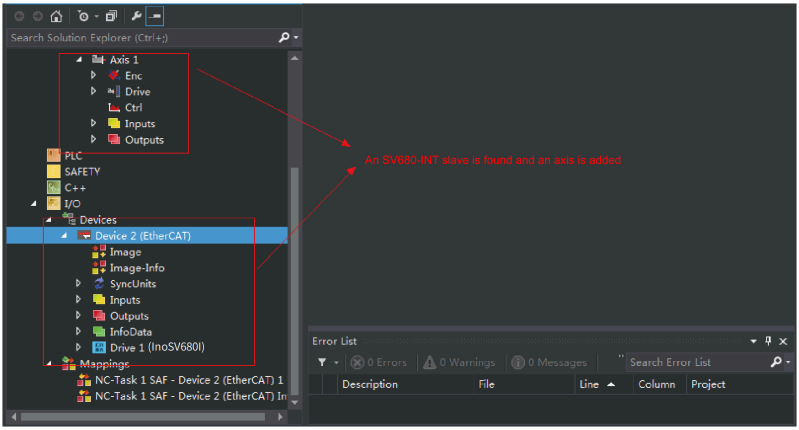
5. Click **OK**.



6. Click **Cancel**.

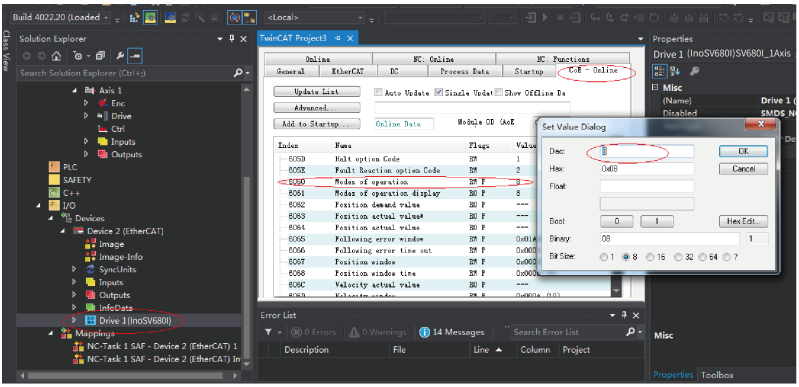


7. The search for the device is done, as shown below.



Configuring servo drive parameters

Configure parameters through SDO communication in CoE - Online interface. When H0E.01 (200E-02h) is set to 3, the parameter values modified through SDO communication will be saved upon power failure. To modify 6060h to the CSP mode (8), follow the procedure shown in the following figure.



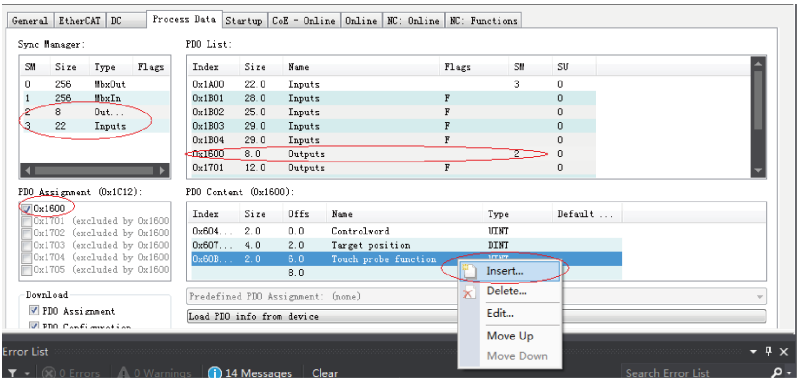
Note

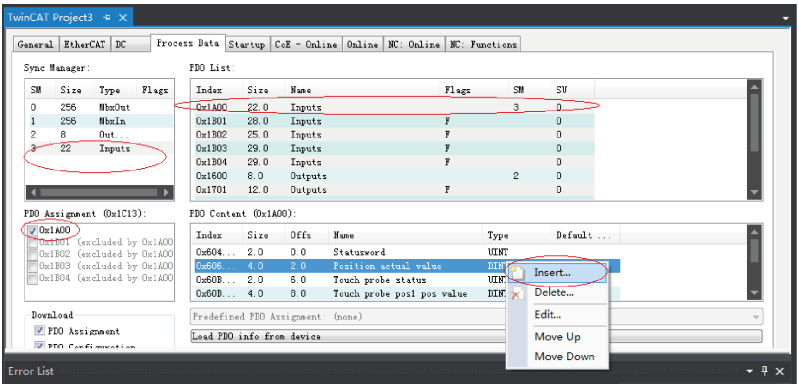
This operation is available only when H02.00 is set to 9.

Configuring PDO

Select 0x1600 and 0x1A00 as shown in the following figure. Change the current PDO only if it does not fulfill your needs. To modify the PDO, right click the PDO Content window, click "Delete" to delete the redundant PDO or click "Insert" to add the PDO

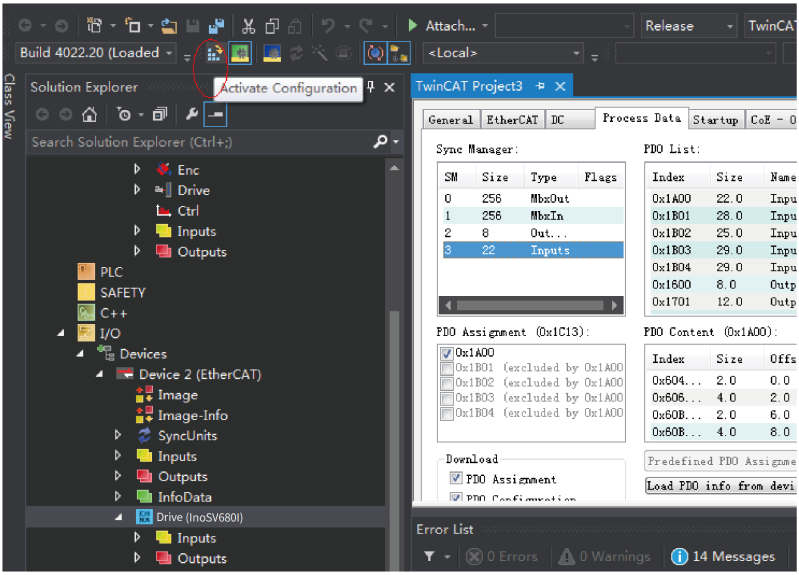
needed. To modify the PDO, right-click on the PDO Content window, click Delete to delete the redundant PDO or click Insert to add the PDO needed.



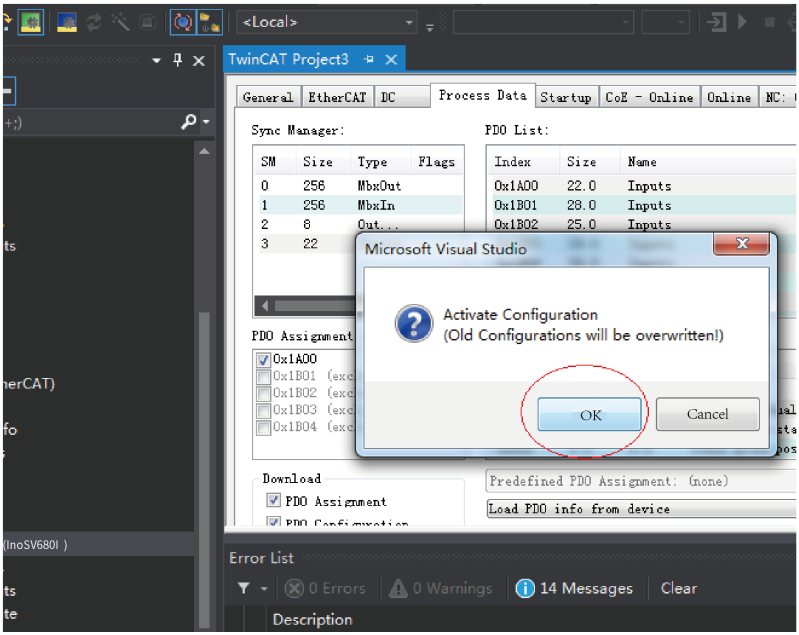


Activate the configuration and switch to the operation mode.

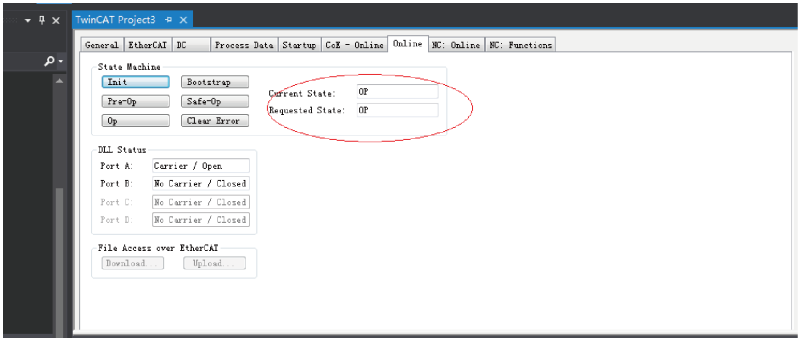
1. Click "".



2. Click **OK**.



3. After you click OK, the device enters OP status as shown in the Online interface. Meanwhile, the 3rd LED on the keypad displays "8", and the keypad displays _88RY.



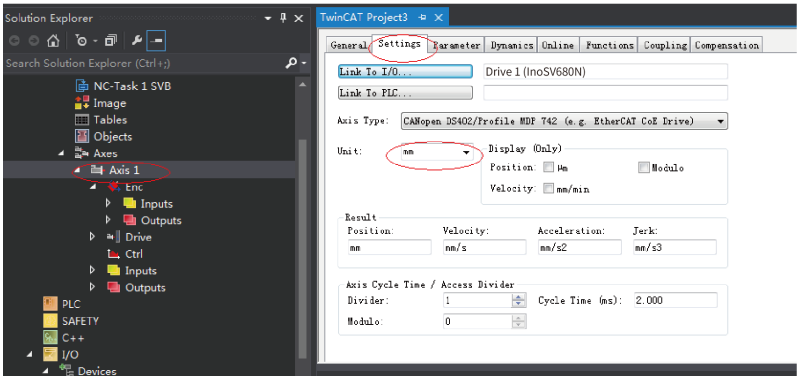
Controlling servo drive operation

Control the servo drive through NC or PLC programs.

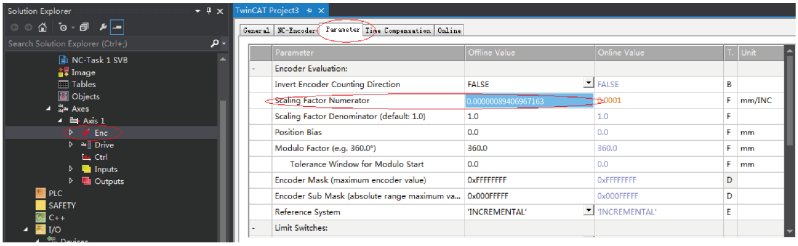
1. For operating in CSP mode

a. Set the unit.

Set the unit to "mm" during the test.



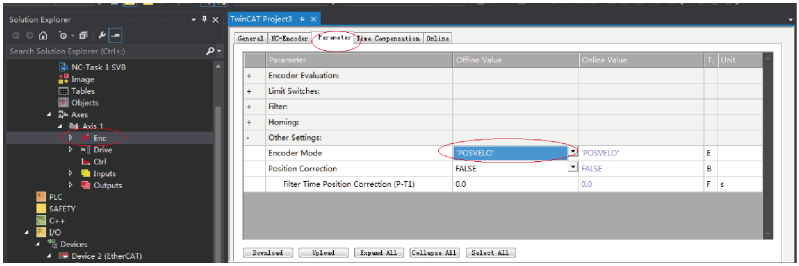
b. Set the scaling factor.



Scaling factor: Indicates the distance corresponding to the encoder pulses per position feedback.

For example, 67108864 PPR corresponds to a distance of 60 mm, and the scaling factor is: 60/67108864 = 0.00000089406967163 mm/Inc.

c. Set the encoder feedback mode to PosVelo.



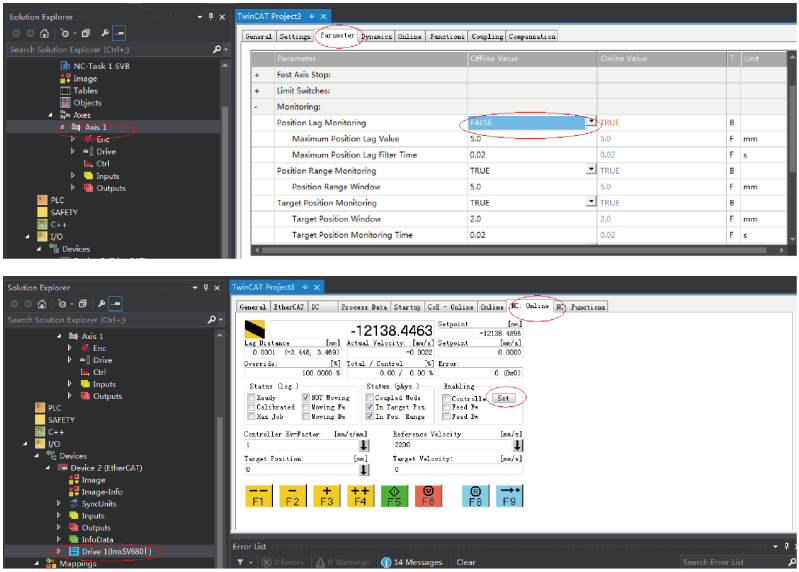
Descriptions for Other Settings:

Encoder mode: There are three encoder modes: POS, POSVELO, and POSVELOACC.

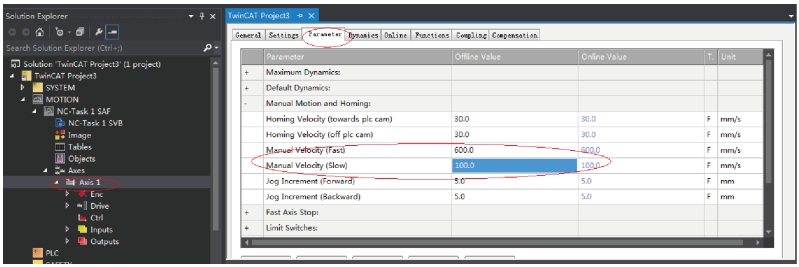
- POS: The encoder only calculates the position, which is used when the position loop is in the servo drive.
- POSVELO: The encoder only calculates the position, which is used when the position loop is in TWinCAT NC.
- POSVELOACC: The TWinCAT NC uses the encoder to determine the position, speed, and acceleration.

d. Jogging test.

Hide the system deviation temporarily.

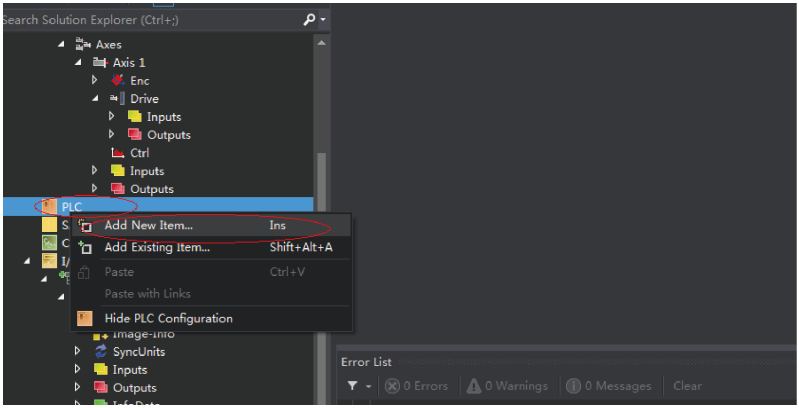


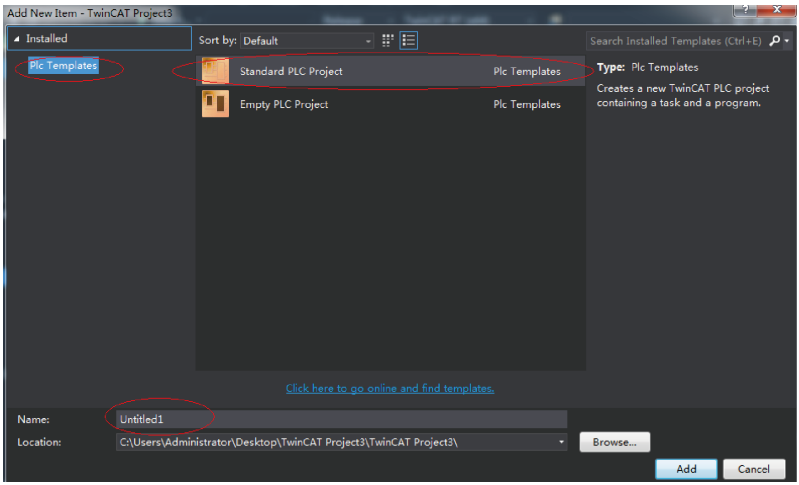
Click Set to display a dialog box and then click All to enable the servo drive. Perform jogging through F1 to F4. The jog speed is set as shown in the following figure.



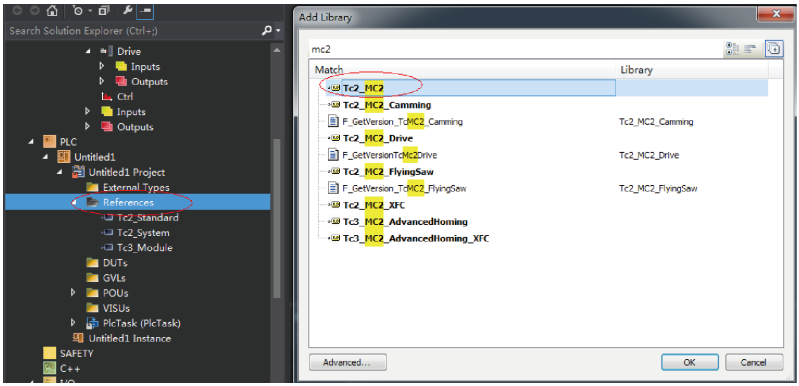
2. Controlling the servo drive operations through the PLC

a. Create a PLC program.

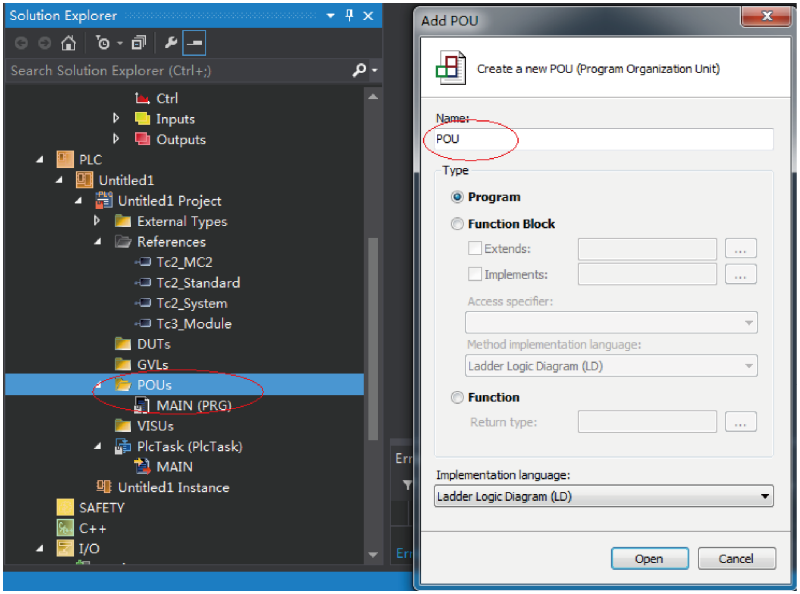




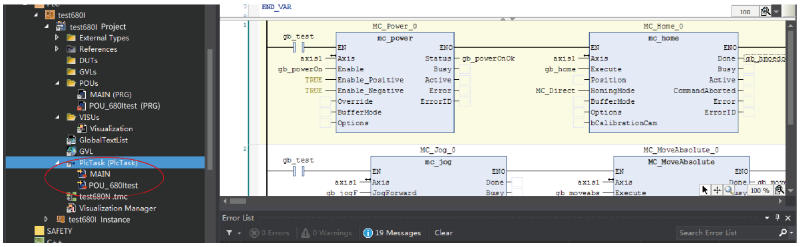
b. Add a motion control library for calling the motion control function blocks.



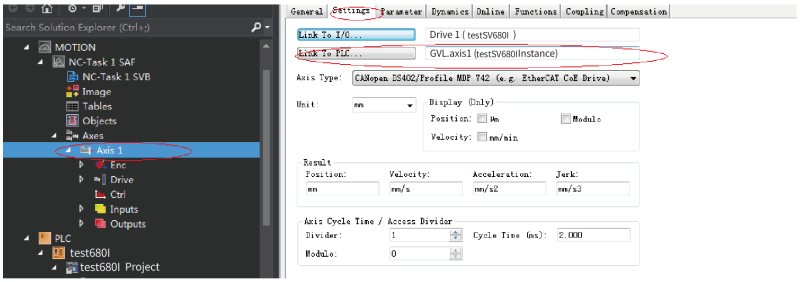
c. Create a POU program.



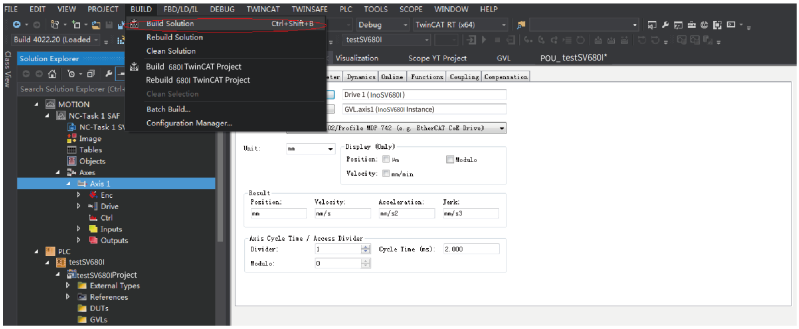
d. Call the motion module to implement some simple actions and input the final program to PLCtask.

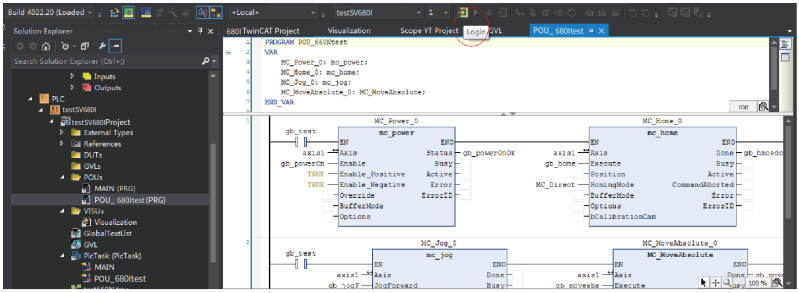


e. Link the axis to the variable defined in the PLC.

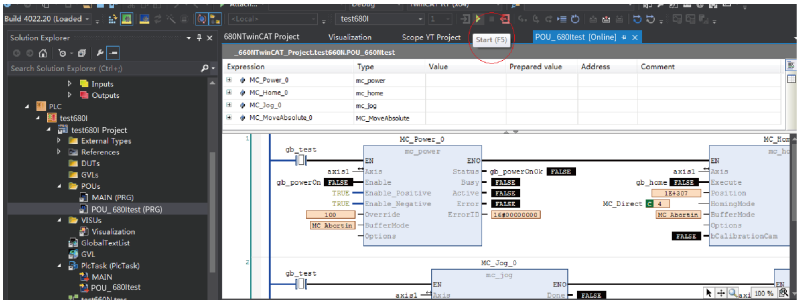


f. Compile the program. If there is not fault, activate the configuration and log onto the PLC.



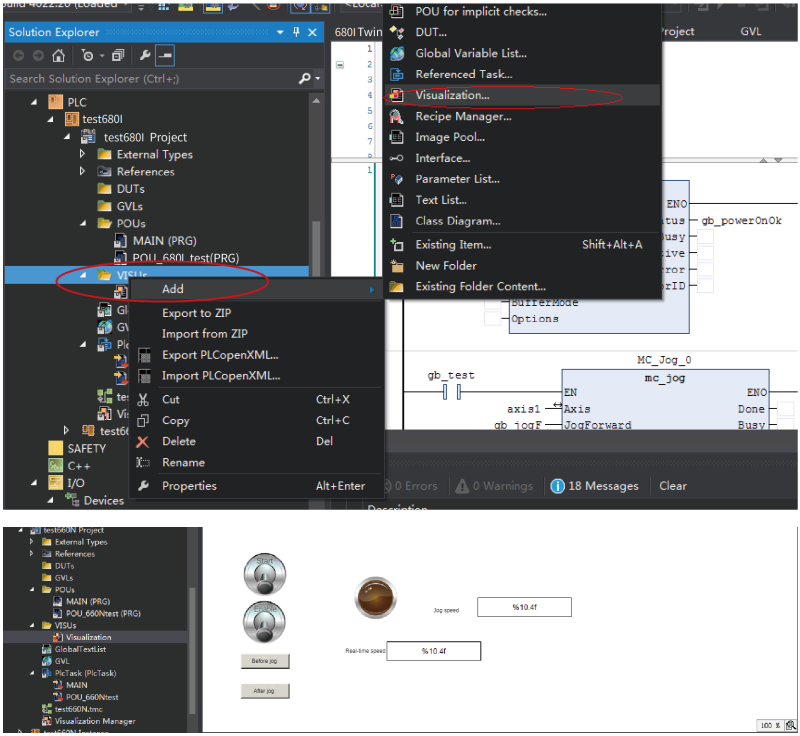


g. Click "Start" to make the servo drive run.



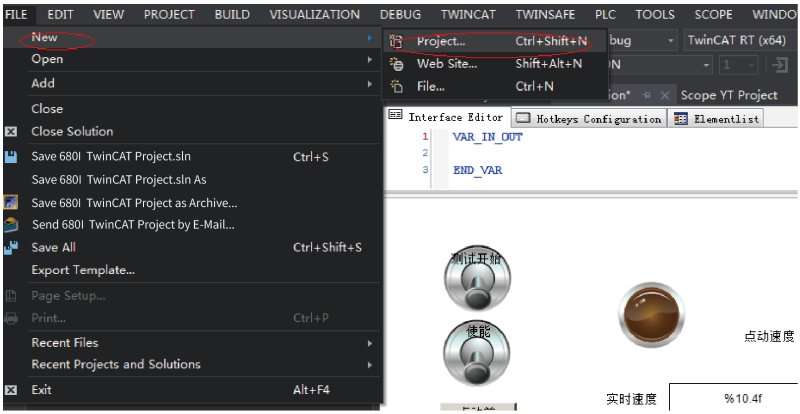
3. Controlling the servo drive operations through the HMI

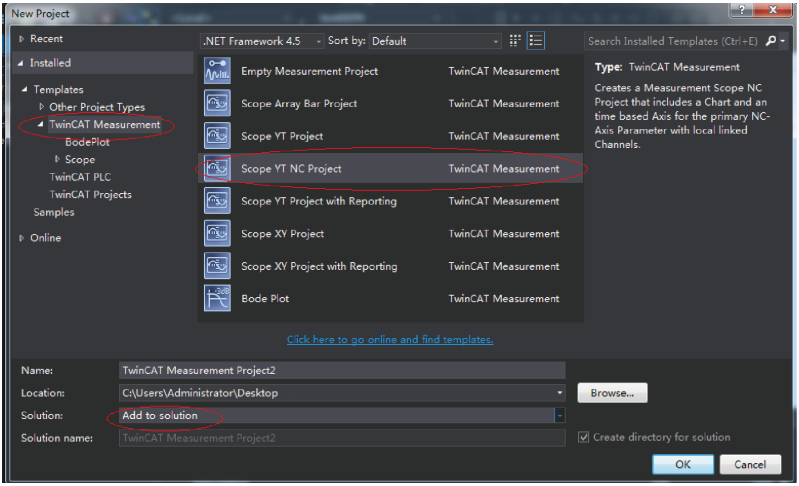
   Add the HMI interface to control the servo drive through the HMI interface.



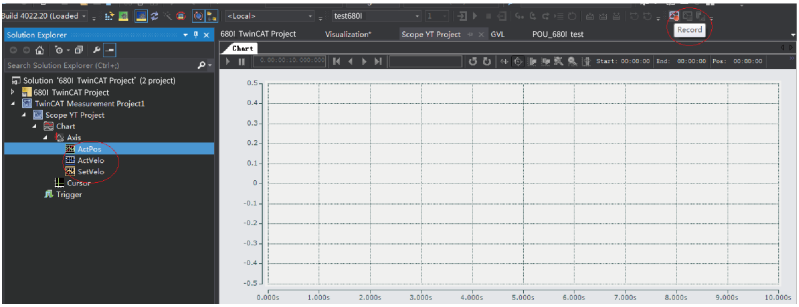
Use the scope view function.

1. Add a scope view project as shown in the following figure.





2. Add parameters to be monitored and monitor these parameters during operation of the PLC.



19.5.3.4 SV680N-INT and KEYENCE KV7500 Controller

19.5.3.4.1 Configuring the Servo Drive

- Servo drive version
  It is recommended to use the device description file "SV680N-INT-Ecat_v0.09.xml" or above for trial run of SV680N-INT series servo drives.

- Related Parameters
  The definition of 60FDh of the SV680N-INT series differs from that of IS620N: bit0: negative limit; bit1: positive limit; bit2: home switch; bit16...bit20 correspond to DI1...DI5 respectively.

19.5.3.4.2 Configuring KEYENCE KV7500 Software Tool

As software tool versions earlier than KV STUDIO 9.45 do not support extension of KEYENCE EtherCAT module "KV-XH16EC", the version of the KEYENCE software tool used must be KV STUDIO 9.45 or later.

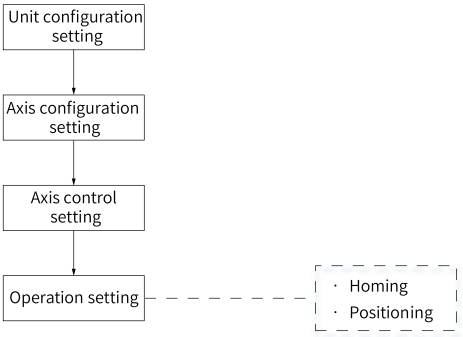
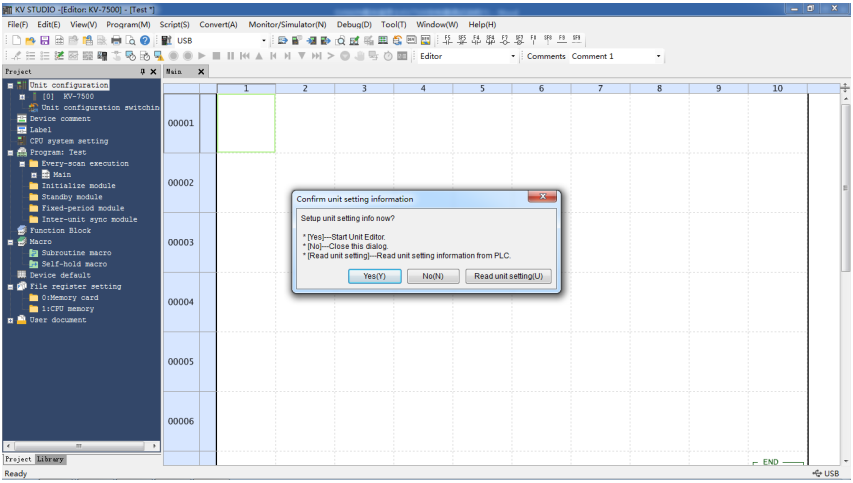


Figure 19-39 Configuration flowchart

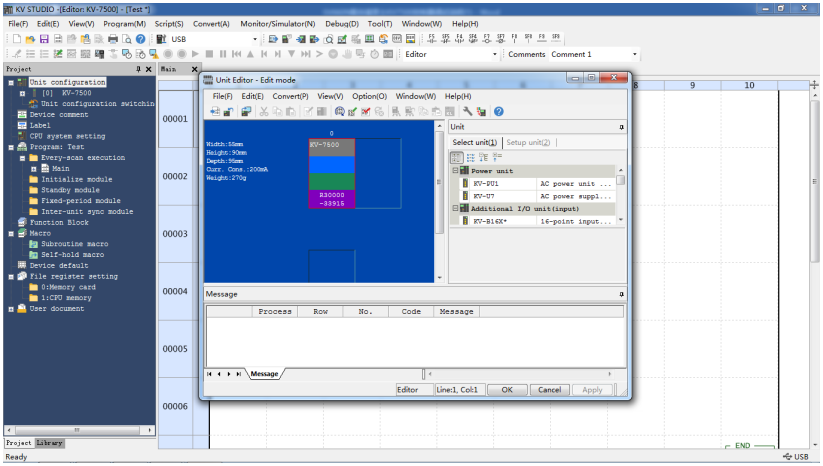
Unit configuration setting

Create a project and click OK to display the following window.

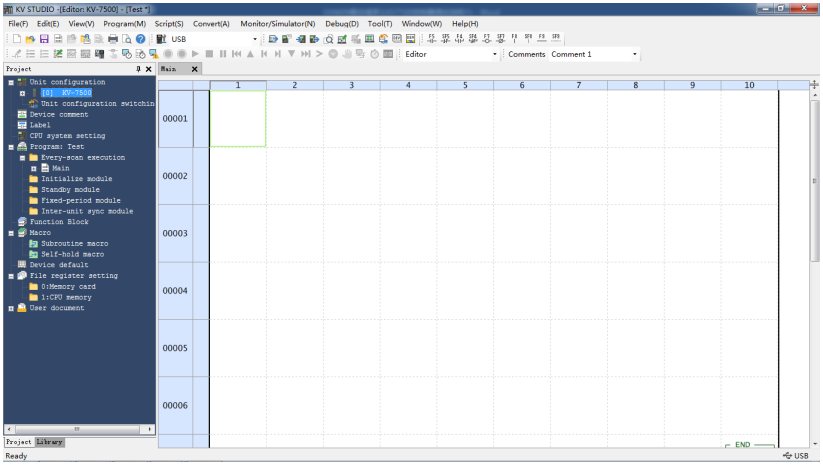


Click Yes, No, or Read unit setting as needed.

- Click Read unit setting when the physical PLC unit is connected properly and able to communicate with the software tool. The software tool obtains unit configurations automatically according to the physical connection.
- If you click Yes, the Unit editor window opens, allowing you to select units for configuration through dragging or double-clicking.

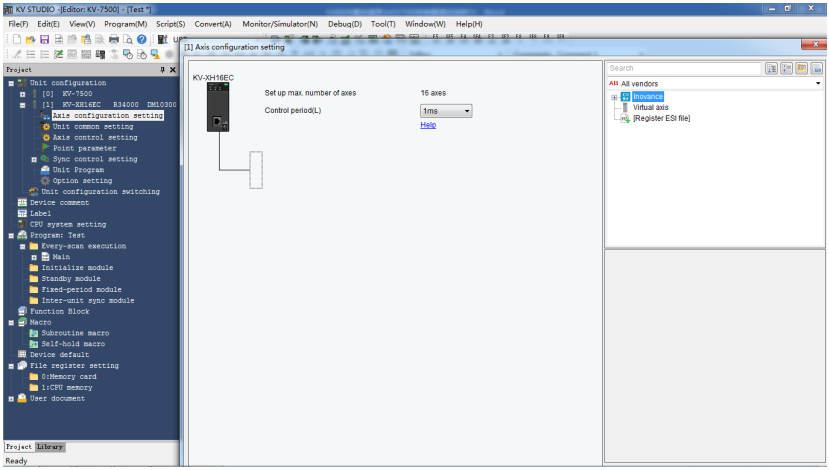


- If you click No, you can click Tool > Unit editor or double-click [0] KV7500 under Unit configuration.



Axis configuration setting

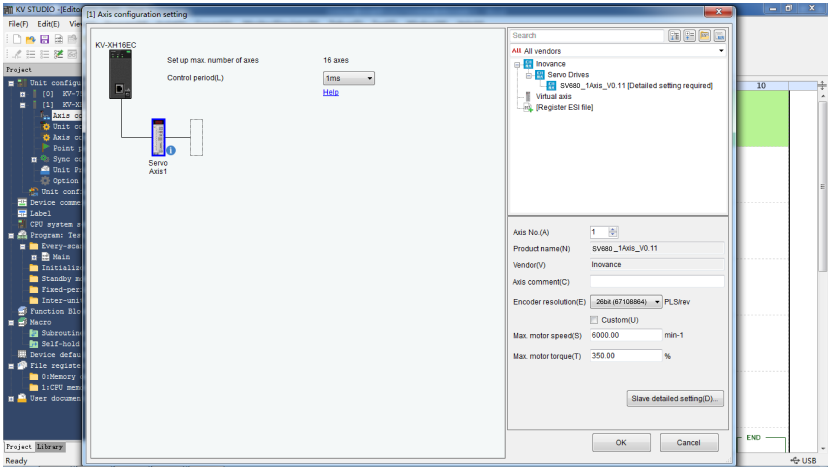
1. Enter “Axis configuration setting”.
2. Double-click “Register ESI file”.



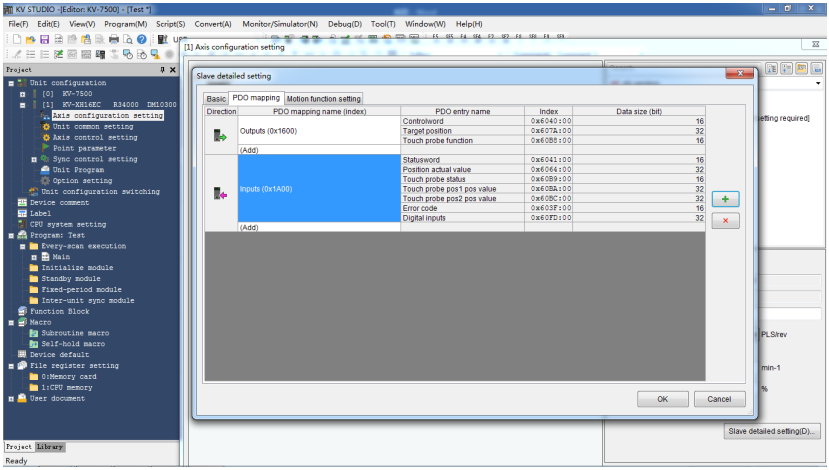
3. Find the storage directory of the device description file ".xml" and open it.
4. Importing the “. XML” file.



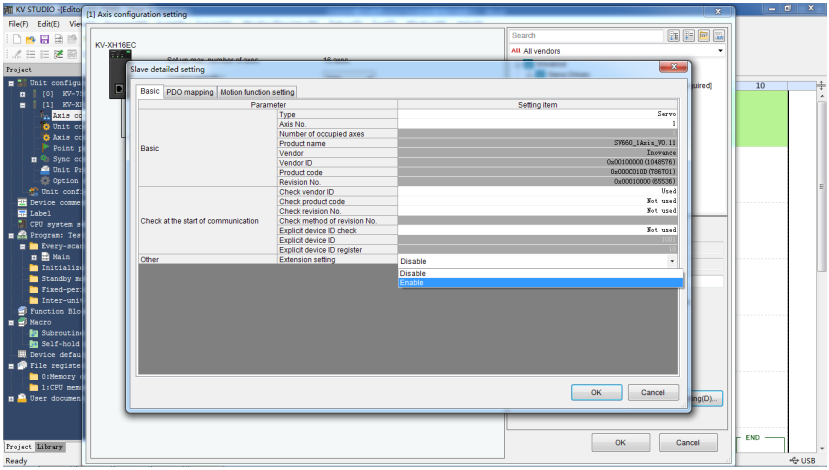
5. After the device description file is imported, you can start to add axes. You can also set the control period in “Axis configuration setting”. The default control cycle is 1 ms and the minimum control cycle is 250 μs.
6. You can add the axes needed through dragging or double-clicking. Select the corresponding axis and set critical information such the Encoder resolution, Max. motor speed, and Max. motor torque for this axis.



7. You can add PDO setting in detailed setting of the slave.

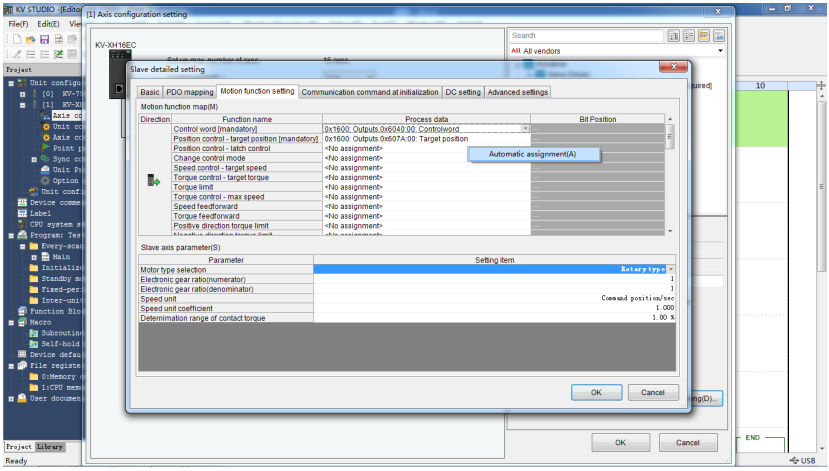


8. If extension setting is needed, set Extension setting to Enable.

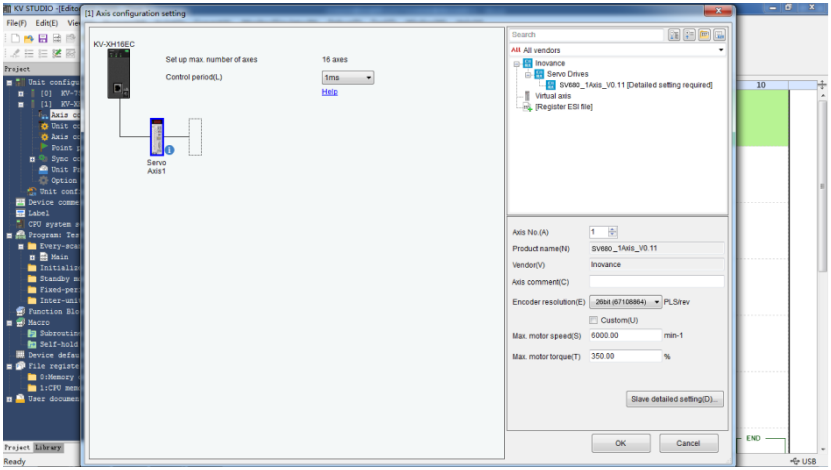


9. For motion function settings, you can double-click or click on the combo box (small triangle icon) to select the PDO configuration needed from the dropdown list. You can also right-click > Automatic assignment > Yes, in this way the assigned contents will correspond to preceding PDO contents automatically.

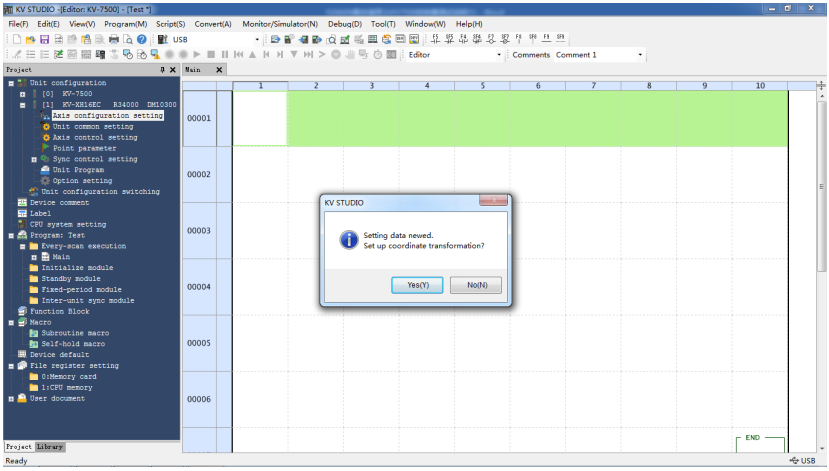
   During manual assignment, do not neglect any contents in the PDO mapping. Otherwise, a pop-up window will be displayed to remind you of the missing contents when you click OK. For Communication command at initialization, DC setting, and Advanced settings, use the default values. After settings are done, click OK.



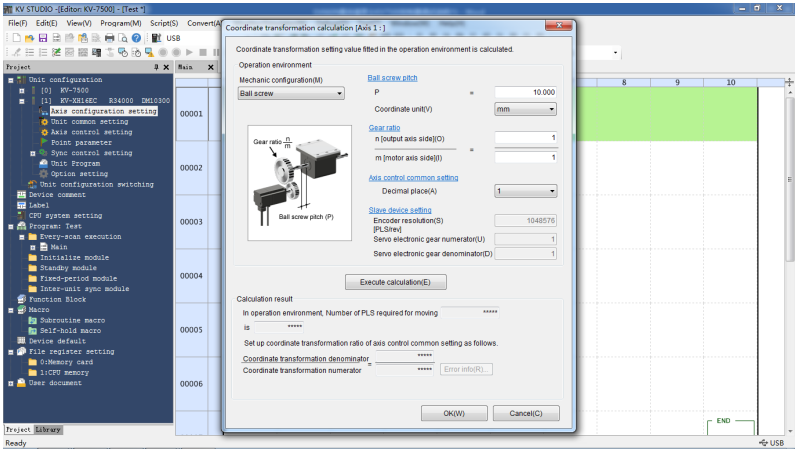
10. After Slave detailed setting is done, the exclamation symbol disappears.



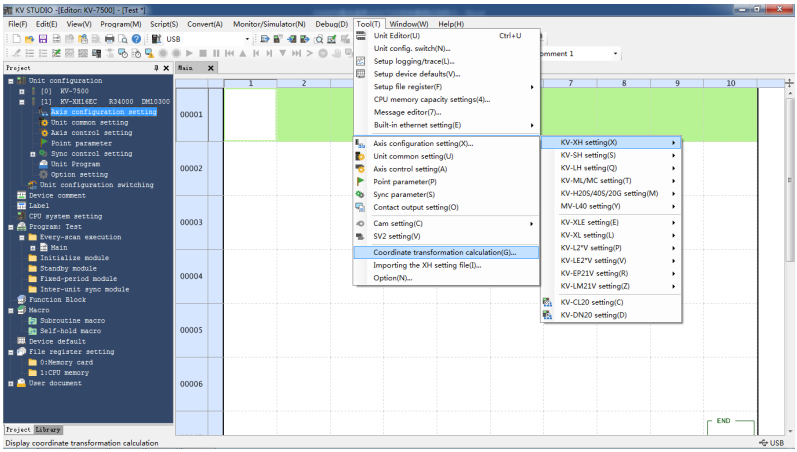
11. After adding the axes, click OK, and the following dialog box opens, asking you whether to set up coordinate (namely electronic gear ratio) transformation.



- Click Yes and the coordinate transformation dialog box opens. Set mechanical parameters and the coordinate unit based on field conditions and click Execute calculation. The software calculates the denominator and numerator for coordinate transformation automatically and writes parameters to Axis control setting automatically.

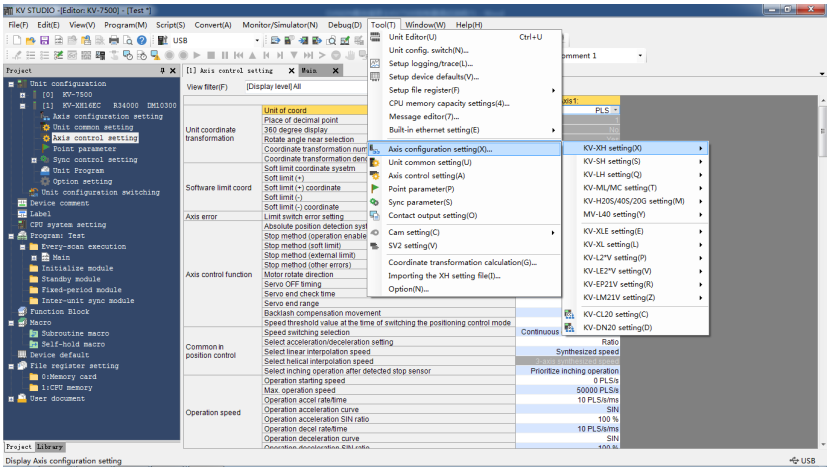


- If you click No, you can click Tool > Coordinate transformation calculation > KV-XH setting > Coordinate transformation calculation.



Axis control setting

1. To open axis control setting, click Tool > Axis configuration setting > KV-XH setting > Axis control setting, or click Axis control setting under Project.
2. In axis control setting, you can set items including Unit coordinate transformation, Software limit coord, Axis error, Axis control function, Common in position control, Operation speed, and JOG.



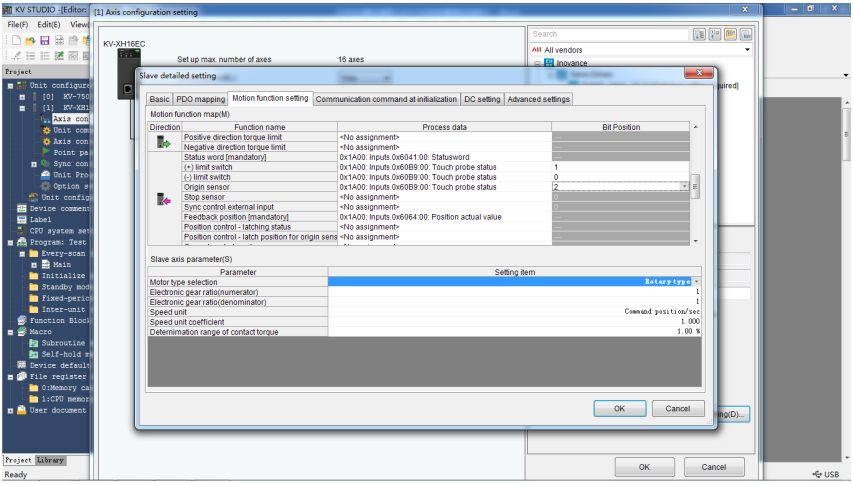
Running setting

Homing

Before homing, assign (+) limit switch, (-) limit switch, and Origin sensor in Motion function setting under Axis configuration setting to each bit of 60FDh. 60FDh is defined as follows:

bit0: negative limit; bit1: positive limit; bit2: home switch; bit16...bit20 correspond to DI1...DI5 respectively.

In automatic assignment, you need to assign (+) limit switch, (-) limit switch, and origin sensor manually, you can assign them to corresponding bits of 60FDh based on the relation shown in the following figure or to bit16–bit20, in this case, you also need to assign them to corresponding DIs of the drive.



Set the restriction parameters for homing in Axis control setting > Origin return. The following homing methods are available. For detailed trajectories, see KEYENCE instruction manual for positioning/motion control unit KV-XH16EC.

Default	Value range	Description
DOG type (with phase Z)	DOG type (with phase Z)	Decelerating upon DOG signal input and homing through phase Z signal
	DOG type (without phase Z)	Decelerating upon DOG signal input and homing through falling edge of DOG signal
	DOG-type jogging (with phase Z)	Pausing after moving based on Dog ON upon DOG signal input. Then moving to the homing direction through position-type speed control and homing with phase Z signal.
	DOG-type jogging (without phase Z)	Moving based on Dog ON upon DOG signal input before homing
	DOG type (contact)	Homing executed when the ON duration of the torque limit signal keeps longer than the compression torque time upon DOG signal input
	Origin sensor and phase Z	Homing executed in the initial phase Z position after the origin sensor is ON

Default	Value range	Description
	Rising edge of origin sensor	Homing executed through the rising edge of the origin sensor
	Middle point of origin sensor (without phase Z)	Taking the middle point of the ON range of origin sensor as the origin and comparing it with that in "Rising edge of origin sensor". Even if the light-receptive performance of the origin sensor degrades, the homing position can hardly change with the time.
	Rising edge of limit switch	Homing executed with the limit switch in the negative direction (direction where the current coordinate decreases) acting as the origin sensor
	Immediate homing of phase Z	Homing executed with phase Z signal
	Data setting type	Taking current coordinate as the origin coordinate

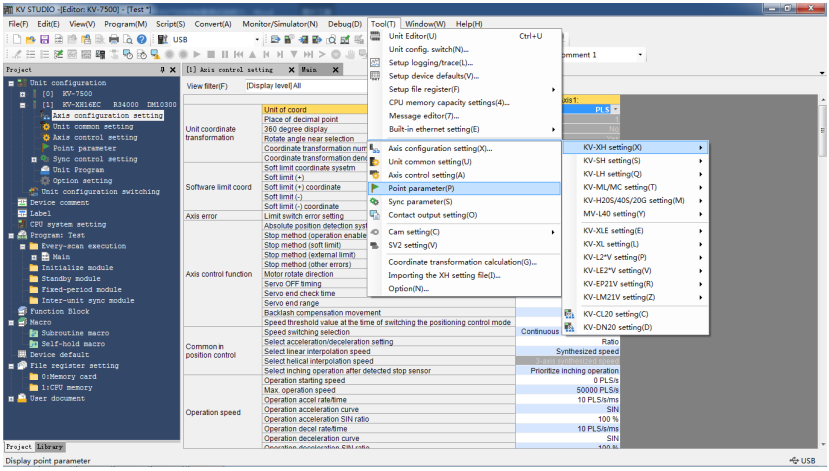
The following homing methods are available in SV680N-INT series servo drives.

No.	Homing mode	SV680N-INT
1	DOG-type (with phase Z)	✓
2	DOG-type (without phase Z)	✓
3	DOG-type jogging (with phase Z)	×
4	DOG-type jogging (without phase Z)	×
5	DOG-type (contact)	Homing is available, but the reference coordinate after homing is not 0. Updating to the xml coordinate of 680N zeros out the reference coordinate.
6	Home sensor and phase Z	✓
7	Rising edge of origin sensor	✓
8	Middle point of origin sensor	×
9	Rising edge of limit switch	Homing is available, but the reference coordinate after homing is not 0.
10	Immediate homing of phase Z	✓

Positioning

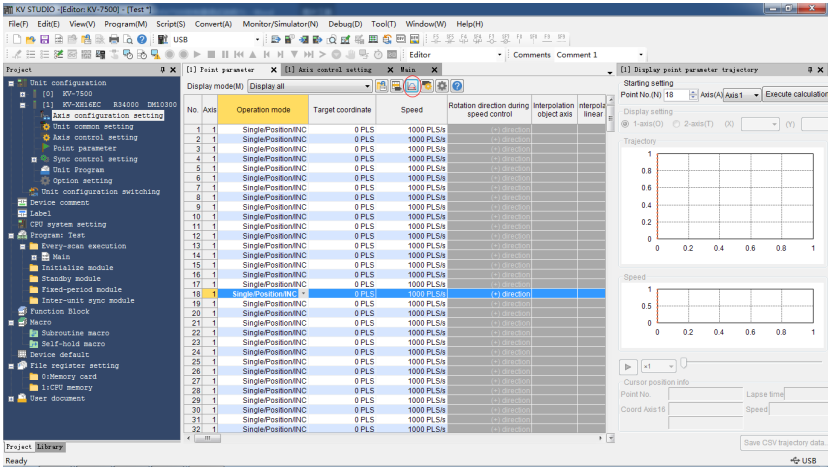
Set the unit coordinate transformation properly before positioning. The unit coordinate transformation is "PLS" by default, which allows no modification on the numerator or denominator. Assume N revolutions are required by the servo drive, in this case, the number of commands that need to be sent by the host controller is N x Pulses per revolution. If coordinate transformation calculation has been executed, the unit coordinate transformation parameters will correspond to the unit transformation results automatically.

1. To set the motion profile of the servo drive, click Tool > Point parameter.



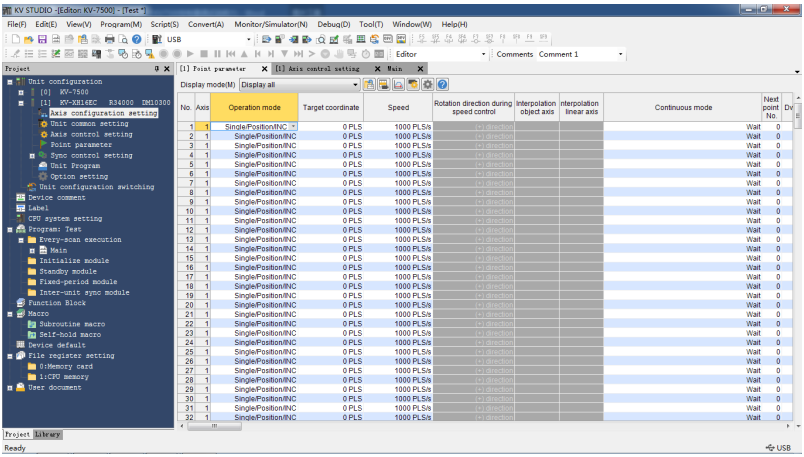
Set the target coordinate and speed per positioning segment as needed. After settings are done, you can call the corresponding point number through the program to start operation.

2. You can preview the parameter trajectory through the following short-cut.

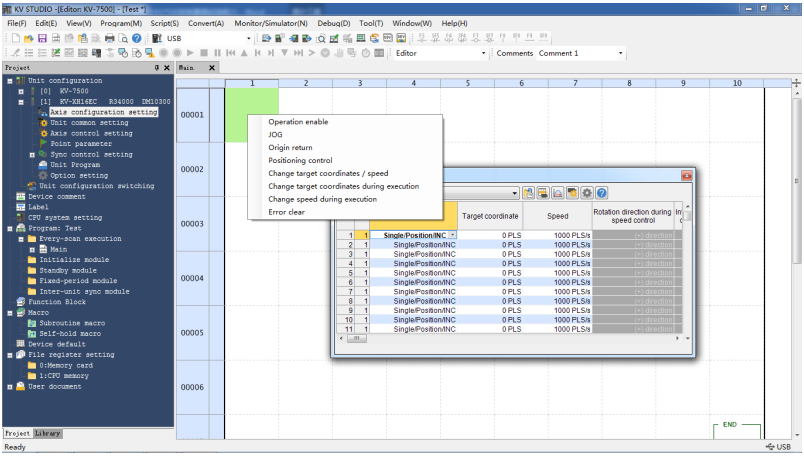


3. You can write ladder diagrams through regular methods. You can also use the following short-cut method provided by KEYENCE.

   a. Drag down the Point parameter window with the left mouse button, and zoom out the window to put it in a proper place.

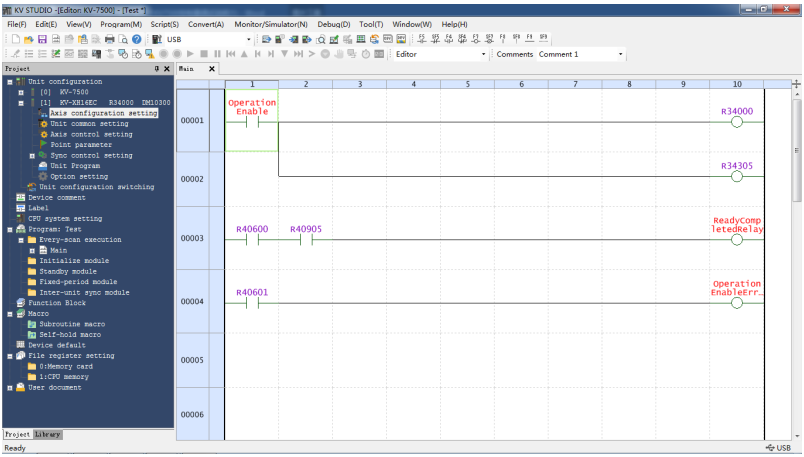


b. Move the mouse to the point parameter, such as "No.1-Axis1", and wait until the mouse icon to change from an arrow to a small hand. Then drag towards the program edit interface with the right mouse button, and the following short-cut pops out.



c. Select the desired function.

If the operation is enabled, click it to automatically generate a DEMO program. Then designate the part in red as the relay needed. After these actions are done, this function is done compiling.

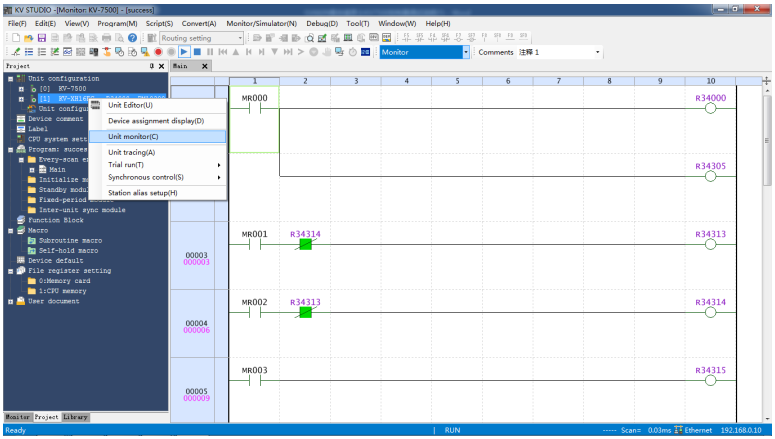


4. Set the unit monitor.

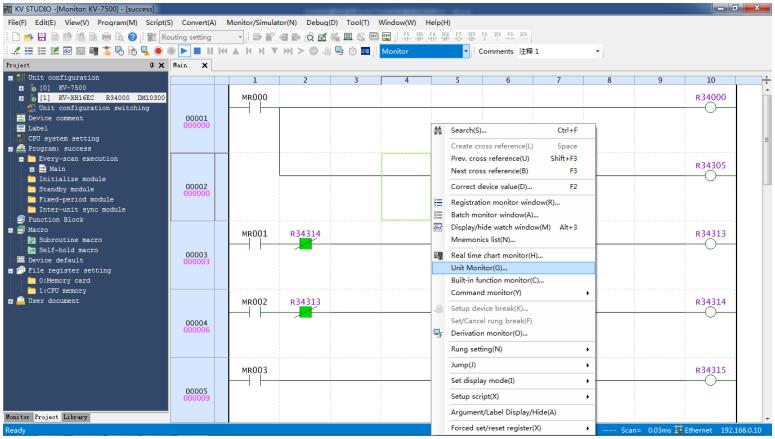
   The unit monitor supports monitoring on the operating state of KV-XH16EC or the internal data.

   a. Open “Unit monitor”. There are three ways:

   - Select the unit to be monitored and right-click to select **Unit Monitor** in the short-cut menu.

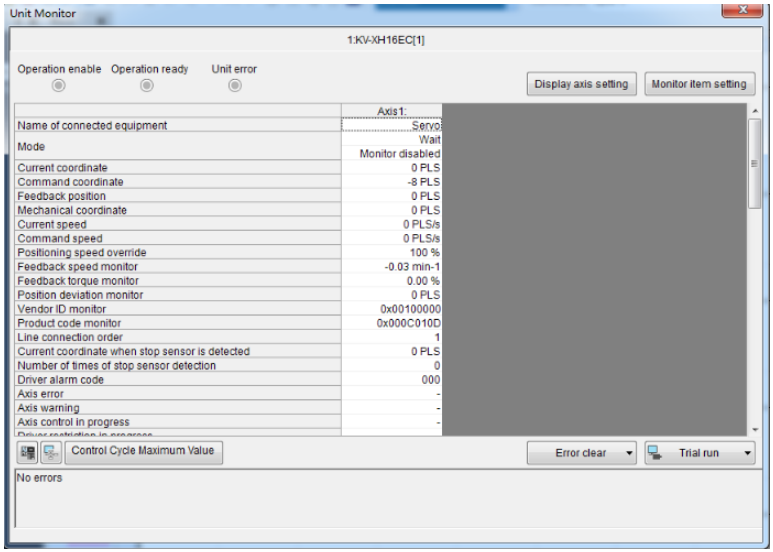


   - Double-click with left mouse button to open the Unit monitor.
   - Right-click the blank section in the main program to select Unit monitor in the pop-up menu.



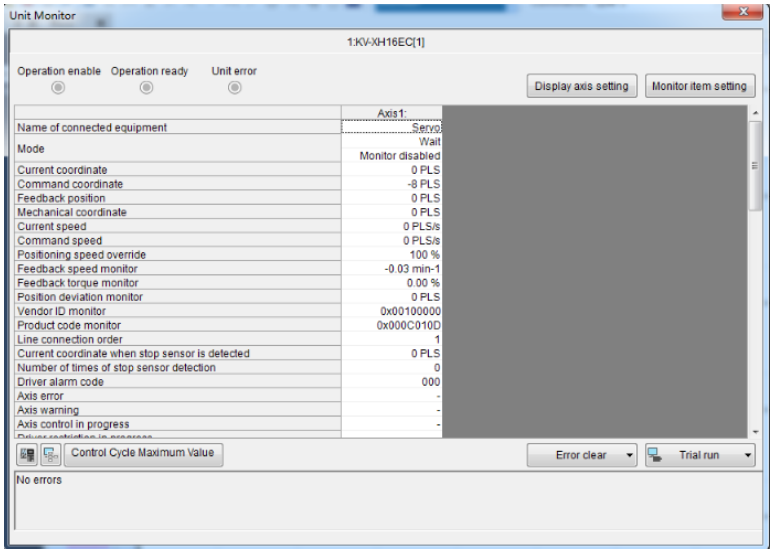
b. The unit monitor displays the operating state of each axis.

1). To change the operating state of the monitor item, click Monitor item setting on the top right corner.



2). To check whether I/O signals such as limit switch signals and origin sensor signals are normal, open Unit monitor and find the corresponding monitoring position.

If corresponding message is received, a small black circle will be displayed.



The error state of the unit can also be displayed in the Unit monitor. The axis error can be cleared using the Error clear button in the bottom right.

19.5.3.4.3 Trial Run

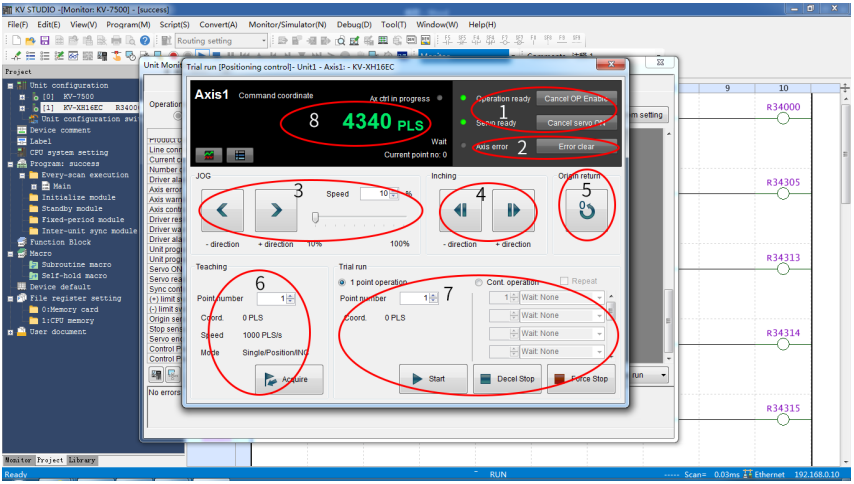
In trial run, actions can be acknowledged directly, without the need for programming ladder diagrams.

1. You can find the Trial run button at the bottom right of the unit monitor interface.
2. Select the control mode from positioning control, speed control, and torque control.
3. Then, select the object axis for trial run.

Note

If trial run is executed in the speed control mode or torque control mode, a warning will be reported. To execute trial run, set the control mode to position control.

The following introduces trial run → positioning control.



1. OP enable/Servo ON.
   Unrelated to the status of the ladder diagram program. OP enable and Servo ON can be executed through Commissioning. After operations are done, the Operation ready and Servo ready indicators turn green. To ensure safety, set the CPU unit to PROG mode and execute operations again after stopping ladder diagram program.

   Confirm the following items when the Servo ready indicator is not in green.

   - No error occurs on the axis.
   - No alarm occurs on the servo drive.
   - The main circuit power supply of the servo drive is switched on.
   - The Ethernet cable is connected.

2. Axis error/Error clear
   Check the error details and clear the error. After rectifying the error cause, click the Clear button to clear the error.

3. JOG.
   Click the "FWD" and "REV" buttons to perform JOG operation in forward/reverse directions respectively. The jogging speed is the value in General Axis Control Settings→JOG High Speed multiplied by a ratio. You can set the ratio at a 1% increment between 10% and 100%.

4. Inching.
   Click the "FWD" and "REV" buttons to perform inching in forward/reverse directions respectively. The inching runs at the speed specified in General Axis Control Settings→JOG Start Speed. The inching runs with the movement specified in General Axis Control Settings→JOG Inch Movement.

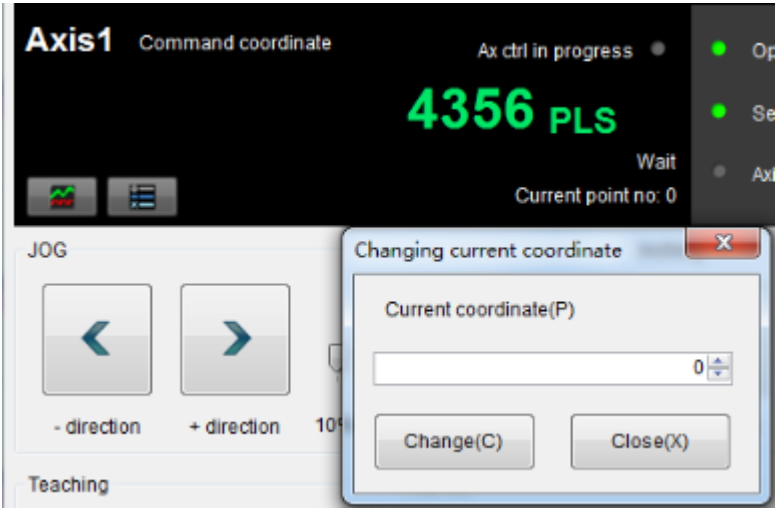
5. Origin return

Click the Origin return button to execute homing.

6. Teaching
   Click the Acquire button to save current command coordinate value to the buffer memory of the target coordinate of the designated point number. The teaching function is available only in the online edit mode. The teaching value will also be reflected to the buffer memory and the point parameter.

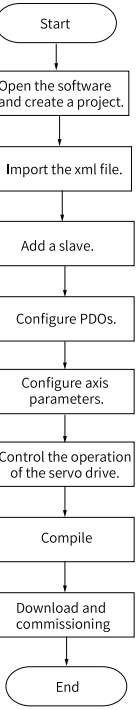
7. Trial run
   Designate a point number and click the Start button to execute point positioning. To stop operation, click the **Stop** button. Clicking the 1 point operation button makes the servo drive execute positioning of one point. Clicking the Cont. operation button makes the servo drive execute positioning of ten points at most. Clicking the Repeat button makes the servo drive return to the point in the first row and execute positioning repeatedly after positioning of the point in the last row is done. The time interval between points can be set to a value within 0.1s to 20.0s.

8. Changing current coordinate
   Click Command coordinate and the Changing current coordinate dialog box opens. Enter the coordinate needing to be changed and click the Change button to change the current coordinate of the axis in trial run, and then close the Changing current coordinate dialog box. If you click the Close button after changing current coordinate, the Changing current coordinate dialog box will be closed with current coordinate unchanged.

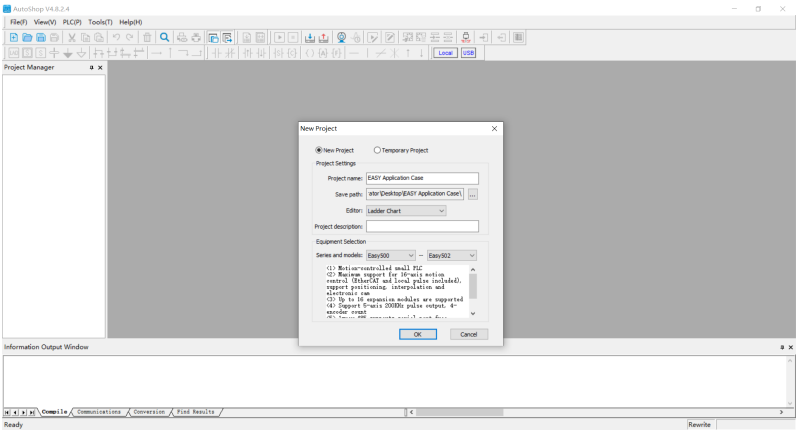


19.5.3.5 SV680N-INT and EASY Controller

This section describes how to configure the SV680N-INT series servo drive for cooperation with the EASY series controller.

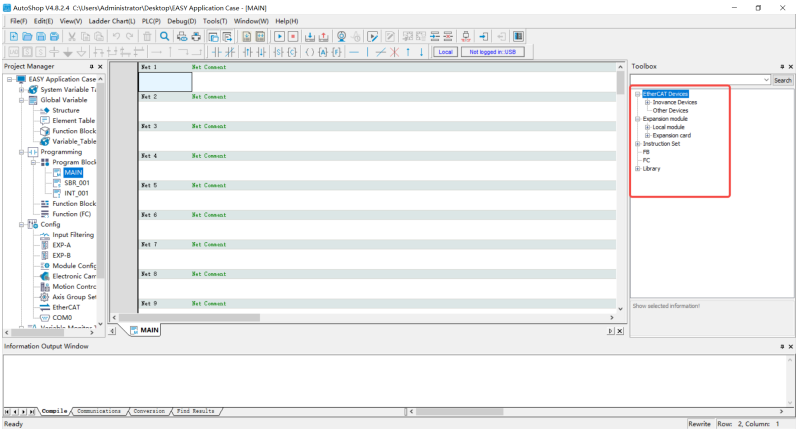


1. **Open the software, and create an EASY project.**
   a. Open Autoshop and click "New Project". In the popup dialog box, first select the editor type, and then select Easy500 as the PLC type.
   b. Enter the project name and select the save path, and then click "OK" to create a new project and enter the project main interface.

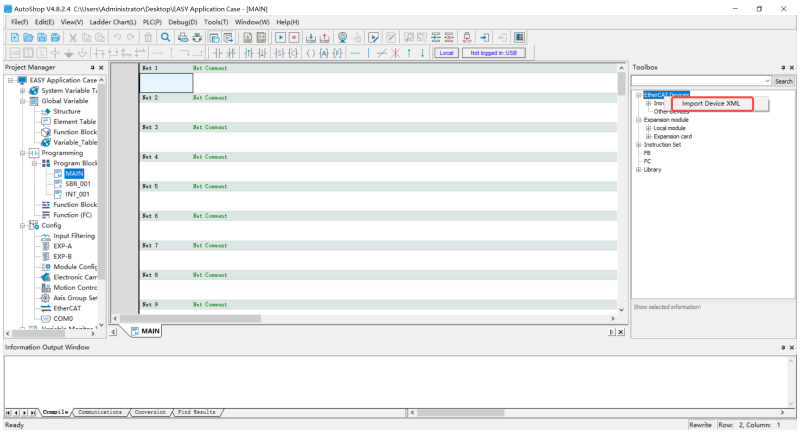


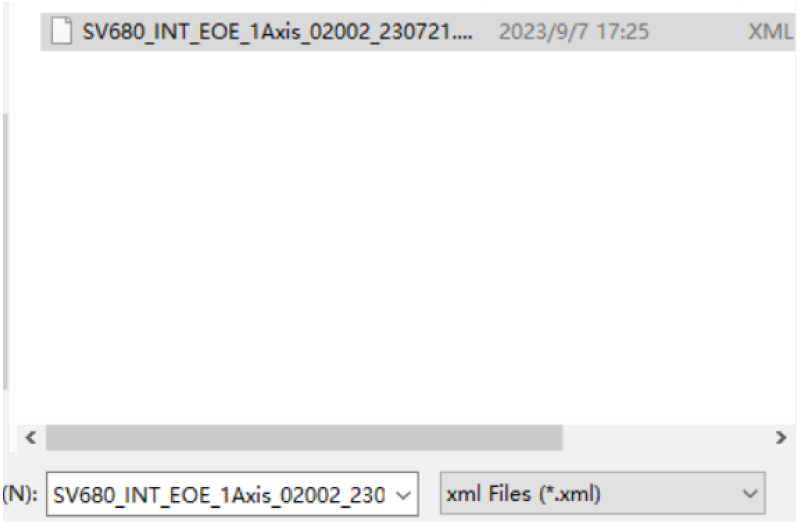
2. **Importing device XML**

a. Open the toolbox and find the EtherCAT Devices list.

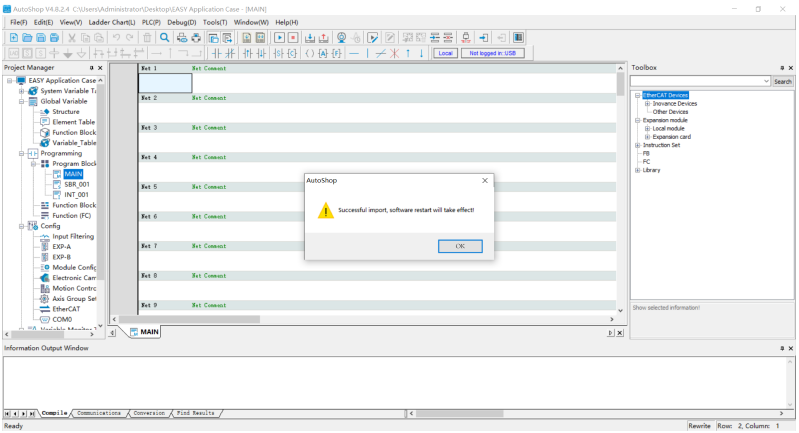


b. Right-click on EtherCAT Devices, and in the pop-up dialog box, select the desired XML file and import it.



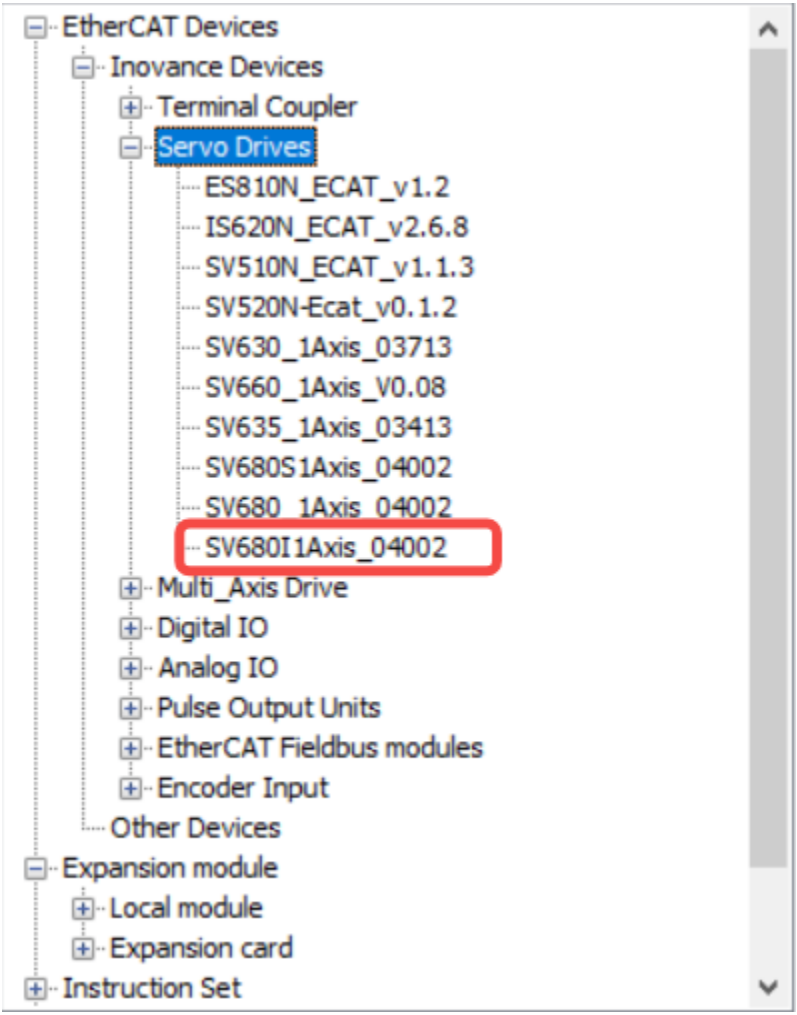


c. You need to restart the application to let the imported xml take effect.



After clicking "OK", you need to restart the application manually to let the newly added device take effect.

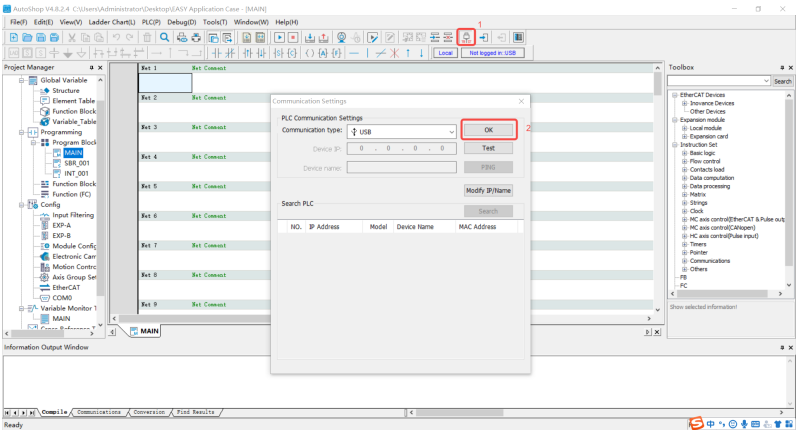
d. After reopening the application, you can see the newly added device.



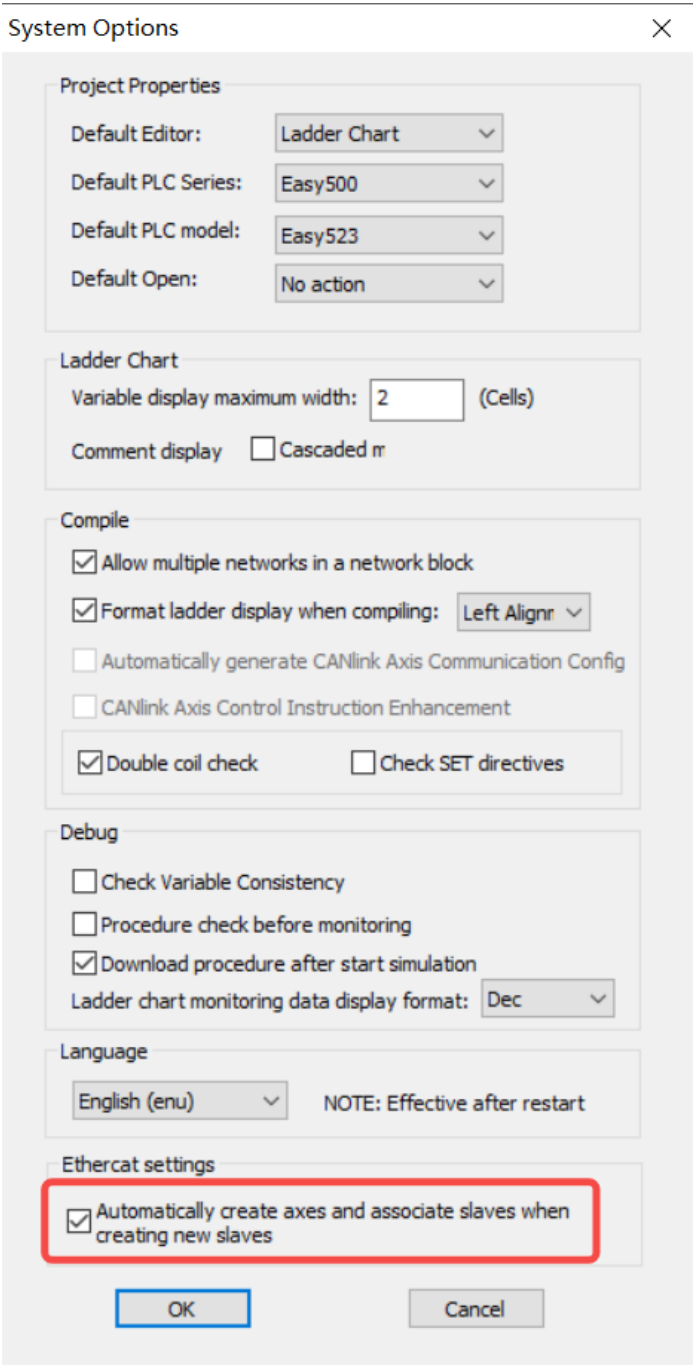
3. **Adding a slave station**

   First, connect the PLC through Ethernet.

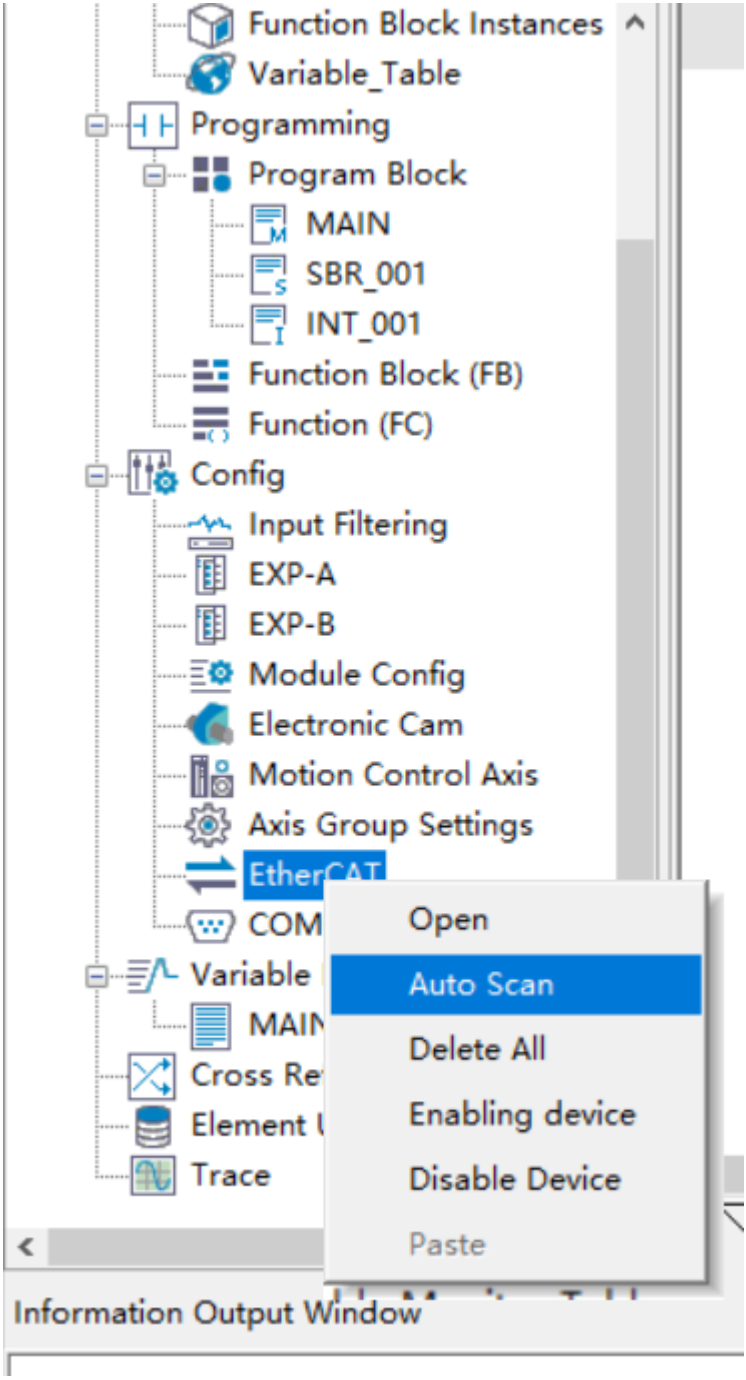
   a. Select the target host.



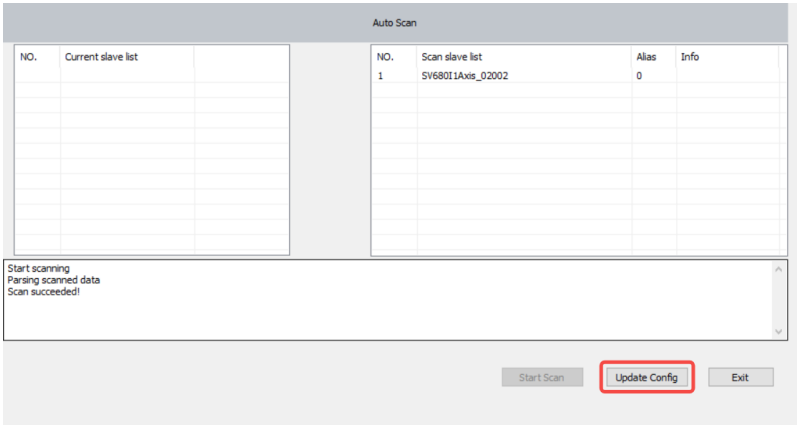
b. Set whether to automatically associate motion control axes as needed.
   If you select "Auto create axis and associate slave station when creating new slave station" in EtherCAT Settings, a motion control axis will be automatically added for each drive-type EtherCAT slave station.


System Options
Project Properties
Default Editor:
Ladder Chart
Default PLC Series:
Easy500
Default PLC model:
Easy523
Default Open:
No action
Ladder Chart
Variable display maximum width:
2
(Cells)
Comment display
Cascaded m
Compile
Allow multiple networks in a network block
Format ladder display when compiling:
Left Alignr
Automatically generate CANlink Axis Communication Config
CANlink Axis Control Instruction Enhancement
Double coil check
Check SET directives
Debug
Check Variable Consistency
Procedure check before monitoring
Download procedure after start simulation
Ladder chart monitoring data display format:
Dec
Language
English (enu)
NOTE: Effective after restart
Ethercat settings
Automatically create axes and associate slaves when creating new slaves
OK
Cancel

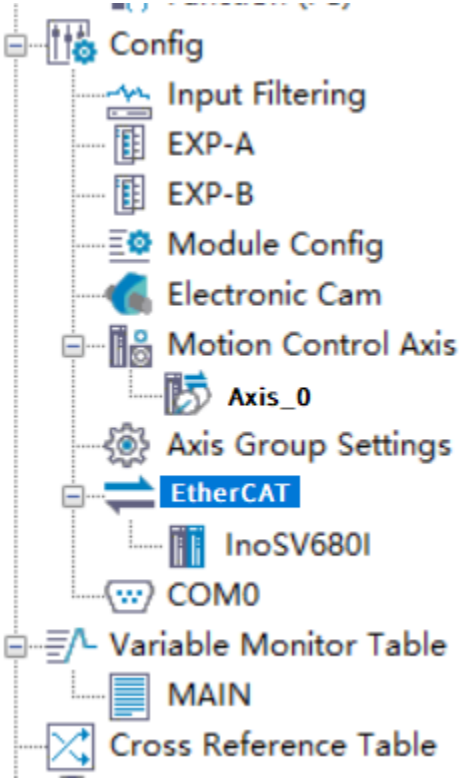
c. Right click the EtherCAT tab and select Auto Scan.


Function Block Instances
Variable_Table
Programming
Program Block
MAIN
SBR_001
INT_001
Function Block (FB)
Function (FC)
Config
Input Filtering
EXP-A
EXP-B
Module Config
Electronic Cam
Motion Control Axis
Axis Group Settings
EtherCAT
COM
Variable
MAIN
Cross Re
Element
Trace
Open
Auto Scan
Delete All
Enabling device
Disable Device
Paste
Information Output Window

d. Select Start Scan in the pop-up dialog box. After the scan completes, you can see all scanned slave devices. Click Update Configuration to update the scanned devices to the configuration list.

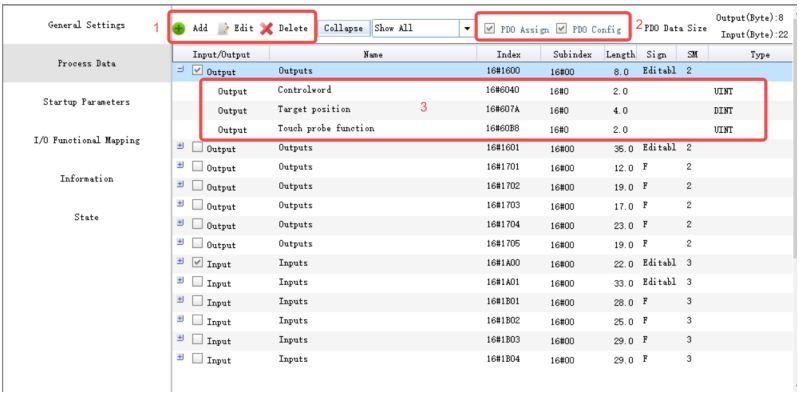


e. The configuration list is as follows. The SV680I in the configuration will be automatically associated with the motion control axis.



4. **Configuring PDO**

The Process Data interface is used to edit PDO. The interface is as follows:



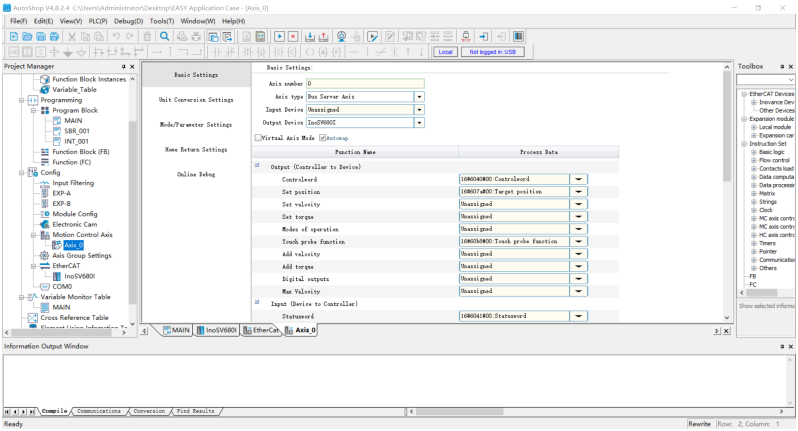
PDOs include output PDOs and input PDOs in terms of data flow direction. The output PDO represents the process data sent by the EtherCAT master station to the EtherCAT slave station, such as the control word 0x6040. The input PDO represents

the process data sent by the EtherCAT slave station to the master station. Each slave station may have multiple groups of PDOs or a single group of PDOs, as shown in the above figure. Some PDOs can be added and deleted.

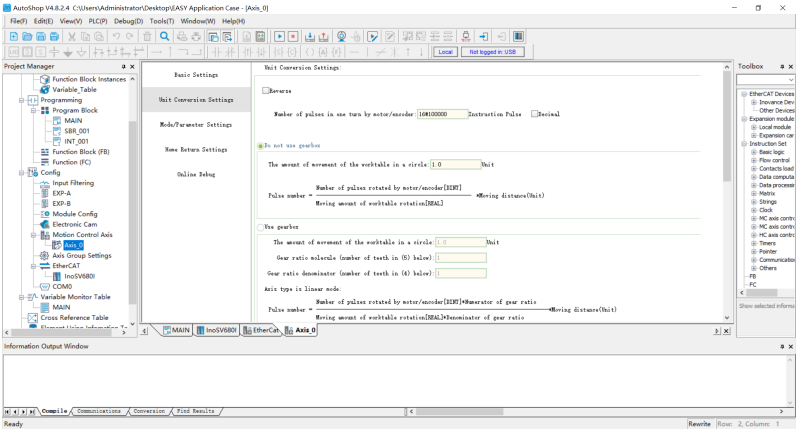
PDO control according to control requirements in process data.

5. **Configuring axis parameters**

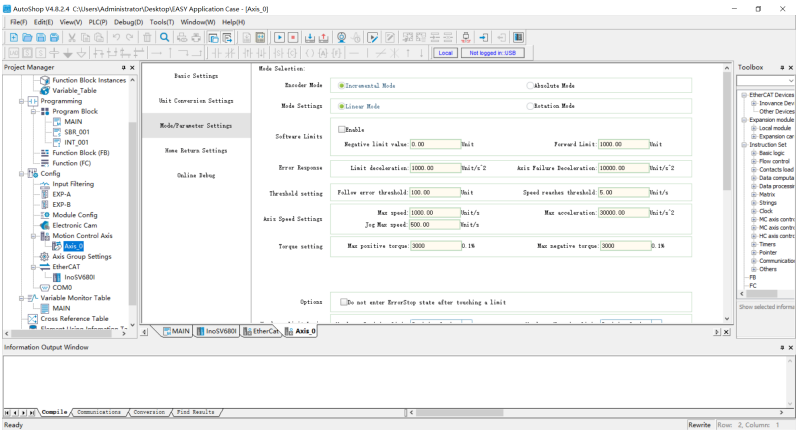
a. In Genera Setting, you can set the axis type and select the physical driving device.. The interface is as shown below.



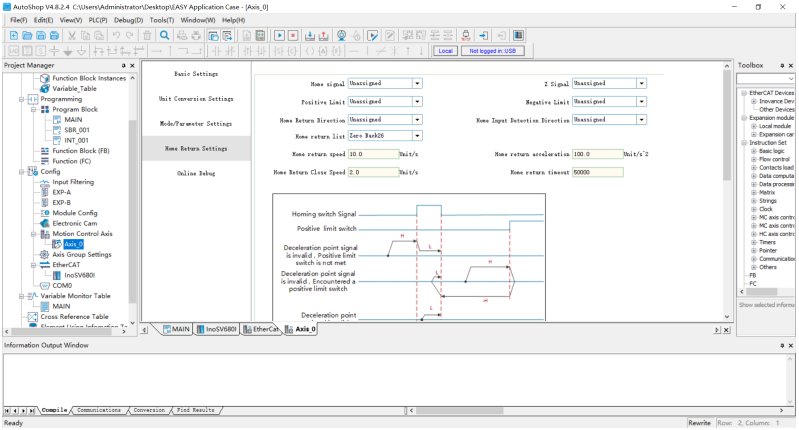
b. In Scaling, select 16#4000000 for the 26-bit encoder and 16#800000 for the 23-bit encoder.



c. In General Setting, you can set the software position limit and the operation mode. The interface is as follows. Note that the parameter lists displayed vary with different axis types you select.

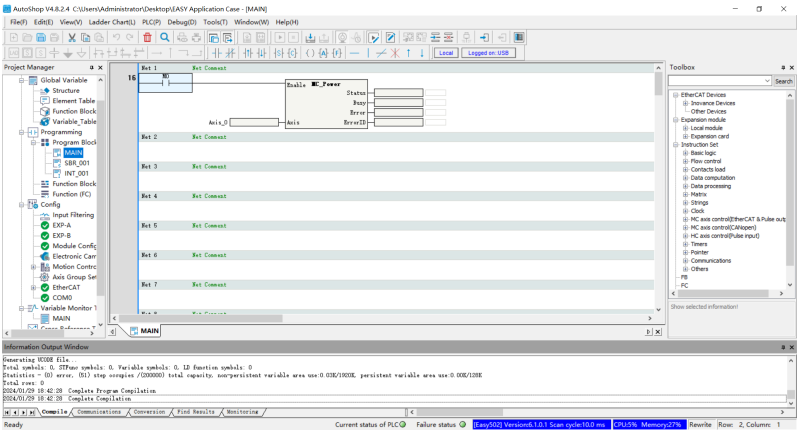


d. Select the homing mode according to actual needs. For details, see section "Homing Mode" in *SV680-INT Series Servo Drive Function Guide* for details.



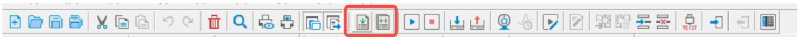
6. **Controlling servo drive operation**

   After configurations are done, you can control the servo drive operations through the PLC program.



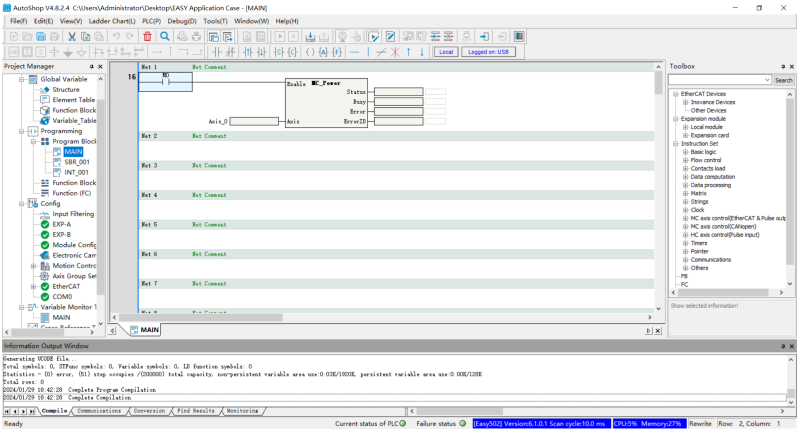
7. **Compiling**

   After compiling the program, click the icon indicated by the red square box to check whether the program is correct.



8. **Downloading and commissioning**

   After checking that the program is correct, download the program to PLC. The program can be activated after running. Click  to switch the PLC to operation state.



20 Parameter List [Standard P]

The mapping relation between the parameter displayed on the keypad (in decimal) and the object dictionary operated by the host controller (in hexadecimal, "Index" and "Sub-index") is as follows.

Object dictionary index = 0x2000 + Parameter group number

Object dictionary sub-index = Hexadecimal offset within the parameter group + 1 For example:

Panel Display	Object dictionary operated by the host controller
H02.15	2002.10h

Note

The following section only describes the display and parameter settings on the keypad side (in decimal), which are different from those displayed in the software tool (in hexadecimal). Make necessary value conversions during use.

20.1 H00 Servo Motor Parameters

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H00.00	2000-01h	Motor SN	20000: linear motor-pulse encoder 14203: linear motor-BiSS-C encoder 14206: linear motor-SSI encoder 14207: linear motor-EnDat2.2 encoder 14202: linear motor-Inovance communication 23-bit encoder 14205: linear motor-Inovance interpolator 23-bit encoder 20001: DDR motor-pulse encoder 14210: DDR motor-Inovance interpolator 23-bit encoder 14201: DDR motor-Inovance communication 23-bit encoder 14211: DDR motor-BiSS-C encoder 14212: DDR motor-EnDat2.2 encoder 14213: DDR motor-SSI encoder 20002: rotary motor-pulse encoder 14000: rotary motor-Inovance communication 20-bit encoder 14101: rotary motor-Inovance communication 23-bit encoder 14102: rotary motor-Inovance communication 26-bit encoder 14020: rotary motor-Harmonic 20-bit encoder-2.5M baud rate 14021: rotary motor-Harmonic 17-bit encoder-2.5M baud rate 14022: rotary motor-Harmonic 17-bit encoder-4M baud rate	14102	-	At stop	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
			14120: rotary motor-Nikon 20-bit encoder-2.5M baud rate 14121: rotary motor-Nikon 17-bit encoder-2.5M baud rate 14122: rotary motor-Nikon 17-bit encoder-4M baud rate 14130: rotary motor-TAMAGAWA 17-bit encoder 14131: rotary motor-TAMAGAWA 23-bit encoder 14140: rotary motor-EnDat2.2 encoder 14150: rotary motor-SSI encoder 14160: rotary motor-BiSS-C encoder				
H00.02	2000-03h	Customized No.	0.00–42949672.95	0.00	-	Unchangeable	
H00.04	2000-05h	Encoder version	0.0–6553.5	0.0	-	Unchangeable	
H00.05	2000-06h	Serial-type motor code	0–65535	0	-	Unchangeable	
H00.06	2000-07h	FPGA customized SN	0.00–655.35	0.00	-	Unchangeable	
H00.07	2000-08h	STO version	0.0–6553.5	0.0	-	Unchangeable	
H00.08	2000-09h	Bus encoder type	0–65535	0	-	At stop	
H00.14	2000-0Fh	Rated speed	50[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	At stop	
H00.15	2000-10h	Maximum speed	50[mm/s]/[rpm]–10000[mm/s]/[rpm]	6000	[mm/s]/[rpm]	At stop	
H00.18	2000-13h	Stator resistance	0.001Ω to 65.535Ω	0.500	Ω	At stop	
H00.19	2000-14h	Stator inductance Lq	0.01mH to 655.35mH	3.27	mH	At stop	
H00.20	2000-15h	Stator inductance Ld	0.01mH to 655.35mH	3.87	mH	At stop	
H00.22	2000-17h	Torque coefficient Kt	0.01[N/Arms]/[N·m/Arms]–655.35[N/Arms]/[N·m/Arms]	0.51	[N/Arms]/[N·m/Arms]	At stop	
H00.40	2000-29h	Motor control type	0: General-purpose rotary motor (ROT)	2	-	At stop	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
			1: Direct drive rotary motor (DDR) 2: Direct drive linear motor (DDL) 3: Voice coil motor (VOL)				
H00.41	2000-2Ah	Master encoder configuration	0: CN2 1: CN7	1	-	Unchangeable	
H00.43	2000-2Ch	Number of BiSS-C/SSI/ EnDat2.2 data bits	0–40	32	-	At stop	
H00.44	2000-2Dh	Number of BiSS-C/SSI fault bits	0–31	2	-	At stop	
H00.45	2000-2Eh	Encoder pitch 1	0.00[mm]/[deg]–655.35[mm]/[deg]	2.00	[mm]/[deg]	At stop	
H00.46	2000-2Fh	Encoder pitch 2	0.00[mm]/[deg]–655.35[mm]/[deg]	0.50	[mm]/[deg]	At stop	
H00.47	2000-30h	Encoder Type	0: Optical scale 1: Magnetic scale	0	-	At stop	
H00.48	2000-31h	Linear motor pole pitch (N-S)	0.00 millimeters–655.35 millimeters	16.00	mm	At stop	
H00.49	2000-32h	Direct drive motor encoder resolution	0.000um/p–65.535um/p	1.000	um/p	At stop	
H00.54	2000-37h	BiSS-C/SSI CRC	0–1	1	-	At stop	
H00.55	2000-38h	Rated torque (Uint32)	0.00[N]/[N·m]–42949672.95[N]/[N·m]	2.00	[N]/[N·m]	At stop	
H00.57	2000-3Ah	Max. torque (Uint32)	0.00[N]/[N·m]–42949672.95[N]/[N·m]	7.00	[N]/[N·m]	At stop	
H00.59	2000-3Ch	Encoder counting direction	0: Forward 1: Reverse	0	-	At stop	
H00.63	2000-40h	Max. current (Uint32)	0.00A–42949672.95A	3.00	A	At stop	
H00.65	2000-42h	Rated current (Uint32)	0.00A–42949672.95A	1.00	A	At stop	
H00.67	2000-44h	Moment of inertia (Uint32)	0.00000[g]/[0.00001kg·cm^2]–42949.67295[g]/[0.00001kg·cm^2]	0.00001	[g]/[0.00001kg·cm^2]	At stop	
H00.69	2000-46h	Linear back EMF coefficient (Uint32)	0.00[V/(m/s)]/[100mV/rpm]–42949672.95[V/(m/s)]/[100mV/rpm]	33.00	[V/(m/s)]/[100mV/rpm]	At stop	

20.2 H01 Servo Drive Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H01.00	2001-01h	MCU software version	0.0–6553.5	0.0	-	Unchangeable	
H01.01	2001-02h	FPGA software version	0.0–6553.5	0.0	-	Unchangeable	
H01.02	2001-03h	Servo drive series No.	0–65535	0	-	Unchangeable	
H01.06	2001-07h	Board software version	0.0–6553.5	0.0	-	Unchangeable	
H01.10	2001-0Bh	Drive series No.	2: S1R6 3: S2R8 5: S5R5 6: S7R6 7: S012 8: S018 9: S022 10: S027 10001: T3R5 10002: T5R4 10003: T8R4 10004: T012 10005: T017 10006: T021 10007: T026	3	-	At stop	
H01.11	2001-0Ch	DC-AC voltage class	0 V–65535 V	220	V	Unchangeable	
H01.12	2001-0Dh	Drive rated power	0.00 kW–42949672.95kW	0.40	kW	Unchangeable	
H01.14	2001-0Fh	Max. output power of the drive	0.00 kW–42949672.95kW	0.40	kW	Unchangeable	
H01.16	2001-11h	Rated output current of the drive	0.00 A–42949672.95 A	2.80	A	Unchangeable	
H01.18	2001-13h	Max. output current of the drive	0.00 A–42949672.95 A	10.10	A	Unchangeable	
H01.40	2001-29h	DC bus overvoltage protection threshold	0 V–2000 V	420	V	Real-time	
H01.75	2001-4Ch	Current loop amplification factor	0.00–655.35	1.00	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H01.88	2001-59h	Junction temperature parameter version 1	0.0–6553.5	0.0	-	Unchangeable	
H01.89	2001-5Ah	Junction temperature parameter version 2	0–65535	0	-	Unchangeable	
H01.90	2001-5Bh	Motor property mask	0–65535	0	-	At stop	

20.3 H02 Basic Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.00	2002-01h	Control mode	0: Speed control mode 1: Position control mode 2: Torque control mode 3: Torque/Speed control mode 4: Speed/Position control mode 5: Torque/Position control mode 6: Torque/Speed/Position compound mode 7: Process segment 8: CANopen mode	1	-	At stop	
H02.01	2002-02h	Absolute system selection	0: Incremental mode 1: Absolute position linear mode 2: Absolute position rotation mode 3: Absolute position linear mode (without encoder overflow alarm) 4: Absolute position single-turn mode	0	-	At stop	
H02.02	2002-03h	Rotation direction selection	0: Counterclockwise (CCW) as forward direction 1: Clockwise (CW) as forward direction	0	-	At stop	
H02.03	2002-04h	Output pulse phase	0: Phase A leads phase B	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			1: Phase A lags behind phase B				
H02.05	2002-06h	Stop mode at S-ON OFF	-4: Stop based on ramp 2, keeping dynamic braking state -3: Stop at zero speed, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Dynamic braking stop, keeping de-energized state	0	-	Real-time	
H02.06	2002-07h	Stop mode at No. 2 fault	-5: Stop at zero speed, keeping dynamic braking state -4: Stop at emergency stop torque, keeping dynamic braking state -3: Stop based on ramp 2, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Stop based on ramp 2, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state	2	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.07	2002-08h	Stop mode at overtravel	0: Coast to stop, keeping de-energized state 1: Stop at zero speed, keeping position lock state 2: Stop at zero speed, keeping de-energized state 3: Stop based on ramp 2, keeping de-energized state 4: Stop based on ramp 2, keeping position lock state 5: Dynamic braking stop, keeping de-energized state 6: Dynamic braking stop, keeping dynamic braking state 7: Not responding to overtravel	1	-	At stop	
H02.08	2002-09h	Stop mode at No.1 fault	0: Coast to stop, keeping de-energized state 1: Dynamic braking stop, keeping de-energized state 2: Dynamic braking stop, keeping dynamic braking state	2	-	At stop	
H02.09	2002-0Ah	Delay from brake output ON to command received	0 ms–500 ms	250	ms	Real-time	
H02.10	2002-0Bh	Delay from brake output OFF to motor de-energized	50 ms–1000 ms	150	ms	Real-time	
H02.11	2002-0Ch	Motor speed threshold at brake output OFF in rotation state	20[mm/s]/[rpm]–3000[mm/s]/[rpm]	30	[mm/s]/[rpm]	Real-time	
H02.12	2002-0Dh	Delay from S-ON OFF to brake output OFF in rotation state	1 ms–65535 ms	500	ms	Real-time	
H02.15	2002-10h	LED Alarm Display	0: Output alarm information immediately 1: Not output alarm information	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.16	2002-11h	Brake enable switch	0: OFF 1: ON	0	-	Real-time	
H02.17	2002-12h	Stop mode upon main circuit power failure	0: Keep current action 1: Stop upon fault as defined by H02.06 2: Stop at S-ON OFF as defined by H02.05 3: Stop quickly as defined by H02.18	2	-	Real-time	
H02.18	2002-13h	Quick stop mode	0: Coast to stop, keeping de-energized state 1: Stop by ramp 1, keeping de-energized state 2: Stop by ramp 2, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 5: Stop by ramp 1, keeping position lock state 6: Stop by ramp 2, keeping position lock state 7: Stop at emergency stop torque, keeping position lock state	2	-	Real-time	
H02.21	2002-16h	Permissible minimum resistance of braking resistor	1Ω to 1000Ω	40	Ω	Unchangeable	
H02.22	2002-17h	Power of built-in braking resistor	0W–65535W	50	W	Unchangeable	
H02.23	2002-18h	Resistance of built-in braking resistor	0Ω to 65535Ω	50	Ω	Unchangeable	
H02.24	2002-19h	Resistor heat dissipation coefficient	10% to 100%	30	%	Real-time	
H02.25	2002-1Ah	Braking resistor type	0: Built-in 1: External, natural cooling 2: External, forced air cooling 3: No resistor needed	3	-	Real-time	
H02.26	2002-1Bh	Power of external braking resistor	1 W–65535W	40	W	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.27	2002-1Ch	Resistance of external braking resistor	15Ω to 1000Ω	50	Ω	Real-time	
H02.28	2002-1Dh	Parameters Initialization	0: Parameters in group H02 and above initialized 1: Parameters in group H00, H02 and above initialized 2: All parameters initialized (default values used for model-related parameters)	0	-	At stop	
H02.30	2002-1Fh	User password	0–65535	0	-	Real-time	
H02.31	2002-20h	System parameter initialization	0: No operation 1: Restore default settings 2: Clear fault records	0	-	At stop	
H02.32	2002-21h	Selection of parameters in group H0b	0–99	50	-	Real-time	
H02.35	2002-24h	Keypad data update frequency	0 Hz–20 Hz	0	Hz	Real-time	
H02.38	2002-27h	Overload time of external resistor	0s to 200s	40	s	Real-time	
H02.41	2002-2Ah	Manufacturer password	0–65535	0	-	Real-time	
H02.47	2002-30h	Delay time from power cable breakage to brake OFF	0 ms–1000 ms	10	ms	Real-time	

20.4 H03 Terminal Input Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H03.00	2003-01h	DI function allocation 1 (activated upon power-on)	0: 0x00: Corresponding to null 1: 0x01: Corresponding to FunIN.1 2: 0x02: Corresponding to FunIN.2 4: 0x04: Corresponding to FunIN.3 8: 0x08: Corresponding to FunIN.4 16: 0x10: Corresponding to FunIN.5 32: 0x20: Corresponding to FunIN.6 64: 0x40: Corresponding to FunIN.7 128: 0x80: Corresponding to FunIN.8 256: 0x100: Corresponding to FunIN.9 512: 0x200: Corresponding to FunIN.10 1024: 0x400: Corresponding to FunIN.11 2048: 0x800: Corresponding to FunIN.12 4096: 0x1000: Corresponding to FunIN.13 8192: 0x2000: Corresponding to FunIN.14 16384: 0x4000: Corresponding to FunIN.15 32768: 0x8000: Corresponding to FunIN.16	0x0	-	Real-time	
H03.01	2003-02h	DI function allocation 2 (activated upon power-on)	0: 0x00: Corresponding to null 1: 0x01: Corresponding to FunIN.17 2: 0x02: Corresponding to FunIN.18 4: 0x04: Corresponding FunIN.19 8: 0x08: Corresponding FunIN.20 16: 0x10: Corresponding FunIN.21	0x0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			32: 0x20: Corresponding FunIN.22 64: 0x40: Corresponding FunIN.23 128: 0x80: Corresponding FunIN.24 256: 0x100: Corresponding FunIN.25 512: 0x200: Corresponding FunIN.26 1024: 0x400: Corresponding FunIN.27 2048: 0x800: Corresponding FunIN.28 4096: 0x1000: Corresponding FunIN.29 16384: 0x4000: Corresponding FunIN.31 32768: 0x8000: Corresponding FunIN.32				
H03.02	2003-03h	DI1 function	0: No assignment 1: S-ON 2: Warning reset signal 3: Gain switchover switch 4: Switchover between main and auxiliary references 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 10: Mode switchover M1-SEL 11: Mode switchover M2-SEL 12: Zero clamp enable signal 13: Position reference inhibited 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog	14	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			20: Step enable 21: Handwheel override signal 1 22: Handwheel override signal 2 23: Hand wheel enable signal 24: Electronic gear ratio selection 25: Torque reference direction 26: Speed reference direction 27: Position reference direction 28: Multi-position reference enable 29: Interrupt positioning cancel signal				
H03.02	2003-03h	DI1 function	31: Home switch 32: Homing enable 33: Interrupt positioning inhibited 34: Emergency stop 35: Clear position deviation 36: Internal speed limit source 37: Pulse reference inhibited 38: Touch probe 1 39: Touch probe 2 40: Multi-speed enable 41: Current position as home 42: Axis control command executed immediately 43: Axis control command not executed immediately 44: Positioning and command completed signal clear 45: Interrupt positioning enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1	14	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H03.03	2003-04h	DI1 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.04	2003-05h	DI2 function	See H03.02	15	-	Real-time	
H03.05	2003-06h	DI2 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.06	2003-07h	DI3 function	See H03.02	13	-	Real-time	
H03.07	2003-08h	DI3 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.08	2003-09h	DI4 function	See H03.02	2	-	Real-time	
H03.09	2003-0Ah	DI4 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.10	2003-0Bh	DI5 function	See H03.02	1	-	Real-time	
H03.11	2003-0Ch	DI5 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.12	2003-0Dh	DI6 function	See H03.02	0	-	Real-time	
H03.13	2003-0Eh	DI6 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.14	2003-0Fh	DI7 function	See H03.02	45	-	Real-time	
H03.15	2003-10h	DI7 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.16	2003-11h	DI8 function	See H03.02	31	-	Real-time	
H03.17	2003-12h	DI8 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.34	2003-23h	DI function allocation 3 (activated upon power-on)	0: 0x00: Corresponding to null 1: 0x01: Corresponding to FunIN.33 2: 0x02: Corresponding to FunIN.34 4: 0x04: Corresponding to FunIN.35 8: 0x08: Corresponding to FunIN.36	0x0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			16: 0x10: Corresponding to FunIN.37 32: 0x20: Corresponding to FunIN.38 64: 0x40: Corresponding to FunIN.39 128: 0x80: Corresponding to FunIN.40 256: 0x100: Corresponding to FunIN.41 512: 0x200: Corresponding to FunIN.42 1024: 0x400: Corresponding to FunIN.43 2048: 0x800: Corresponding to FunIN.44 4096: 0x1000: Corresponding to FunIN.45 8192: 0x2000: Corresponding to FunIN.46 16384: 0x4000: Corresponding to FunIN.47 32768: 0x8000: Corresponding to FunIN.48				
H03.35	2003-24h	DI function allocation 4 (activated upon power-on)	0: 0x00: Corresponding to null 1: 0x01: Corresponding to FunIN.49 2: 0x02: Corresponding to FunIN.50 4: 0x04: Corresponding FunIN.51 8: 0x08: Corresponding FunIN.52 16: 0x10: Corresponding FunIN.53 32: 0x20: Corresponding FunIN.54 64: 0x40: Corresponding FunIN.55 128: 0x80: Corresponding FunIN.56 256: 0x100: Corresponding FunIN.57 512: 0x200: Corresponding FunIN.58 1024: 0x400: Corresponding FunIN.59	0x0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			2048: 0x800: Corresponding FunIN.60 4096: 0x1000: Corresponding FunIN.61 8192: 0x2000: Corresponding FunIN.62 16384: 0x4000: Corresponding FunIN.63				
H03.50	2003-33h	Voltage-type AI1 offset	-5000 mV to 5000 mV	0	mV	Real-time	
H03.51	2003-34h	Voltage-type AI1 input filter time constant	0.00 ms–655.35 ms	2.00	ms	Real-time	
H03.53	2003-36h	Voltage-type AI1 dead zone	0.0 mV to 1000.0 mV	10.0	mV	Real-time	
H03.54	2003-37h	Voltage-type AI1 zero drift	-500.0 mV–500.0 mV	0.0	mV	Real-time	
H03.55	2003-38h	Voltage-type AI2 offset	-5000 mV to 5000 mV	0	mV	Real-time	
H03.56	2003-39h	Voltage-type AI2 input filter time constant	0.00 ms–655.35 ms	2.00	ms	Real-time	
H03.58	2003-3Bh	Voltage-type AI2 dead zone	0.0 mV to 1000.0 mV	10.0	mV	Real-time	
H03.59	2003-3Ch	Voltage-type AI2 zero drift	-500.0 mV–500.0 mV	0.0	mV	Real-time	
H03.60	2003-3Dh	DI1 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.61	2003-3Eh	DI2 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.62	2003-3Fh	DI3 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.63	2003-40h	DI4 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.64	2003-41h	DI5 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.65	2003-42h	DI6 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.66	2003-43h	DI7 fitter time	0.00 ms–500.00 ms	0.00	ms	Real-time	
H03.67	2003-44h	DI8 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.80	2003-51h	Speed corresponding to analog 10 V	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	At stop	
H03.81	2003-52h	Torque corresponding to analog 10 V	0.00 to 8.00	1.00	Multiplier	At stop	

20.5 H04 Terminal Output Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H04.00	2004-01h	DO1 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 25: Comparison DO 26: Closed-loop state 27: Left limit 28: Right limit 30: Alarm or fault output 31: Communication-forced DO 32: EDM output 33: Gantry alignment	1	-	Real-time	
H04.01	2004-02h	DO1 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H04.02	2004-03h	DO2 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking	5	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 25: Comparison DO 26: Closed-loop state 27: Left limit 28: Right limit 30: Alarm or fault output 31: Communication-forced DO 32: EDM output 33: Gantry alignment				
H04.03	2004-04h	DO2 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H04.04	2004-05h	DO3 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			23: Writing next command allowed 24: Internal motion completed 25: Comparison DO 26: Closed-loop state 27: Left limit 28: Right limit 30: Alarm or fault output 31: Communication-forced DO 32: EDM output 33: Gantry alignment				
H04.05	2004-06h	DO3 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H04.06	2004-07h	DO4 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 25: Comparison DO 26: Closed-loop state 27: Left limit 28: Right limit 30: Alarm or fault output 31: Communication-forced DO 32: EDM output 33: Gantry alignment	11	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H04.07	2004-08h	DO4 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H04.08	2004-09h	DO5 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 25: Comparison DO 26: Closed-loop state 27: Left limit 28: Right limit 30: Alarm or fault output 31: Communication-forced DO 32: EDM output 33: Gantry alignment	16	-	Real-time	
H04.09	2004-0Ah	DO5 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H04.22	2004-17h	DO source selection	bit0: DO1 0: DO1 function output 1: bit0 of H31.04 bit1: DO2 0: DO2 function output 1: bit1 of H31.04 bit2: DO3 0: DO3 function output 1: bit2 of H31.04 bit3: DO4	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			0: DO4 function output 1: bit3 of H31.04 bit4: DO5 0: DO5 function output 1: bit4 of H31.04				
H04.23	2004-18h	Communication-forced DO logic in non-OP status	bit0: DO1 0: Status unchanged 1: No output bit1: DO2 0: Status unchanged 1: No output bit2: DO3 0: Status unchanged 1: No output bit3: DO4 0: Status unchanged 1: No output bit4: DO5 0: Status unchanged 1: No output	0	-	Real-time	
H04.24	2004-19h	DO brake enable	0: Disabled 1: Enabled	0	-	At stop	
H04.50	2004-33h	AO1 signal selection	0: Motor speed (1 V/1000 [mm/s]/[rpm]) 1: Speed reference (1 V/1000 [mm/s]/[rpm]) 2: Torque reference (1 V/100 x rated torque) 3: Position deviation (0.5 mV/1 reference unit) 4: Position deviation (0.5 mV/1 encoder unit) 5: Position reference speed (1 V/1000 [mm/s]/[rpm]) 6: Positioning completed 8: AI1 voltage 9: AI2 voltage 10: Defined by H31.05	0	-	Real-time	
H04.51	2004-34h	AO1 offset voltage	-10000 mV–10000 mV	0	mV	Real-time	
H04.52	2004-35h	AO1 ratio	-99.99–99.99	1.00	-	Real-time	

20.6 H05 Position Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.00	2005-01h	Primary position reference source	0: Pulse reference 1: Step reference 2: Multi-position reference	0	-	Real-time	
H05.01	2005-02h	Position pulse reference input terminal	0: Low speed 1: High speed	0	-	At stop	
H05.02	2005-03h	Pulses per revolution	0–4294967295	0	[P/N-N]/[P/Rev]	At stop	
H05.04	2005-05h	First-order low-pass filter time constant	0.0 ms–6553.5 ms	0.0	ms	At stop	
H05.05	2005-06h	Step amount	-9999 to +9999	50	Reference unit	At stop	
H05.06	2005-07h	Moving average filter time constant 1	0.0 ms–128.0 ms	0.0	ms	At stop	
H05.07	2005-08h	Electronic gear ratio 1 (numerator)	1–1073741824	67108864	-	Real-time	
H05.09	2005-0Ah	Electronic gear ratio 1 (denominator)	1–1073741824	10000	-	Real-time	
H05.11	2005-0Ch	Electronic gear ratio 2 (numerator)	1–1073741824	67108864	-	Real-time	
H05.13	2005-0Eh	Electronic gear ratio 2 (denominator)	1–1073741824	10000	-	Real-time	
H05.15	2005-10h	Pulse reference form	0: Direction + Pulse, positive logic 1: Direction + Pulse, negative logic 2: Phase A + phase B quadrature pulse, quadrupled frequency 3: CW + CCW	0	-	At stop	
H05.16	2005-11h	Clear action	0: Position deviation cleared upon S-OFF or fault 1: Position deviation cleared upon S-OFF or fault	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			2: Position deviation cleared upon non-operational state or active DI function 35				
H05.17	2005-12h	Number of encoder frequency-division pulses	0–4194303	2500	[P/N-N]/[P/Rev]	At stop	
H05.19	2005-14h	Speed feedforward control	0: No speed feedforward 1: Internal speed feedforward 2: H05.72 3: Zero phase	1	-	At stop	
H05.20	2005-15h	Condition for positioning completed signal output	0: When absolute value of position deviation is smaller than the value of H05.21, a positioning completion ON signal is output. 1: When filtered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 2: When unfiltered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 3: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the unfiltered position command and the absolute value of the position deviation.	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			4: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the filtered position command and the absolute value of the position deviation. 5: When the unfiltered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 6: When the filtered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 7: When the unfiltered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 8: When the filtered position command is 0, positioning completion evaluation starts after the delay time H05.60				

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.				
H05.20	2005-15h	Condition for positioning completed signal output	9: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 10: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.	0	-	Real-time	
H05.21	2005-16h	Threshold of positioning completed	1 to 65535	46976	Encoder unit	Real-time	
H05.22	2005-17h	Proximity threshold	1 to 65535	65535	Encoder unit	Real-time	
H05.24	2005-19h	Interrupt positioning displacement	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H05.26	2005-1Bh	Constant operating speed in interrupt positioning	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.27	2005-1Ch	Acc./Dec. time of interrupt positioning	0 ms–65535 ms	10	ms	Real-time	
H05.29	2005-1Eh	Interruption fixed length unlock	0: Disabled 1: Enabled	1	-	Real-time	
H05.30	2005-1Fh	Homing enable selection	0: Disabled 1: Homing enabled through the HomingStart signal input from DI 2: Electrical homing enabled through the HomingStart signal input from DI 3: Homing started immediately upon power-on 4: Homing executed immediately 5: Electrical homing started 6: Current position as home 8: D-triggered position as home	0	-	Real-time	
H05.31	2005-20h	Homing mode	0: Forward, home switch as deceleration point and home 1: Reverse, home switch as deceleration point and home 2: Forward, Z signal as deceleration point and home 3: Reverse, motor Z signal as deceleration point and home 4: Forward, home switch as deceleration point and Z signal as home 5: Reverse, home switch as deceleration point and Z signal as home 6: Forward, positive limit switch as deceleration point and home 7: Reverse, negative limit switch as deceleration point and home 8: Forward, positive limit switch as deceleration point and Z signal as home 9: Reverse, negative limit switch as deceleration point and Z signal as home	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			10: Forward, mechanical limit position as deceleration point and home 11: Reverse, mechanical limit position as deceleration point and home 12: Forward, mechanical limit position as deceleration point and Z signal as home 13: Reverse, mechanical limit position as deceleration point and Z signal as home 14: Forward single-turn homing 15: Reverse single-turn homing 16: Nearby single-turn homing				
H05.32	2005-21h	Speed of high-speed search for home switch signal	0[mm/s]/[rpm]–3000[mm/s]/[rpm]	100	[mm/s]/[rpm]	Real-time	
H05.33	2005-22h	Speed of low-speed search for home switch signal	0[mm/s]/[rpm]–1000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	
H05.34	2005-23h	Acceleration/Deceleration time during homing	0 ms–1000 ms	1000	ms	Real-time	
H05.35	2005-24h	Home search time limit	0 ms–65535 ms	10000	ms	Real-time	
H05.36	2005-25h	Mechanical home offset	-2147483648 to 2147483647	0	Reference unit	Real-time	
H05.38	2005-27h	Frequency-division output source	0: Encoder frequency-division output 1: Pulse reference synchronous output 2: Frequency-division output inhibited 3: Second encoder frequency-division output 4: H31.01 reference frequency output	0	-	Real-time	
H05.39	2005-28h	Electronic gear ratio	0: Switchover after position reference is kept 0 for 2.5 ms	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		switchover condition	1: Switched in real time				
H05.40	2005-29h	Mechanical home offset and action upon overtravel	0: H05.36 as the coordinate after homing, reverse homing applied after homing triggered again on overtravel 1: H05.36 as the relative offset after homing, reverse homing applied after homing triggered again on overtravel 2: H05.36 as the coordinate after homing, reverse homing auto-applied on overtravel 3: H05.36 as the relative offset after homing, reverse homing auto-applied on overtravel	0	-	Real-time	
H05.41	2005-2Ah	Z pulse output polarity	bit0: Frequency-division Z output polarity 0: Positive (high level upon active Z pulse) 1: Negative (low level upon active Z pulse) bit1: OCZ output polarity 0: Positive (high level upon active Z pulse) 1: Negative (low level upon active Z pulse) bit2: Inner loop probe Z signal source 0: Motor Z signal 1: Frequency-division output Z signal	0x1	-	At stop	
H05.43	2005-2Ch	Position pulse edge	0: Rising edge-triggered 1: Falling edge-triggered	0	-	Real-time	
H05.44	2005-2Dh	Numerator of frequency-division output reduction ratio	1–16383	1	-	At stop	
H05.45	2005-2Eh	Denominator of frequency-division output reduction ratio	1–8191	1	-	At stop	
H05.46	2005-2Fh	DI selection of multi-turn frequency-division Z starting point	0: No selection 1: DI1 2: DI2 3: DI3 4: DI4	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			5: DI5 6: DI6 7: DI7 8: DI8				
H05.47	2005-30h	Frequency-division Z pulse width	0μs to 400μs	0	μs	Real-time	
H05.48	2005-31h	Frequency-division output dead zone setting threshold	0–255	0	-	Real-time	
H05.50	2005-33h	Mechanical gear ratio in absolute position rotation mode (numerator)	1–65535	1	-	At stop	
H05.51	2005-34h	Mechanical gear ratio in absolute position rotation mode (denominator)	1–65535	1	-	At stop	
H05.52	2005-35h	Pulses per revolution of the load in absolute position rotation mode (low 32 bits)	0 to 4294967295	0	Encoder unit	At stop	
H05.54	2005-37h	Pulses per revolution of the load in absolute position rotation mode (high 32 bits)	0 to 4294967295	0	Encoder unit	At stop	
H05.58	2005-3Bh	Torque threshold in homing upon hit-and-stop	0.0% to 400.0%	100.0	%	Real-time	
H05.59	2005-3Ch	Positioning window time	0 ms–30000 ms	0	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.60	2005-3Dh	Hold time of positioning completed	0 ms–30000 ms	0	ms	Real-time	
H05.66	2005-43h	Homing time unit	0: 1 ms 1: 10 ms 2: 100 ms	2	-	At stop	
H05.67	2005-44h	Offset between zero point and single-turn absolute position	-2147483648 to 2147483647	0	Encoder unit	At stop	
H05.71	2005-48h	Motor Z signal width	1 ms–100 ms	4	ms	Real-time	
H05.72	2005-49h	External speed feedforward source selection	0: 60B1 1: AI1 2: AI2	1	-	Real-time	

20.7 H06 Speed Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H06.00	2006-01h	Source of main speed reference A	0: Digital setting (H06.03) 1: AI1 2: AI2	0	-	At stop	
H06.01	2006-02h	Source of auxiliary speed reference B	0: Digital setting (H06.03) 1: AI1 2: AI2 5: Multi-speed reference	1	-	At stop	
H06.02	2006-03h	Speed reference source	0: Source of main speed reference A 1: Source of auxiliary speed reference B 2: A+B 3: Switched between A and B 4: Communication	0	-	At stop	
H06.03	2006-04h	Speed reference set through keypad	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H06.04	2006-05h	DI jog speed reference	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	150	[mm/s]/[rpm]	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H06.05	2006-06h	Acc. ramp time of speed reference	0 ms–65535 ms	0	ms	Real-time	
H06.06	2006-07h	Dec. ramp time of speed reference	0 ms–65535 ms	0	ms	Real-time	
H06.07	2006-08h	Maximum speed limit	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	7000	[mm/s]/[rpm]	Real-time	
H06.08	2006-09h	Forward speed threshold	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	7000	[mm/s]/[rpm]	Real-time	
H06.09	2006-0Ah	Reverse speed threshold	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	7000	[mm/s]/[rpm]	Real-time	
H06.10	2006-0Bh	Deceleration unit in emergency stop	0: Multiplied by 1 1: Multiplied by 10 2: Multiplied by 100	0	-	At stop	
H06.11	2006-0Ch	Torque feedforward control	0: No torque feedforward 1: Internal torque feedforward 3: STune mode 5	1	-	Real-time	
H06.12	2006-0Dh	Acc./dec. ramp time of speed jog	0 ms–65535 ms	10	ms	Real-time	
H06.13	2006-0Eh	Speed feedforward smoothing filter	0μs to 65535μs	0	μs	Real-time	
H06.15	2006-10h	Zero clamp speed threshold	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	
H06.16	2006-11h	Threshold of TGON (motor rotation) signal	0[mm/s]/[rpm]–1000[mm/s]/[rpm]	20	[mm/s]/[rpm]	Real-time	
H06.17	2006-12h	Threshold of V-Cmp (speed matching) signal	0[mm/s]/[rpm]–100[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	
H06.18	2006-13h	Threshold of speed reach signal	20[mm/s]/[rpm]–10000[mm/s]/[rpm]	1000	[mm/s]/[rpm]	Real-time	
H06.19	2006-14h	Threshold of zero speed output signal	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H06.40	2006-29h	Ramp 1 deceleration time	0 ms–65535 ms	0	ms	Real-time	
H06.41	2006-2Ah	Ramp 2 deceleration time	0 ms–65535 ms	0	ms	Real-time	
H06.50	2006-33h	Speed S-curve enable switch	0: Disabled 1: Enabled	1	-	At stop	
H06.51	2006-34h	Increasing acceleration 1 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.52	2006-35h	Decreasing acceleration 1 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.53	2006-36h	Decreasing deceleration 1 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.54	2006-37h	Decreasing acceleration 1 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.55	2006-38h	Increasing acceleration 2 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.56	2006-39h	Decreasing acceleration 2 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.57	2006-3Ah	Decreasing deceleration 2	0.0% to 100.0%	50.0	%	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		of speed S-curve deceleration segment					
H06.58	2006-3Bh	Decreasing acceleration 2 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.59	2006-3Ch	Increasing acceleration 3 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.60	2006-3Dh	Decreasing acceleration 3 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.61	2006-3Eh	Decreasing deceleration 3 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.62	2006-3Fh	Decreasing acceleration 3 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.63	2006-40h	Increasing acceleration 4 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.64	2006-41h	Decreasing acceleration 4 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H06.65	2006-42h	Decreasing deceleration 4 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.66	2006-43h	Decreasing acceleration 4 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.67	2006-44h	Increasing acceleration 5 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.68	2006-45h	Decreasing acceleration 5 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.69	2006-46h	Decreasing deceleration 5 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.70	2006-47h	Decreasing acceleration 5 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.71	2006-48h	Increasing acceleration 6 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.72	2006-49h	Decreasing acceleration 6 of speed S-curve	0.0% to 100.0%	50.0	%	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		acceleration segment					
H06.73	2006-4Ah	Decreasing deceleration 6 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.74	2006-4Bh	Decreasing acceleration 6 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.75	2006-4Ch	Increasing acceleration 7 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.76	2006-4Dh	Decreasing acceleration 7 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.77	2006-4Eh	Decreasing deceleration 7 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.78	2006-4Fh	Decreasing acceleration 7 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.79	2006-50h	Increasing acceleration 8 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.80	2006-51h	Decreasing acceleration 8	0.0% to 100.0%	50.0	%	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		of speed S-curve acceleration segment					
H06.81	2006-52h	Decreasing deceleration 8 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.82	2006-53h	Decreasing acceleration 8 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	

20.8 H07 Torque Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H07.00	2007-01h	Source of main torque reference A	0: Keypad (H07.03) 1: AI1 2: AI2	0	-	At stop	
H07.01	2007-02h	Source of auxiliary torque reference B	0: Keypad (H07.03) 1: AI1 2: AI2	1	-	At stop	
H07.02	2007-03h	Torque reference source	0: Source of main torque reference A 1: Source of auxiliary torque reference B 2: Source of A+B 3: Switched between A and B 4: Communication	0	-	At stop	
H07.03	2007-04h	Torque reference set through keypad	-400.0% to 400.0%	0.0	%	Real-time	
H07.05	2007-06h	Torque reference filter time constant 1	0.00 ms–30.00 ms	0.50	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H07.06	2007-07h	Torque reference filter time constant 2	0.00 ms–30.00 ms	0.27	ms	Real-time	
H07.07	2007-08h	Torque Limit source	0: Positive/Negative internal torque limit 1: Internal or external limit as defined by DI 2: T_LMT 3: T_LMT or external limit as defined by DI (FunIN.16 or FunIN.17) 4: T_LMT or internal limit (FunIN.16 or FunIN.17) as defined by DI	0	-	Real-time	
H07.08	2007-09h	T-LMT selection	1: AI1 2: AI2	1	-	Real-time	
H07.09	2007-0Ah	Positive internal torque limit	0.0% to 400.0%	350.0	%	Real-time	
H07.10	2007-0Bh	Negative internal torque limit	0.0% to 400.0%	350.0	%	Real-time	
H07.11	2007-0Ch	Positive external torque limit	0.0% to 400.0%	350.0	%	Real-time	
H07.12	2007-0Dh	Negative external torque limit	0.0% to 400.0%	350.0	%	Real-time	
H07.15	2007-10h	Emergency-stop torque	0.0% to 400.0%	100.0	%	Real-time	
H07.17	2007-12h	Speed limit source	0: Internal speed limit 1: V-LMT 2: H07.19 or H07.20 as defined by DI	0	-	Real-time	
H07.18	2007-13h	V-LMT selection	1: AI1 2: AI2	1	-	Real-time	
H07.19	2007-14h	Positive speed limit/Speed limit 1 in torque control	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	Real-time	
H07.20	2007-15h	Negative speed limit/Speed limit 2 in torque control	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	Real-time	
H07.21	2007-16h	Torque reach base value	0.0% to 400.0%	0.0	%	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H07.22	2007-17h	Torque reach valid value	0.0% to 400.0%	20.0	%	Real-time	
H07.23	2007-18h	Torque reach invalid value	0.0% to 400.0%	10.0	%	Real-time	
H07.24	2007-19h	Field weakening depth	60% to 115%	115	%	Real-time	
H07.25	2007-1Ah	Max. permissible demagnetizing current	0% to 300%	100	%	Real-time	
H07.26	2007-1Bh	Field weakening selection	0: Disabled 1: Enabled	0	-	At stop	
H07.27	2007-1Ch	Flux weakening gain	0.001 kHz–1.000 kHz	0.030	kHz	Real-time	
H07.28	2007-1Dh	Speed of flux weakening point	0–65535	0	-	Unchangeable	
H07.35	2007-24h	Torque non-standard feature enable	bit0: Motor output correction enable bit1: Shield compensation data enable	0	-	At stop	
H07.36	2007-25h	Time constant of low-pass filter 2	0.00 ms–10.00 ms	0.00	ms	Real-time	
H07.37	2007-26h	Torque reference filter selection	0: First-order filter 1: Biquad filter	0	-	Real-time	
H07.38	2007-27h	Biquad filter attenuation ratio	0–50	16	-	Real-time	
H07.40	2007-29h	Speed limit threshold in torque control mode	0 ms–300 ms	10	ms	Real-time	
H07.42	2007-2Bh	Biquad low pass filter damping coefficient	0.001–10.000	1.000	-	Real-time	

20.9 H08 Gain Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.00	2008-01h	Speed loop gain	0.0 Hz–2000.0 Hz	40.0	Hz	Real-time	
H08.01	2008-02h	Speed loop integral time constant	0.15 ms–512.00 ms	19.89	ms	Real-time	
H08.02	2008-03h	Position loop gain	0.0 Hz–2000.0 Hz	64.0	Hz	Real-time	
H08.03	2008-04h	2nd speed loop gain	0.1 Hz–2000.0 Hz	75.0	Hz	Real-time	
H08.04	2008-05h	2nd speed loop integral time constant	0.15 ms–512.00 ms	10.61	ms	Real-time	
H08.05	2008-06h	2nd position loop gain	0.1 Hz–2000.0 Hz	120.0	Hz	Real-time	
H08.08	2008-09h	2nd gain mode setting	0: Fixed to the 1st gain, switched between P and PI as defined by bit26 of external 60FEh 1: Switched between the 1st and 2nd gain sets as defined by H08.09	1	-	Real-time	
H08.09	2008-0Ah	Gain switchover condition	0: Fixed to the 1st gain set (PS) 1: Switched as defined by bit26 of 60FEh 2: Torque reference too large (PS) 3: Speed reference too large (PS) 4: Speed reference change rate too large (PS) 5: Speed reference low/high speed threshold (PS) 6: Position deviation too large (P) 7: Position reference available (P) 8: Positioning unfinished (P) 9: Actual speed (P) 10: Position reference + Actual speed (P)	0	-	Real-time	
H08.10	2008-0Bh	Gain switchover delay	0.0 ms–1000.0 ms	5.0	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.11	2008-0Ch	Gain switchover level	0–20000	50	-	Real-time	
H08.12	2008-0Dh	Gain switchover hysteresis	0–20000	30	-	Real-time	
H08.13	2008-0Eh	Position gain switchover time	0.0 ms–1000.0 ms	3.0	ms	Real-time	
H08.15	2008-10h	Load moment of inertia ratio	0.00–120.00	1.00	-	Real-time	
H08.17	2008-12h	Zero phase delay	0.0 ms–4.0 ms	0.0	ms	Real-time	
H08.18	2008-13h	Time constant of speed feedforward filter	0.00 ms–64.00 ms	0.50	ms	Real-time	
H08.19	2008-14h	Speed feedforward gain	0.0% to 100.0%	0.0	%	Real-time	
H08.20	2008-15h	Torque feedforward filter time constant	0.00 ms–64.00 ms	0.50	ms	Real-time	
H08.21	2008-16h	Torque feedforward gain	0.0% to 300.0%	0.0	%	Real-time	
H08.22	2008-17h	Speed feedback filtering option	0: Inhibited 1: 2 times 2: 4 times 3: 8 times 4: 16 times	0	-	At stop	
H08.23	2008-18h	Cutoff frequency of speed feedback low-pass filter	100 Hz–8000 Hz	8000	Hz	Real-time	
H08.24	2008-19h	PDFF control coefficient	0.0% to 200.0%	100.0	%	Real-time	
H08.25	2008-1Ah	Speed measurement method	0: M-method 1: MT-method	0	-	At stop	
H08.27	2008-1Ch	Speed observer cutoff frequency	50 Hz–600 Hz	170	Hz	Real-time	
H08.28	2008-1Dh	Speed observer inertia	1% to 1600%	100	%	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		correction coefficient					
H08.29	2008-1Eh	Speed observer filter time	0.00 ms–10.00 ms	0.80	ms	Real-time	
H08.31	2008-20h	Disturbance cutoff frequency	1 Hz–4000 Hz	600	Hz	Real-time	
H08.32	2008-21h	Disturbance compensation gain	0% to 100%	0	%	Real-time	
H08.33	2008-22h	Disturbance observer inertia correction coefficient	1% to 1600%	100	%	Real-time	
H08.37	2008-26h	Phase modulation for medium-frequency jitter suppression 2	-90° to 90°	0	°	Real-time	
H08.38	2008-27h	Medium-frequency suppression 2 frequency	0 Hz–1000 Hz	0	Hz	Real-time	
H08.39	2008-28h	Compensation gain of medium-frequency jitter suppression 2	0% to 300%	0	%	Real-time	
H08.40	2008-29h	Speed observer selection	0: Disabled 1: Enabled	0	-	Real-time	
H08.42	2008-2Bh	Model control selection	0: Disabled 1: Enabled 2: Reserved 4: Model tracking B	0	-	Real-time	
H08.43	2008-2Ch	Model gain	0.1–2000.0	40.0	-	Real-time	
H08.46	2008-2Fh	Feedforward value	0.0–102.4	95.0	-	Real-time	
H08.48	2008-31h	Model torque feedforward forward compensation coefficient	0.0–204.8	102.4	-	Real-time	
H08.49	2008-32h	Model torque feedforward reverse	0.0–204.8	102.4	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		compensation coefficient					
H08.53	2008-36h	Medium- and low-frequency jitter suppression frequency 3	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	
H08.54	2008-37h	Medium- and low-frequency jitter suppression compensation 3	0% to 200%	0	%	Real-time	
H08.56	2008-39h	Medium- and low-frequency jitter suppression phase modulation 3	0% to 600%	100	%	Real-time	
H08.59	2008-3Ch	Medium- and low-frequency jitter suppression frequency 4	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	
H08.60	2008-3Dh	Medium- and low-frequency jitter suppression compensation 4	0% to 200%	0	%	Real-time	
H08.61	2008-3Eh	Medium- and low-frequency jitter suppression phase modulation 4	0% to 600%	100	%	Real-time	
H08.62	2008-3Fh	Position loop integral time constant	0.15–512.00	512.00	-	Real-time	
H08.63	2008-40h	2nd position loop integral time constant	0.15–512.00	512.00	-	Real-time	
H08.64	2008-41h	Speed observer feedback source	0: Observer output speed 1: Observer observed speed	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.65	2008-42h	Zero deviation control selection	0: Disabled 1: Enabled	0	-	Real-time	
H08.66	2008-43h	Zero deviation control position average filter	0.0 ms–320.0 ms	5.0	ms	At stop	
H08.68	2008-45h	Speed feedforward of zero deviation control	0.0% to 100.0%	100.0	%	Real-time	
H08.69	2008-46h	Torque feedforward of zero deviation control	0.0% to 100.0%	100.0	%	Real-time	
H08.90	2008-5Bh	Encoder scale spacing ripple suppressor enable	0: Disabled 1: 1st group activated only-adaptive mode 2: 1st group activated only-hysteresis mode 3: Two groups activated-adaptive mode 4: Two groups activated-hysteresis mode	0	-	Real-time	

20.10H09 Auto-tuning Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.00	2009-01h	Auto-adjustment mode	0: Disabled, manual gain tuning required 1: Enabled, gain parameters generated automatically based on the stiffness level 2: Positioning mode, gain parameters generated automatically based on the stiffness level 3: Interpolation mode+Inertia auto-tuning 4: Normal mode+Inertia auto-tuning 5: Stune mode 5 6: Quick positioning mode+Inertia auto-tuning 9: Model tracking + Inertia auto-tuning + Friction force compensation	4	-	Real-time	
H09.01	2009-02h	Stiffness level selection	0–41	15	-	Real-time	
H09.02	2009-03h	Mode selection of adaptive notch	0: Adaptive notch no longer updated 1: One adaptive notch activated (3rd notch) 2: Two adaptive notches activated (3rd and 4th notches) 3: Resonance point tested only (displayed in H09.24) 4: Adaptive notch cleared, values of 3rd and 4th notches restored to default	0	-	Real-time	
H09.03	2009-04h	Online inertia auto-tuning mode	0: Disabled 1: Enabled, changing slowly 2: Enabled, changing normally 3: Enabled, changing quickly	0	-	Real-time	
H09.05	2009-06h	Offline inertia auto-tuning mode	0: Bi-directional 1: Unidirectional	0	-	At stop	
H09.06	2009-07h	Max. speed of inertia auto-tuning	100[mm/s]/[rpm]–1000[mm/s]/[rpm]	500	[mm/s]/[rpm]	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.07	2009-08h	Time constant for accelerating to max. speed during inertia auto-tuning	10 ms–5000 ms	125	ms	At stop	
H09.08	2009-09h	Interval time after an individual inertia auto-tuning	50 ms–10000 ms	800	ms	At stop	
H09.09	2009-0Ah	Motor rotating distance per inertia auto-tuning	0.00[mm]/[Rev]–100.00[mm]/[Rev]	1.00	[mm]/[Rev]	Real-time	
H09.11	2009-0Ch	Vibration threshold	0.0% to 100.0%	5.0	%	Real-time	
H09.12	2009-0Dh	Frequency of the 1st notch	50 Hz–8000 Hz	8000	Hz	Real-time	
H09.13	2009-0Eh	Width level of the 1st notch	0–20	2	-	Real-time	
H09.14	2009-0Fh	Depth level of the 1st notch	0–99	0	-	Real-time	
H09.15	2009-10h	Frequency of the 2nd notch	50 Hz–8000 Hz	8000	Hz	Real-time	
H09.16	2009-11h	Width level of the 2nd notch	0–20	2	-	Real-time	
H09.17	2009-12h	Depth level of the 2nd notch	0–99	0	-	Real-time	
H09.18	2009-13h	Frequency of the 3rd notch	50 Hz–8000 Hz	8000	Hz	Real-time	
H09.19	2009-14h	Width level of the 3rd notch	0–20	2	-	Real-time	
H09.20	2009-15h	Depth level of the 3rd notch	0–99	0	-	Real-time	
H09.21	2009-16h	Frequency of the 4th notch	50 Hz–8000 Hz	8000	Hz	Real-time	
H09.22	2009-17h	Width level of the 4th notch	0–20	2	-	Real-time	
H09.23	2009-18h	Depth level of the 4th notch	0–99	0	-	Real-time	
H09.24	2009-19h	Auto-tuned resonance frequency	0 Hz–5000 Hz	0	Hz	Unchangeable	
H09.32	2009-21h	Gravity compensation value	-100.0% to 100.0%	0.0	%	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.33	2009-22h	Positive friction compensation value	0.0% to 100.0%	0.0	%	Real-time	
H09.34	2009-23h	Negative friction compensation value	-100.0% to 0.0%	0.0	%	Real-time	
H09.35	2009-24h	Friction compensation speed	0.0–20.0	2.0	-	Real-time	
H09.36	2009-25h	Friction compensation speed	0: Slow mode+Speed reference 1: Slow mode+Model speed 2: Slow mode+Speed feedback 3: Slow mode+Observe speed 16: Quick mode +Speed reference 17: Quick mode +Model speed 18: Quick mode +Speed feedback 19: Quick mode+Observe speed	0x0	-	Real-time	
H09.37	2009-26h	Vibration monitoring time	0–65535	300	-	Real-time	
H09.38	2009-27h	Frequency of low-frequency resonance suppression 1 at the mechanical end	1.0 Hz–100.0 Hz	100.0	Hz	At stop	
H09.39	2009-28h	Low-frequency resonance suppression 1 at the mechanical end	0–3	2	-	At stop	
H09.44	2009-2Dh	Frequency of low-frequency resonance suppression 2 at mechanical load end	0.0–200.0	0.0	-	At stop	
H09.45	2009-2Eh	Responsiveness of low-	0.01–10.00	1.00	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		frequency resonance suppression 2 at mechanical load end					
H09.47	2009-30h	Width of low-frequency resonance suppression 2 at mechanical load end	0.00–2.00	1.00	-	At stop	
H09.49	2009-32h	Frequency of low-frequency resonance suppression 3 at mechanical load end	0.0–200.0	0.0	-	At stop	
H09.50	2009-33h	Responsiveness of low-frequency resonance suppression 3 at mechanical load end	0.01–10.00	1.00	-	At stop	
H09.52	2009-35h	Width of low-frequency resonance suppression 3 at mechanical load end	0.00–2.00	1.00	-	At stop	
H09.54	2009-37h	Resonance detection torque threshold	0.0% to 300.0%	50.0	%	Real-time	
H09.56	2009-39h	Max. overshoot allowed by ETune	0–65535	2936	-	Real-time	
H09.57	2009-3Ah	STune resonance suppression switchover frequency	0 Hz–4000 Hz	650	Hz	Real-time	
H09.58	2009-3Bh	STune resonance suppression reset selection	0: Disabled 1: Enabled	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.62	2009-3Fh	Stune stop delay judgment	0.00 ms–50.00 ms	1.00	ms	Real-time	
H09.63	2009-40h	STune quick convergence speed	0.00–50.00	1.00	-	Real-time	
H09.71	2009-48h	Starting frequency	0 Hz–8000 Hz	15	Hz	Real-time	
H09.72	2009-49h	End frequency	0 Hz–8000 Hz	8000	Hz	Real-time	
H09.73	2009-4Ah	Frequency subdivision	0–500	50	-	Real-time	
H09.74	2009-4Bh	Excitation amplitude	0.0% to 400.0%	15.0	%	Real-time	
H09.75	2009-4Ch	Starting frequency 2	0 Hz–8000 Hz	500	Hz	Real-time	
H09.76	2009-4Dh	Frequency subdivision 2	0–1000	500	-	Real-time	
H09.77	2009-4Eh	Biquad filter mode	0: Disabled 1: First-order low-pass 2: Second-order low-pass 3: Notch 4: Lead-lag 5: User-defined	0	-	Real-time	
H09.78	2009-4Fh	Biquad filter numerator frequency	0 Hz–16000 Hz	8000	Hz	Real-time	
H09.79	2009-50h	Biquad filter numerator damping coefficient	0.001–10.000	1.000	-	Real-time	
H09.80	2009-51h	Biquad filter denominator frequency	0 Hz–16000 Hz	8000	Hz	Real-time	
H09.81	2009-52h	Biquad filter denominator damping coefficient	0.001–10.000	1.000	-	Real-time	
H09.82	2009-53h	Vibration frequency 1	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	
H09.83	2009-54h	Resonance frequency 1	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	
H09.84	2009-55h	Vibration damping 1	0.00–0.50	0.05	-	Real-time	
H09.85	2009-56h	Resonance damping 1	0.00–0.50	0.05	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.86	2009-57h	Vibration frequency 2	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	
H09.87	2009-58h	Resonance frequency 2	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	
H09.88	2009-59h	Vibration damping 2	0.00–0.50	0.05	-	Real-time	
H09.89	2009-5Ah	Resonance damping 2	0.00–0.50	0.05	-	Real-time	
H09.92	2009-5Dh	Model friction force compensation enable	0: Disabled 1: Enabled	1	-	Real-time	
H09.93	2009-5Eh	Model friction force compensation coefficient	0.00%/1000 rpm–50.00%/1000 rpm	0.00	%/1000 rpm	Real-time	
H09.98	2009-63h	Vibration suppression auto-tuning	0: Disabled 1: Fast auto-tuning 2: Slow auto-tuning	0	-	Real-time	

20.11H0A Fault and Protection Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.00	200A-01h	Power input phase loss and failure protection	0: Enable 1: Disable	0	-	Real-time	
H0A.01	200A-02h	Absolute position limit	0: Disabled 1: Enabled 2: Enabled after homing	0	-	Real-time	
H0A.04	200A-05h	Motor overload protection gain	50–300	100	-	Real-time	
H0A.08	200A-09h	Overspeed threshold	0[mm/s]/[rpm]–20000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	
H0A.09	200A-0Ah	Max. pulse input frequency in position control	100 kHz–16000 kHz	16000	kHz	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.10	200A-0Bh	Threshold of excessive local position deviation	0 to 4294967295	219895614	Encoder unit	Real-time	
H0A.12	200A-0Dh	Runaway protection enable	0: Disabled 1: Runaway protection scheme 1 2: Runaway protection scheme 2	1	-	At stop	
H0A.13	200A-0Eh	Angle auto-tuning mode	0: pre-positioning 1: Inching 2: Voltage injection 6: Static hall 8: Closed-loop pre-positioning 9: Position locking	0	-	At stop	
H0A.17	200A-12h	Reference pulse selection	0: Pulse unit 1: Reference unit	0	-	At stop	
H0A.18	200A-13h	IGBT over-temperature threshold	120°C–175°C	140	°C	Real-time	
H0A.19	200A-14h	Filter time constant of touch probe 1	0.00μs to 6.30μs	2.00	μs	Real-time	
H0A.20	200A-15h	Filter time constant of touch probe 2	0.00μs to 6.30μs	2.00	μs	Real-time	
H0A.21	200A-16h	STO function display selection	0–7	0	-	Real-time	
H0A.23	200A-18h	TZ signal filter time	0 ns–31 ns	15	25ns	At stop	
H0A.24	200A-19h	Filter time constant of low-speed pulse input terminal	0 ns–255 ns	30	25ns	At stop	
H0A.25	200A-1Ah	Speed display DO low-pass filter time	0 ms–5000 ms	0	ms	At stop	
H0A.26	200A-1Bh	Motor overload detection	0: Show motor overload alarm (E909.0) and fault (E620.0) 1: Hide motor overload alarm (E909.0) and fault (E620.0)	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.27	200A-1Ch	Average filter time for speed display DO	0 ms–100 ms	50	ms	At stop	
H0A.28	200A-1Dh	Quadrature encoder filter time	0 ns–255 ns	2	25ns	At stop	
H0A.29	200A-1Eh	Fully closed-loop encoder (ABZ) filter time	bit0–bit7: Fully closed loop encoder (ABZ) pulse signal filtering time bit8–bit15: Fully closed loop encoder (ABZ) wire breakage filter time	4111	25ns	At stop	
H0A.30	200A-1Fh	Filter time constant of high-speed pulse input terminal	0 ns–255 ns	2	ns	At stop	
H0A.32	200A-21h	Time threshold for locked motor overheat protection	10 ms–65535 ms	200	ms	Real-time	
H0A.33	200A-22h	Locked motor overheat protection	0: Disabled 1: Enabled	1	-	Real-time	
H0A.36	200A-25h	Encoder multi-turn overflow fault selection	0: Not hide 1: Hide	0	-	Real-time	
H0A.40	200A-29h	Compensation function selection	bit0: Overtravel compensation 0: Enabled 1: Disabled bit1: Touch probe rising edge compensation 0: Disabled 1: Enabled bit2: Touch probe falling edge compensation 0: Disabled 1: Enabled bit3: Touch probe scheme 0: New scheme 1: Old scheme (same as SV660N) bit4: Probe 2 separate compensation time enable 0: Disabled 1: Enabled	0x6	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.41	200A-2Ah	Forward position of software position limit	-2147483648 to 2147483647	2147483647	Encoder unit	At stop	
H0A.43	200A-2Ch	Reverse position of software position limit	-2147483648 to 2147483647	-2147483648	Encoder unit	At stop	
H0A.50	200A-33h	Encoder communication fault tolerance threshold	0–31	31	-	Real-time	
H0A.51	200A-34h	Phase loss detection filter times	3 ms–36 ms	20	55ms	Real-time	
H0A.52	200A-35h	Encoder temperature protection threshold	0°C–175°C	120	°C	Real-time	
H0A.53	200A-36h	Probe DI ON compensation time	-3000 ns–3000 ns	200	25ns	Real-time	
H0A.54	200A-37h	Probe DI OFF compensation time	-3000 ns–3000 ns	1512	25ns	Real-time	
H0A.55	200A-38h	Runaway current threshold	100.0% to 400.0%	200.0	%	Real-time	
H0A.56	200A-39h	Fault reset delay	0 ms–60000 ms	10000	ms	Real-time	
H0A.57	200A-3Ah	Runaway speed threshold	1[mm/s]/[rpm]–1000[mm/s]/[rpm]	50	[mm/s]/[rpm]	Real-time	
H0A.58	200A-3Bh	Runaway speed filter time	0.1 ms–100.0 ms	2.0	ms	Real-time	
H0A.59	200A-3Ch	Runaway protection detection time	10 ms–1000 ms	30	ms	Real-time	
H0A.60	200A-3Dh	Black box function mode	0: Disable 1: Any fault 2: Designated fault 3: Triggered based on designated condition	1	-	Real-time	
H0A.61	200A-3Eh	Designated fault code	0.0–6553.5	0.0	-	Real-time	
H0A.62	200A-3Fh	Trigger source	0–25	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.63	200A-40h	Trigger level	-2147483648–2147483647	0	-	Real-time	
H0A.65	200A-42h	Trigger level	0: Rising edge 1: Equal 2: Falling edge 3: Edge-triggered	0	-	Real-time	
H0A.66	200A-43h	Trigger position	0% to 100%	75	%	Real-time	
H0A.67	200A-44h	Sampling frequency	0: Current loop 1: Position loop 2: Main cycle	0	-	Real-time	
H0A.70	200A-47h	Overspeed threshold 2	0[mm/s]/[rpm]–20000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	
H0A.71	200A-48h	Internal function switch	0–65535	4098	-	Real-time	
H0A.72	200A-49h	Maximum stop time in ramp-to-stop	0 ms–65535 ms	10000	ms	At stop	
H0A.73	200A-4Ah	STO 24 V disconnection filter time	1 ms–5 ms	1	ms	Real-time	
H0A.74	200A-4Bh	Filter time for two inconsistent STO channels	1 ms–1000 ms	100	ms	Real-time	
H0A.75	200A-4Ch	Servo OFF delay after STO triggered	0 ms–25 ms	20	ms	Real-time	
H0A.87	200A-58h	Hall state fault filtering count	0–1000	1	-	Real-time	
H0A.88	200A-59h	Alarm enable	0–3	0	-	At stop	
H0A.89	200A-5Ah	Correct state of DDL BiSS-C data	0–31	1	-	At stop	
H0A.90	200A-5Bh	Speed display low-pass filter time	0 ms–100 ms	0	ms	At stop	
H0A.91	200A-5Ch	Moving average filter time for torque display values	0 ms–100 ms	0	ms	At stop	
H0A.92	200A-5Dh	Moving average filter time for position display values	0 ms–100 ms	0	ms	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.93	200A-5Eh	Low-pass filter time for voltage display values	0 ms–250 ms	0	ms	At stop	
H0A.94	200A-5Fh	Low-pass filter time for thermal display values	0 ms–250 ms	0	ms	At stop	

20.12H0b Monitoring Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.00	200b-01h	Motor speed actual value	-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]	0	[mm/s]/[rpm]	Unchangeable	
H0b.01	200b-02h	Speed reference	-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]	0	[mm/s]/[rpm]	Unchangeable	
H0b.02	200b-03h	Internal torque reference	-3276.7% to 3276.7%	0.0	%	Unchangeable	
H0b.03	200b-04h	Input (DI) signal monitoring	0–65535	0	-	Unchangeable	
H0b.05	200b-06h	Output (DO) signal monitoring	0–65535	0	-	Unchangeable	
H0b.07	200b-08h	Absolute position counter	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
H0b.09	200b-0Ah	Mechanical angle	0.0° to 360.0°	0.0	°	Unchangeable	
H0b.10	200b-0Bh	Electrical angle	0.0° to 360.0°	0.0	°	Unchangeable	
H0b.12	200b-0Dh	Average load ratio	0.0% to 800.0%	0.0	%	Unchangeable	
H0b.13	200b-0Eh	Input reference counter	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
H0b.15	200b-10h	Position following error (encoder unit)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.17	200b-12h	Feedback pulse counter	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0b.19	200b-14h	Total power-on time	0.0s–429496729.5s	0.0	s	Unchangeable	
H0b.21	200b-16h	Displayed AI1 voltage	-327.67 V–327.67 V	0.00	V	Unchangeable	
H0b.22	200b-17h	Displayed AI2 voltage	-327.67 V–327.67 V	0.00	V	Unchangeable	
H0b.24	200b-19h	Phase current RMS value	0.0 A–6553.5 A	0.0	A	Unchangeable	
H0b.25	200b-1Ah	Angle obtained upon voltage injection auto-tuning	0.0° to 360.0°	0.0	°	Unchangeable	
H0b.26	200b-1Bh	Bus voltage	0.0 V–6553.5 V	0.0	V	Unchangeable	
H0b.27	200b-1Ch	Module temperature	-20°C–200°C	0	°C	Unchangeable	
H0b.28	200b-1Dh	Absolute encoder fault information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.29	200b-1Eh	Axis status information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.30	200b-1Fh	Axis fault information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.31	200b-20h	Encoder fault information	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.33	200b-22h	Fault log	0: Present fault 1: Last fault 2: 2nd to last fault 3: 3rd to last fault 4: 4th to last fault 5: 5th to last fault 6: 6th to last fault 7: 7th to last fault 8: 8th to last fault 9: 9th to last fault 10: 10th to last fault 11: 11th to last fault 12: 12th to last fault 13: 13th to last fault 14: 14th to last fault 15: 15th to last fault	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			16: 16th to last fault 17: 17th to last fault 18: 18th to last fault 19: 19th to last fault				
H0b.34	200b-23h	Fault code of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.35	200b-24h	Timestamp of the selected fault	0.0s–429496729.5s	0.0	s	Unchangeable	
H0b.37	200b-26h	Motor speed upon occurrence of the selected fault	-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]	0	[mm/s]/[rpm]	Unchangeable	
H0b.38	200b-27h	Motor phase U current upon occurrence of the selected fault	-3276.7 A–3276.7 A	0.0	A	Unchangeable	
H0b.39	200b-28h	Motor phase V current upon occurrence of the selected fault	-3276.7 A–3276.7 A	0.0	A	Unchangeable	
H0b.40	200b-29h	Bus voltage upon occurrence of the selected fault	0.0 V–6553.5 V	0.0	V	Unchangeable	
H0b.41	200b-2Ah	Input terminal state on selected fault	0–65535	0	-	Unchangeable	
H0b.43	200b-2Ch	Output terminal status upon occurrence of the selected fault	0–65535	0	-	Unchangeable	
H0b.45	200b-2Eh	Internal fault code	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.46	200b-2Fh	Absolute encoder fault information given by FPGA upon occurrence of	0x0 to 0xFFFF	0x0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		the selected fault					
H0b.47	200b-30h	System status information given by FPGA upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.48	200b-31h	System fault information given by FPGA upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.49	200b-32h	Encoder fault information upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.51	200b-34h	Internal fault code upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.52	200b-35h	FPGA timeout fault standard bit upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.53	200b-36h	Position following error (reference unit)	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
H0b.55	200b-38h	Actual motor speed 2	-214748364.8[mm/s]/[rpm]–214748364.7[mm/s]/[rpm]	0.0	[mm/s]/[rpm]	Unchangeable	
H0b.57	200b-3Ah	Control circuit bus voltage	0.0 V–6553.5 V	0.0	V	Unchangeable	
H0b.58	200b-3Bh	Mechanical absolute position (low 32 bits)	0 to 4294967295	0	Encoder unit	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.60	200b-3Dh	Mechanical absolute position (high 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0b.63	200b-40h	NotRdy state	0: Normal 1: Control circuit error 2: Main circuit power input error 3: Bus undervoltage 4: Soft start failed 5: Encoder initialization undone 6: Short circuit to ground failed 7: Others 9: Fully closed-loop encoder initialization not completed	0	-	Unchangeable	
H0b.64	200b-41h	Real-time input position reference counter	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
H0b.66	200b-43h	Encoder temperature	-32768°C–32767°C	0	°C	Unchangeable	
H0b.67	200b-44h	Load rate of braking resistor	0.0% to 200.0%	0.0	%	Unchangeable	
H0b.70	200b-47h	Number of absolute encoder revolutions	-32768Rev to 32767Rev	0	Rev	Unchangeable	
H0b.71	200b-48h	Single-turn position fed back by the absolute encoder	0 to 2147483647	0	Encoder unit	Unchangeable	
H0b.74	200b-4Bh	System fault information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.77	200b-4Eh	Encoder position (low 32 bits)	0 to 4294967295	0	Encoder unit	Unchangeable	
H0b.79	200b-50h	Encoder position (high 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0b.81	200b-52h	Single-turn position of the	0 to 4294967295	0	Encoder unit	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		rotary load (low 32 bits)					
H0b.83	200b-54h	Single-turn position of the rotary load (high 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0b.85	200b-56h	Single-turn position of the rotary load (reference unit)	0 to 4294967295	0	Reference unit	Unchangeable	
H0b.87	200b-58h	IGBT junction temperature	0–200	0	-	Unchangeable	
H0b.90	200b-5Bh	Group No. of the abnormal parameter	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.91	200b-5Ch	Offset within the group of the abnormal parameter	0–65535	0	-	Unchangeable	
H0b.92	200b-5Dh	Hall state	0–65535	0	-	Unchangeable	
H0b.93	200b-5Eh	Closed loop state	0: Half closed loop 1: Fully closed loop	0	-	Unchangeable	
H0b.94	200b-5Fh	Individual power-on time	0.0s–429496729.5s	0.0	s	Unchangeable	
H0b.96	200b-61h	Individual power-on time upon occurrence of the selected fault	0.0s–429496729.5s	0.0	s	Unchangeable	
H0b.98	200b-63h	Dynamic braking resistor load rate	0.0% to 200.0%	0.0	%	Unchangeable	

20.13H0C Fault and Protection Parameters 2

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0C.53	200C-36h	Probe DI ON compensation time 2	-3000 ns–3000 ns	200	25ns	Real-time	
H0C.54	200C-37h	Probe DI OFF compensation time 2	-3000 ns–3000 ns	1512	25ns	Real-time	
H0C.71	200C-48h	Internal function switch 2	0–65535	512	-	Real-time	

20.14H0d Auxiliary Function Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0d.00	200d-01h	Software Reset	0: No operation 1: Enable	0	-	At stop	
H0d.01	200d-02h	Fault Reset	0: No operation 1: Enable	0	-	At stop	
H0d.02	200d-03h	Inertia auto-tuning enable	0–65	0	-	Real-time	
H0d.04	200d-05h	Read/write in encoder ROM	0: No operation 1: Write ROM 2: Read ROM 3: ROM failure	0	-	At stop	
H0d.05	200d-06h	Emergency stop	0: No operation 1: Emergency stop	0	-	Real-time	
H0d.06	200d-07h	Current loop auto-tuning test	0: No operation 1: Enable current loop auto-tuning 2: Enable current loop step test (static) 3: Enable current loop step test	0	-	At stop	
H0d.10	200d-0Bh	Analog channel auto adjusting	0: No operation 1: Adjusted through AI1 2: Adjusted through AI2	0	-	At stop	
H0d.12	200d-0Dh	Phase U/V current balance correction enable	0: Disabled 1: Enabled	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0d.17	200d-12h	Forced DI/DO enable switch	bit0: Forced DI enable switch 0: Disabled 1: Enabled bit1: Forced DO enable switch 0: Disabled 1: Enabled	0	-	Real-time	
H0d.18	200d-13h	Forced DI value	0x0 to 0xFF	0xFF	-	Real-time	
H0d.19	200d-14h	Forced DO value	0x0 to 0x1F	0x0	-	Real-time	
H0d.20	200d-15h	Absolute encoder reset	0: No operation 1: Reset fault 2: Reset fault and multi-turn data 3: Reset Inovance 2nd encoder fault 4: Reset Inovance 2nd encoder fault and multi-turn data	0	-	At stop	
H0d.21	200d-16h	Read error status bit of Nikon and EnDat2.2 encoders	0: No operation 1: Reading error status bit	0	-	At stop	
H0d.29	200d-1Eh	Motor parameter auto-tuning	0: No operation 1: Enabled	0	-	At stop	

20.15H0E Communication Function Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0E.00	200E-01h	Node address	1–127	1	-	At stop	
H0E.01	200E-02h	Save objects written through communication to EEPROM	0: Not save 1: Save parameters 2: Save object dictionaries 3: Save parameters and object dictionaries 4: Save object dictionaries written before communication (OP) 255: Determine through H0E03 and H0E04	1	-	Real-time	
H0E.03	200E-04h	Save objects written through software	0: Do not save 1: Save	1	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		(commissioning protocol) to EEPROM					
H0E.04	200E-05h	Save objects written through communication to EEPROM (excluding commissioning protocol)	0: Do not save 1: Save	0	-	Real-time	
H0E.07	200E-08h	Object dictionary unit selection	0: Reference unit system (p/s, p/s2) 1: User unit system (0.01 [mm/s]/[rpm], ms)	0	-	At stop	
H0E.10	200E-0Bh	CAN selection	0: Pulse/Axis control command 1: Enhanced axis control command 2: CANopen	0	-	At stop	
H0E.11	200E-0Ch	CAN baud rate	0: 20 kbps 1: 50 kbps 2: 100 kbps 3: 125 kbps 4: 250 kbps 5: 500 kbps 6: 1 Mbps 7: 1 Mbps - non-standard	5	-	At stop	
H0E.12	200E-0Dh	Excessive IP position command increment count	1–30	20	-	Real-time	
H0E.13	200E-0Eh	CANopen sync period error limit	0: 1/4 1: 1/2 2: 3/4 3: 1 4: 2 5: Disabled	0	-	At stop	
H0E.14	200E-0Fh	CANopen communication state	0–9	0	-	Unchangeable	
H0E.17	200E-12h	Get the count of received NMT frames with incorrect length	0–65535	0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0E.18	200E-13h	Get the count of received NMT frames with incorrect command	0–65535	0	-	Unchangeable	
H0E.19	200E-14h	Get received heartbeat frames of wrong length	0–65535	0	-	Unchangeable	
H0E.80	200E-51h	Modbus baud rate	0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps	9	-	Real-time	
H0E.81	200E-52h	Modbus data format	0: No parity, 2 stop bits (N-2) 1: Even parity, 1 stop bit (E-1) 2: Odd parity, 1 stop bit (O-1) 3: No parity, 1 stop bit (N-1)	3	-	Real-time	
H0E.82	200E-53h	Modbus response delay	0 ms–20 ms	0	ms	Real-time	
H0E.83	200E-54h	Modbus communication timeout	0 ms–600 ms	0	ms	Real-time	
H0E.84	200E-55h	Sequence of Modbus communication data bits	0: High bits before low bits 1: Low bits before high bits	1	-	Real-time	
H0E.90	200E-5Bh	Communication version	0.00–655.35	0.00	-	Unchangeable	
H0E.97	200E-62h	Communication monitoring parameter 1	0–65535	0	-	Real-time	
H0E.98	200E-63h	Communication monitoring parameter 2	0–65535	0	-	Real-time	

20.16H0F Fully Closed-loop Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.00	200F-01h	Encoder feedback mode	0: Internal encoder feedback 1: External encoder feedback 2: Inner/Outer loop switchover	0	-	Real-time	
H0F.01	200F-02h	Fully closed-loop encoder application mode	0: Standard operating direction 1: Reverse operating direction	0	-	Real-time	
H0F.02	200F-03h	Fully closed-loop encoder absolute value	0: Incremental mode 1: Absolute linear mode	0	-	At stop	
H0F.03	200F-04h	Fully closed-loop encoder feedback type	0: Quadrature pulse 1: Inovance 2: BiSS-C 3: EnDat2.2 4: SSI	0	-	At stop	
H0F.04	200F-05h	Number of fully closed-loop encoder pulses per revolution	1–2147483647	10000	-	At stop	
H0F.06	200F-07h	Fully closed-loop encoder interface	0: CN2 1: CN7	1	-	At stop	
H0F.08	200F-09h	Excessive deviation threshold in compound control mode	0–2147483647	1000	-	Real-time	
H0F.10	200F-0Bh	Clear deviation in compound control mode	0 Rev to 100 Rev	1	Rev	Real-time	
H0F.13	200F-0Eh	Compound vibration suppression filter time	0.0 ms–6553.5 ms	0.0	ms	At stop	
H0F.16	200F-11h	Pulse deviation display in compound control mode	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0F.18	200F-13h	Internal position pulse feedback display	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0F.20	200F-15h	Fully closed-loop encoder	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		position pulse feedback display					
H0F.22	200F-17h	Quadrature pulse phase Z detection invalid in fully closed-loop mode	0: Detected 1: Not detected	0	-	Real-time	
H0F.23	200F-18h	BiSS-C/SSI/ EDNAT2.2 fully closed-loop encoder absolute homing offset	-2147483648–2147483647	0	-	Real-time	
H0F.25	200F-1Ah	Set the source of touch probe Z signal in fully closed-loop mode.	0: Motor Z signal 1: External feedback Z signal	0	-	Real-time	
H0F.26	200F-1Bh	BiSS-C/SSI/ EDNAT2.2 fully closed-loop encoder absolute feedback offset	-2147483648–2147483647	0	-	Real-time	
H0F.28	200F-1Dh	Index value of BiSS-C/SSI communication alarm	0–65535	0	-	Unchangeable	
H0F.29	200F-1Eh	CRC of BiSS-C/ SSI fully closed-loop encoder feedback	0: Positive 1: Negative	1	-	Real-time	
H0F.30	200F-1Fh	BiSS-C/SSI/ EDNAT2.2 valid bits of encoder communication position feedback in full closed-loop mode	0–127	29	-	At stop	
H0F.31	200F-20h	Valid bit of BiSS-C/SSI encoder communication alarm index in	0–31	2	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		full closed-loop mode					
H0F.32	200F-21h	BiSS-C/SSI/ ENDAT encoder communication frequency in fully closed-loop mode	0 kHz–10000 kHz	2000	kHz	Real-time	
H0F.33	200F-22h	SSI/ENDAT encoder recovery time in fully closed-loop mode	0.000μs to 40.000μs	0.500	μs	Real-time	
H0F.35	200F-24h	BiSS-C error detection enable in fully closed-loop mode	0: Disabled 1: Enabled	0	-	At stop	
H0F.36	200F-25h	BiSS-C error bit polarity in fully closed-loop mode	0: Positive 1: Negative	0	-	At stop	
H0F.40	200F-29h	Fully closed-loop communication encoder fault info	0–65535	0	-	Unchangeable	
H0F.41	200F-2Ah	Inovance fully closed-loop encoder version	0.0–6553.5	0.0	-	Unchangeable	
H0F.42	200F-2Bh	Inovance fully closed-loop encoder resolution	0–4294967295	0	-	Unchangeable	
H0F.45	200F-2Eh	Positioning completed/ Position deviation threshold in fully closed-loop mode	0: Threshold scaled to outer loop unit 1: Same threshold used for inner and outer loops	0	-	At stop	
H0F.51	200F-34h	SSI encoder check bit selection in	0: No check 1: Check applied	1	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		fully closed-loop mode					
H0F.52	200F-35h	SSI encoder code system in full closed-loop mode	0: Binary 1: Gray code	1	-	At stop	
H0F.53	200F-36h	SSI encoder state word code system in fully closed-loop mode	0: Binary 1: Gray code	1	-	At stop	
H0F.54	200F-37h	SSI encoder parity check in fully closed-loop mode	0: Disabled 1: Enabled	0	-	At stop	
H0F.55	200F-38h	Fully closed-loop encoder communication timeout error count	0–65535	0	-	Unchangeable	
H0F.56	200F-39h	Encoder CRC error count in fully closed-loop mode	0–65535	0	-	Unchangeable	
H0F.57	200F-3Ah	Fully closed-loop encoder communication frame stop bit error count.	0–65535	0	-	Unchangeable	

20.17H11 Multi-Position Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H11.00	2011-01h	Multi-position running mode	0: Single run (number of displacements selected in H11.01) 1: Cyclic operation (number of displacement selected in H11.01) 2: DI-based operation (selected by DI) 3: Sequential operation 5: Axis-controlled continuous operation	1	-	At stop	
H11.01	2011-02h	Number of displacement references in multi-position mode	1–16	1	-	At stop	
H11.02	2011-03h	Starting displacement No. after pause	0: Continue to execute the unexecuted displacements 1: Start from displacement 1	0	-	At stop	
H11.03	2011-04h	Interval time unit	0: ms 1: s	0	-	At stop	
H11.04	2011-05h	Displacement reference type	0: Relative displacement reference 1: Absolute displacement reference	0	-	Real-time	
H11.05	2011-06h	Starting displacement No. in sequential operation	0–16	0	-	At stop	
H11.09	2011-0Ah	Deceleration upon axis control OFF	0 ms–65535 ms	65535	ms	Real-time	
H11.10	2011-0Bh	Starting speed of displacement 1	0[mm/s]/[rpm]–6000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	
H11.11	2011-0Ch	Stop speed of displacement 1	0[mm/s]/[rpm]–6000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	
H11.12	2011-0Dh	Displacement 1	-1073741824 to 1073741824	10000	Reference unit	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H11.14	2011-0Fh	Max. speed of displacement 1	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.15	2011-10h	Acc/Dec time of displacement 1	0 ms–65535 ms	10	ms	Real-time	
H11.16	2011-11h	Interval time after displacement 1	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.17	2011-12h	Displacement 2	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.19	2011-14h	Max. speed of displacement 2	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.20	2011-15h	Acc/Dec time of displacement 2	0 ms–65535 ms	10	ms	Real-time	
H11.21	2011-16h	Interval time after displacement 2	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.22	2011-17h	Displacement 3	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.24	2011-19h	Max. speed of displacement 3	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.25	2011-1Ah	Acc/Dec time of displacement 3	0 ms–65535 ms	10	ms	Real-time	
H11.26	2011-1Bh	Interval time after displacement 3	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.27	2011-1Ch	Displacement 4	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.29	2011-1Eh	Max. speed of displacement 4	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.30	2011-1Fh	Acc/Dec time of displacement 4	0 ms–65535 ms	10	ms	Real-time	
H11.31	2011-20h	Interval time after displacement 4	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.32	2011-21h	Displacement 5	-1073741824 to 1073741824	10000	Reference unit	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H11.34	2011-23h	Max. speed of displacement 5	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.35	2011-24h	Acc/Dec time of displacement 5	0 ms–65535 ms	10	ms	Real-time	
H11.36	2011-25h	Interval time after displacement 5	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.37	2011-26h	Displacement 6	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.39	2011-28h	Max. speed of displacement 6	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.40	2011-29h	Acc/Dec time of displacement 6	0 ms–65535 ms	10	ms	Real-time	
H11.41	2011-2Ah	Interval time after displacement 6	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.42	2011-2Bh	Displacement 7	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.44	2011-2Dh	Max. speed of displacement 7	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.45	2011-2Eh	Acc/Dec time of displacement 7	0 ms–65535 ms	10	ms	Real-time	
H11.46	2011-2Fh	Interval time after displacement 7	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.47	2011-30h	Displacement 8	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.49	2011-32h	Max. speed of displacement 8	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.50	2011-33h	Acc/Dec time of displacement 8	0 ms–65535 ms	10	ms	Real-time	
H11.51	2011-34h	Interval time after displacement 8	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.52	2011-35h	Displacement 9	-1073741824 to 1073741824	10000	Reference unit	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H11.54	2011-37h	Max. speed of displacement 9	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.55	2011-38h	Acc/Dec time of displacement 9	0 ms–65535 ms	10	ms	Real-time	
H11.56	2011-39h	Interval time after displacement 9	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.57	2011-3Ah	Displacement 10	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.59	2011-3Ch	Max. speed of displacement 10	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.60	2011-3Dh	Acc/Dec time of displacement 10	0 ms–65535 ms	10	ms	Real-time	
H11.61	2011-3Eh	Interval time after displacement 10	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.62	2011-3Fh	Displacement 11	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.64	2011-41h	Max. speed of displacement 11	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.65	2011-42h	Acc/Dec time of displacement 11	0 ms–65535 ms	10	ms	Real-time	
H11.66	2011-43h	Interval time after displacement 11	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.67	2011-44h	Displacement 12	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.69	2011-46h	Max. speed of displacement 12	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.70	2011-47h	Acc/Dec time of displacement 12	0 ms–65535 ms	10	ms	Real-time	
H11.71	2011-48h	Interval time after	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		displacement 12					
H11.72	2011-49h	Displacement 13	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.74	2011-4Bh	Max. speed of displacement 13	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.75	2011-4Ch	Acc/Dec time of displacement 13	0 ms–65535 ms	10	ms	Real-time	
H11.76	2011-4Dh	Interval time after displacement 13	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.77	2011-4Eh	Displacement 14	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.79	2011-50h	Max. speed of displacement 14	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.80	2011-51h	Acc/Dec time of displacement 14	0 ms–65535 ms	10	ms	Real-time	
H11.81	2011-52h	Interval time after displacement 14	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.82	2011-53h	Displacement 15	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.84	2011-55h	Max. speed of displacement 15	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.85	2011-56h	Acc/Dec time of displacement 15	0 ms–65535 ms	10	ms	Real-time	
H11.86	2011-57h	Interval time after displacement 15	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.87	2011-58h	Displacement 16	-1073741824 to 1073741824	10000	Reference unit	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H11.89	2011-5Ah	Max. speed of displacement 16	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.90	2011-5Bh	Acc/Dec time of displacement 16	0 ms–65535 ms	10	ms	Real-time	
H11.91	2011-5Ch	Interval time after displacement 16	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	

20.18H12 Multi-Speed Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.00	2012-01h	Multi-speed operation mode	0: Individual operation (number of speeds selected in H12.01) 1: Cyclic operation (number of speeds selected in H12.01) 2: DI-based operation	1	-	At stop	
H12.01	2012-02h	Number of speed references in multi-speed mode	1–16	16	-	At stop	
H12.02	2012-03h	Operating time unit	0: s 1: min	0	-	At stop	
H12.03	2012-04h	Acceleration time 1	0 ms–65535 ms	10	ms	Real-time	
H12.04	2012-05h	Deceleration time 1	0 ms–65535 ms	10	ms	Real-time	
H12.05	2012-06h	Acceleration time 2	0 ms–65535 ms	50	ms	Real-time	
H12.06	2012-07h	Deceleration time 2	0 ms–65535 ms	50	ms	Real-time	
H12.07	2012-08h	Acceleration time 3	0 ms–65535 ms	100	ms	Real-time	
H12.08	2012-09h	Deceleration time 3	0 ms–65535 ms	100	ms	Real-time	
H12.09	2012-0Ah	Acceleration time 4	0 ms–65535 ms	150	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.10	2012-0Bh	Deceleration time 4	0 ms–65535 ms	150	ms	Real-time	
H12.20	2012-15h	1st speed reference	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	
H12.21	2012-16h	Operating time of speed 1	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.22	2012-17h	1st speed rise/drop and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.23	2012-18h	Reference 2	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	100	[mm/s]/[rpm]	Real-time	
H12.24	2012-19h	Operating time of speed 2	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.25	2012-1Ah	2nd speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.26	2012-1Bh	Reference 3	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	300	[mm/s]/[rpm]	Real-time	
H12.27	2012-1Ch	Operating time of speed 3	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.28	2012-1Dh	3nd speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.29	2012-1Eh	Reference 4	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	500	[mm/s]/[rpm]	Real-time	
H12.30	2012-1Fh	Operating time of speed 4	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.31	2012-20h	4th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.32	2012-21h	Reference 5	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	700	[mm/s]/[rpm]	Real-time	
H12.33	2012-22h	Operating time of speed 5	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.34	2012-23h	5th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.35	2012-24h	Reference 6	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	900	[mm/s]/[rpm]	Real-time	
H12.36	2012-25h	Operating time of speed 6	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.37	2012-26h	6th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.38	2012-27h	Reference 7	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	600	[mm/s]/[rpm]	Real-time	
H12.39	2012-28h	Operating time of speed 7	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.40	2012-29h	7th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.41	2012-2Ah	Reference 8	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	300	[mm/s]/[rpm]	Real-time	
H12.42	2012-2Bh	Operating time of speed 8	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.43	2012-2Ch	8th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.44	2012-2Dh	Reference 9	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	100	[mm/s]/[rpm]	Real-time	
H12.45	2012-2Eh	Operating time of speed 9	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.46	2012-2Fh	9th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.47	2012-30h	Reference 10	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-100	[mm/s]/[rpm]	Real-time	
H12.48	2012-31h	Operating time of speed 10	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.49	2012-32h	10th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.50	2012-33h	Reference 11	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-300	[mm/s]/[rpm]	Real-time	
H12.51	2012-34h	Operating time of speed 11	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.52	2012-35h	11th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.53	2012-36h	Reference 12	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-500	[mm/s]/[rpm]	Real-time	
H12.54	2012-37h	Operating time of speed 12	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.55	2012-38h	12th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.56	2012-39h	Reference 13	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-700	[mm/s]/[rpm]	Real-time	
H12.57	2012-3Ah	Operating time of speed 13	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.58	2012-3Bh	13th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.59	2012-3Ch	Reference 14	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-900	[mm/s]/[rpm]	Real-time	
H12.60	2012-3Dh	Operating time of speed 14	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.61	2012-3Eh	14th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.62	2012-3Fh	Reference 15	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-600	[mm/s]/[rpm]	Real-time	
H12.63	2012-40h	Operating time of speed 15	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.64	2012-41h	15th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.65	2012-42h	Reference 16	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-300	[mm/s]/[rpm]	Real-time	
H12.66	2012-43h	Operating time of speed 16	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.67	2012-44h	16th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

20.19H13 Application Safety Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H13.00	2013-01h	Auto-tuned scheme 2 runaway distance threshold	0.00[mm]/[Rev]–655.35[mm]/[Rev]	0.00	[mm]/[Rev]	Unchangeable	
H13.01	2013-02h	Scheme 2 runaway distance threshold	0.00[mm]/[Rev]–15.00[mm]/[Rev]	0.50	[mm]/[Rev]	At stop	
H13.02	2013-03h	Scheme 2 runaway current threshold	0.0% to 400.0%	50.0	%	At stop	
H13.03	2013-04h	Runaway speed threshold in scheme 2 speed or position mode	1[mm/s]/[rpm]–6000[mm/s]/[rpm]	50	[mm/s]/[rpm]	At stop	
H13.04	2013-05h	Runaway speed threshold in scheme 2 torque mode	1[mm/s]/[rpm]–6000[mm/s]/[rpm]	500	[mm/s]/[rpm]	At stop	
H13.05	2013-06h	Scheme 2 runaway inspection window time	10 ms–100 ms	30	ms	At stop	

20.20H14 Gantry Synchronization Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H14.00	2014-01h	Gantry communication state	0–1	0	-	Unchangeable	
H14.01	2014-02h	Gantry alignment state	0–1	0	-	Unchangeable	
H14.02	2014-03h	Gantry function selection	0: None 1: Gantry synchronization	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H14.03	2014-04h	Gantry axis attribute (master-slave)	0: Slave axis 1: Master axis	0	-	At stop	
H14.04	2014-05h	Gantry mechanical attribute	0: Rigid gantry scheme 1-Two-axis position control 1: Flexible gantry scheme 1-Two-axis position control 2: Rigid gantry scheme 2-Master axis position control and slave axis torque control	0	-	At stop	
H14.05	2014-06h	Current axis position sync direction	0: Forward 1: Reverse	0	-	At stop	
H14.07	2014-08h	Gantry sync enable	0: Disabled 1: Enabled 2: DI-enabled	0	-	Real-time	
H14.08	2014-09h	Gantry sync position loop proportional gain	0.0% to 300.0%	0.0	%	Real-time	
H14.09	2014-0Ah	Gantry sync position loop integral time constant	0.5 ms–1000.0 ms	1000.0	ms	Real-time	
H14.10	2014-0Bh	Gantry sync speed loop proportional gain	0.0% to 300.0%	0.0	%	Real-time	
H14.11	2014-0Ch	Gantry sync speed loop integral time constant	0.5 ms–1000.0 ms	1000.0	ms	Real-time	
H14.12	2014-0Dh	Gantry sync speed limit	0.0rpm to 6000.0rpm	50.0	rpm	Real-time	
H14.13	2014-0Eh	Gantry alignment speed	0.0rpm to 3000.0rpm	10.0	rpm	Real-time	
H14.14	2014-0Fh	Gantry alignment acc./dec. time	0 ms–1000 ms	100	ms	Real-time	
H14.18	2014-13h	Torque pre-alignment before gantry homing	0: Disabled 1: Enabled	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H14.20	2014-15h	Gantry aligned by default upon power-on	0: No operation 1: Align at first power-on	1	-	At stop	
H14.21	2014-16h	Gantry alignment mode	0: Gantry homing alignment 2: Gantry torque alignment 3: Gantry enable alignment 4: Gantry DI alignment	0	-	At stop	
H14.25	2014-1Ah	Flexible gantry homing - Master/slave home deviation auto-tuning	0: Disabled 1: Torque alignment auto-tuning 2: Position auto-tuning	0	-	Real-time	
H14.26	2014-1Bh	Gantry torque alignment enable	0: Disabled 1: Enabled 2: DI-enabled 3: Enabled at power-on	0	-	Real-time	
H14.27	2014-1Ch	Gantry torque alignment torque	0.0% to 300.0%	10.0	%	Real-time	
H14.28	2014-1Dh	Gantry torque alignment count	1–2	2	-	Real-time	
H14.29	2014-1Eh	Gantry torque alignment speed	0.0rpm to 3000.0rpm	10.0	rpm	Real-time	
H14.30	2014-1Fh	Gantry torque alignment timeout alarm time	1s to 65535s	100	s	Real-time	
H14.31	2014-20h	Gantry torque alignment acc./dec. time	0 ms–1000 ms	100	ms	Real-time	
H14.32	2014-21h	Gantry torque alignment zero speed threshold	0.0rpm to 100.0rpm	2.0	rpm	Real-time	
H14.33	2014-22h	Gantry torque alignment mechanical limit evaluation position loop period count	0–65535	5	-	Real-time	
H14.35	2014-24h	2-axis position deviation (encoder unit)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H14.37	2014-26h	2-axis speed deviation	-32767rpm to 32767rpm	0	rpm	Unchangeable	
H14.38	2014-27h	Torque reference of active axis	-3276.7% to 3276.7%	0.0	%	Unchangeable	
H14.39	2014-28h	Torque reference of paired axis	-3276.7% to 3276.7%	0.0	%	Unchangeable	
H14.40	2014-29h	Motor speed of active axis	-32767rpm to 32767rpm	0	rpm	Unchangeable	
H14.41	2014-2Ah	Motor speed of paired axis	-32767rpm to 32767rpm	0	rpm	Unchangeable	
H14.44	2014-2Dh	Alarm time threshold of large gantry deviation	0.5 ms–1000.0 ms	3.0	ms	Real-time	
H14.45	2014-2Eh	Gantry position alarm threshold	0 to 4294967295	50000	Encoder unit	At stop	
H14.47	2014-30h	Large gantry position deviation alarm enable	0: Disabled 1: Enabled	1	-	Real-time	
H14.48	2014-31h	Alarm time threshold of large gantry torque deviation	0.5 ms–1000.0 ms	3.0	ms	Real-time	
H14.49	2014-32h	Gantry torque deviation alarm threshold	0.0% to 800.0%	300.0	%	At stop	
H14.50	2014-33h	Large gantry torque deviation alarm enable	0: Disabled 1: Enabled	0	-	Real-time	
H14.52	2014-35h	Gantry mismatch	0–1451	0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H14.71	2014-48h	Flexible gantry homing - Enable aligning slave axis homing position to home offset	0: No operation 1: Enabled	0	-	Real-time	
H14.74	2014-4Bh	Gantry scheme 2 slave axis enable	0: No operation 1: Enabled	0	-	At stop	

20.21H17 Virtual DI/DO Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.90	2017-5Bh	Communication VDI enable	0: Disabled 1: Enabled	0	-	At stop	
H17.91	2017-5Ch	VDI default value after power-on	bit0: VDI1 bit1: VDI2 bit2: VDI3 bit3: VDI4 bit4: VDI5 bit5: VDI6 bit6: VDI7 bit7: VDI8 bit8: VDI9 bit9: VDI10 bit10: VDI11 bit11: VDI12 bit12: VDI13 bit13: VDI14 bit14: VDI15 bit15: VDI16	0	-	Real-time	
H17.00	2017-01h	VDI1 function	0: No assignment 1: S-ON 2: Warning reset signal 3: Gain switchover switch 4: Switchover between main and auxiliary references 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 10: Mode switchover M1-SEL 11: Mode switchover M2-SEL 12: Zero clamp enable signal 13: Position reference inhibited 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 20: Step enable 21: Handwheel override signal 1 22: Handwheel override signal 2 23: Hand wheel enable signal 24: Electronic gear ratio selection 25: Torque reference direction 26: Speed reference direction 27: Position reference direction 28: Multi-position reference enable 29: Interrupt positioning cancel signal				
H17.00	2017-01h	VDI1 function	31: Home switch 32: Homing enable 33: Interrupt positioning inhibited 34: Emergency stop 35: Clear position deviation 36: Internal speed limit source 37: Pulse reference inhibited 40: Multi-speed enable 41: Current position as home 42: Axis control command executed immediately 43: Axis control command not executed immediately	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			44: Positioning and command completed signal clear 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.01	2017-02h	VDI1 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.02	2017-03h	VDI2 function	See H17.00	0	-	Real-time	
H17.03	2017-04h	VDI2 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.04	2017-05h	VDI3 function	See H17.00	0	-	Real-time	
H17.05	2017-06h	VDI3 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.06	2017-07h	VDI4 function	See H17.00	0	-	Real-time	
H17.07	2017-08h	VDI4 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.08	2017-09h	VDI5 function	See H17.00	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.09	2017-0Ah	VDI5 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.10	2017-0Bh	VDI6 function	See H17.00	0	-	Real-time	
H17.11	2017-0Ch	VDI6 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.12	2017-0Dh	VDI7 function	See H17.00	0	-	Real-time	
H17.13	2017-0Eh	VDI7 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.14	2017-0Fh	VDI8 function	See H17.00	0	-	Real-time	
H17.15	2017-10h	VDI8 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.16	2017-11h	VDI9 function	See H17.00	0	-	Real-time	
H17.17	2017-12h	VDI9 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.18	2017-13h	VDI10 function	See H17.00	0	-	Real-time	
H17.19	2017-14h	VDI10 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.20	2017-15h	VDI11 function	See H17.00	0	-	Real-time	
H17.21	2017-16h	VDI11 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.22	2017-17h	VDI12 function	See H17.00	0	-	Real-time	
H17.23	2017-18h	VDI12 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.24	2017-19h	VDI13 function	See H17.00	0	-	Real-time	
H17.25	2017-1Ah	VDI13 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.26	2017-1Bh	VDI14 function	See H17.00	0	-	Real-time	
H17.27	2017-1Ch	VDI14 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.28	2017-1Dh	VDI15 function	See H17.00	0	-	Real-time	
H17.29	2017-1Eh	VDI15 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.30	2017-1Fh	VDI16 function	See H17.00	0	-	Real-time	
H17.31	2017-20h	VDI16 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.92	2017-5Dh	Communication VDO enable	0: Disabled 1: Enabled	0	-	At stop	
H17.93	2017-5Eh	VDO default value after power-on	bit0: VDO1 bit1: VDO2 bit2: VDO3 bit3: VDO4 bit4: VDO5 bit5: VDO6 bit6: VDO7 bit7: VDO8 bit8: VDO9 bit9: VDO10 bit10: VDO11 bit11: VDO12 bit12: VDO13 bit13: VDO14 bit14: VDO15 bit15: VDO16	0x0	-	At stop	
H17.32	2017-21h	VDO virtual level	0x0 to 0xFFFF	0x0	-	Unchangeable	
H17.33	2017-22h	VDO1 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment				
H17.34	2017-23h	VDO1 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.35	2017-24h	VDO2 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment				
H17.36	2017-25h	VDO2 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.37	2017-26h	VDO3 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment	0	-	Real-time	
H17.38	2017-27h	VDO3 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.39	2017-28h	VDO4 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment				
H17.40	2017-29h	VDO4 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.41	2017-2Ah	VDO5 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment				
H17.42	2017-2Bh	VDO5 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.43	2017-2Ch	VDO6 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment	0	-	Real-time	
H17.44	2017-2Dh	VDO6 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.45	2017-2Eh	VDO7 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment	0	-	Real-time	
H17.46	2017-2Fh	VDO7 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.47	2017-30h	VDO8 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment				
H17.48	2017-31h	VDO8 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.49	2017-32h	VDO9 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			30: Warning or fault output 32: EDM output 33: Gantry alignment				
H17.50	2017-33h	VDO9 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.51	2017-34h	VDO10 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment	0	-	Real-time	
H17.52	2017-35h	VDO10 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.53	2017-36h	VDO11 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment				
H17.54	2017-37h	VDO11 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.55	2017-38h	VDO12 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment				
H17.56	2017-39h	VDO12 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.57	2017-3Ah	VDO13 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment	0	-	Real-time	
H17.58	2017-3Bh	VDO13 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.59	2017-3Ch	VDO14 function	0: No function 1: Servo ready 2: Motor rotation signal	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment				
H17.60	2017-3Dh	VDO14 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.61	2017-3Eh	VDO15 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment				
H17.62	2017-3Fh	VDO15 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.63	2017-40h	VDO16 function	0: No function 1: Servo ready 2: Motor rotation signal 3: Zero speed signal 4: Speed matching signal 5: Positioning completed 6: Positioning near 7: Torque limited signal 8: Speed limited signal 9: Braking 10: Warning 11: Fault 15: Interrupt positioning completed 16: Homing completed 17: Electrical homing completed 18: Torque reached signal 19: Speed reached signal 21: Enable completed 22: Internal command completed 23: Writing next command allowed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 30: Warning or fault output 32: EDM output 33: Gantry alignment	0	-	Real-time	
H17.64	2017-41h	VDO16 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	

20.22H18 Position Comparison Output Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H18.00	2018-01h	Position comparison output selection	0: Disable 1: Enable (rising edge-triggered)	0	-	Real-time	
H18.01	2018-02h	Position comparison	0: Motor encoder feedback	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		output feedback source	1: Fully closed-loop position feedback				
H18.02	2018-03h	Position comparison resolution	0: 24-bit 1: 23-bit 2: 22-bit 3: 21-bit 4: 20-bit 5: 19-bit 6: 18-bit 7: 17-bit	1	-	Real-time	
H18.03	2018-04h	Position comparison mode	0: Individual comparison mode 1: Cyclic comparison mode 2: Fixed cyclic comparison mode	0	-	Real-time	
H18.04	2018-05h	Current position as zero	0: Disable 1: Enable (rising edge-triggered)	0	-	Real-time	
H18.05	2018-06h	Position comparison output width	0.1 ms–204.7 ms	0.1	ms	Real-time	
H18.06	2018-07h	Position comparison output ABZ port polarity	Bit 0: OCZ output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic Bit 1: Z port output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic bit2: A/B output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic	0	-	Real-time	
H18.07	2018-08h	Position comparison start point	1–40	1	-	Real-time	
H18.08	2018-09h	Position comparison end point	1–40	1	-	Real-time	
H18.09	2018-0Ah	Current state of position comparison	0–1024	0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H18.10	2018-0Bh	Real-time position of position comparison	-2147483648–2147483647	0	-	Unchangeable	
H18.12	2018-0Dh	Zero offset of position comparison	-2147483648–2147483647	0	-	Real-time	
H18.14	2018-0Fh	Position comparison output delay compensation	-12.00μs to 12.00μs	0.00	μs	Real-time	
H18.15	2018-10h	Fixed cyclic comparison	1–65535	1	-	Real-time	
H18.16	2018-11h	ABZ output function setting	bit0: OCZ output function 0: Frequency-division output 1: Position comparison bit1: Z port output function 0: Frequency-division output 1: Position comparison bit2: A/B port output function 0: Frequency-division output 1: Position comparison	0	-	Real-time	
H18.17	2018-12h	Number of fixed mode cycles	0–65535	0	-	Unchangeable	

20.23H19 Target Position Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.00	2019-01h	Target value of position comparison 1	-2147483648–2147483647	0	-	Real-time	
H19.02	2019-03h	Attribute value of position comparison 1	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.03	2019-04h	Target value of position comparison 2	-2147483648–2147483647	0	-	Real-time	
H19.05	2019-06h	Attribute value of position comparison 2	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.06	2019-07h	Target value of position comparison 3	-2147483648–2147483647	0	-	Real-time	
H19.08	2019-09h	Attribute value of position comparison 3	bit0: Current position changes from "less than" to "more than" the comparison point	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.09	2019-0Ah	Target value of position comparison 4	-2147483648–2147483647	0	-	Real-time	
H19.11	2019-0Ch	Attribute value of position comparison 4	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit15: Frequency-division OCZ output				
H19.12	2019-0Dh	Target value of position comparison 5	-2147483648–2147483647	0	-	Real-time	
H19.14	2019-0Fh	Attribute value of position comparison 5	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.15	2019-10h	Target value of position comparison 6	-2147483648–2147483647	0	-	Real-time	
H19.17	2019-12h	Attribute value of position comparison 6	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.18	2019-13h	Target value of position comparison 7	-2147483648–2147483647	0	-	Real-time	
H19.20	2019-15h	Attribute value of position comparison 7	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.21	2019-16h	Target value of position comparison 8	-2147483648–2147483647	0	-	Real-time	
H19.23	2019-18h	Attribute value of position comparison 8	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.24	2019-19h	Target value of position comparison 9	-2147483648–2147483647	0	-	Real-time	
H19.26	2019-1Bh	Attribute value of position comparison 9	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.27	2019-1Ch	Target value of position comparison 10	-2147483648–2147483647	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.29	2019-1Eh	Attribute value of position comparison 10	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.30	2019-1Fh	Target value of position comparison 11	-2147483648–2147483647	0	-	Real-time	
H19.32	2019-21h	Attribute value of position comparison 11	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.33	2019-22h	Target value of position comparison 12	-2147483648–2147483647	0	-	Real-time	
H19.35	2019-24h	Attribute value of position comparison 12	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.36	2019-25h	Target value of position comparison 13	-2147483648–2147483647	0	-	Real-time	
H19.38	2019-27h	Attribute value of position comparison 13	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.39	2019-28h	Target value of position comparison 14	-2147483648–2147483647	0	-	Real-time	
H19.41	2019-2Ah	Attribute value of position comparison 14	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.42	2019-2Bh	Target value of position comparison 15	-2147483648–2147483647	0	-	Real-time	
H19.44	2019-2Dh	Attribute value of position comparison 15	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.45	2019-2Eh	Target value of position comparison 16	-2147483648–2147483647	0	-	Real-time	
H19.47	2019-30h	Attribute value of position comparison 16	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.48	2019-31h	Target value of position comparison 17	-2147483648–2147483647	0	-	Real-time	
H19.50	2019-33h	Attribute value of position comparison 17	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.51	2019-34h	Target value of position comparison 18	-2147483648–2147483647	0	-	Real-time	
H19.53	2019-36h	Attribute value of position comparison 18	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.54	2019-37h	Target value of position comparison 19	-2147483648–2147483647	0	-	Real-time	
H19.56	2019-39h	Attribute value of position comparison 19	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.57	2019-3Ah	Target value of position comparison 20	-2147483648–2147483647	0	-	Real-time	
H19.59	2019-3Ch	Attribute value of position comparison 20	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.60	2019-3Dh	Target value of position comparison 21	-2147483648–2147483647	0	-	Real-time	
H19.62	2019-3Fh	Attribute value of position comparison 21	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.63	2019-40h	Target value of position comparison 22	-2147483648–2147483647	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.65	2019-42h	Attribute value of position comparison 22	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.66	2019-43h	Target value of position comparison 23	-2147483648–2147483647	0	-	Real-time	
H19.68	2019-45h	Attribute value of position comparison 23	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.69	2019-46h	Target value of position comparison 24	-2147483648–2147483647	0	-	Real-time	
H19.71	2019-48h	Attribute value of position comparison 24	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.72	2019-49h	Target value of position comparison 25	-2147483648–2147483647	0	-	Real-time	
H19.74	2019-4Bh	Attribute value of position comparison 25	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.75	2019-4Ch	Target value of position comparison 26	-2147483648–2147483647	0	-	Real-time	
H19.77	2019-4Eh	Attribute value of position comparison 26	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.78	2019-4Fh	Target value of position comparison 27	-2147483648–2147483647	0	-	Real-time	
H19.80	2019-51h	Attribute value of position comparison 27	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.81	2019-52h	Target value of position comparison 28	-2147483648–2147483647	0	-	Real-time	
H19.83	2019-54h	Attribute value of position comparison 28	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.84	2019-55h	Target value of position comparison 29	-2147483648–2147483647	0	-	Real-time	
H19.86	2019-57h	Attribute value of position comparison 29	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.87	2019-58h	Target value of position comparison 30	-2147483648–2147483647	0	-	Real-time	
H19.89	2019-5Ah	Attribute value of position comparison 30	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.90	2019-5Bh	Target value of position comparison 31	-2147483648–2147483647	0	-	Real-time	
H19.92	2019-5Dh	Attribute value of position comparison 31	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.93	2019-5Eh	Target value of position comparison 32	-2147483648–2147483647	0	-	Real-time	
H19.95	2019-60h	Attribute value of position comparison 32	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.96	2019-61h	Target value of position comparison 33	-2147483648–2147483647	0	-	Real-time	
H19.98	2019-63h	Attribute value of position comparison 33	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.99	2019-64h	Target value of position comparison 34	-2147483648–2147483647	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.101	2019-66h	Attribute value of position comparison 34	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.102	2019-67h	Target value of position comparison 35	-2147483648–2147483647	0	-	Real-time	
H19.104	2019-69h	Attribute value of position comparison 35	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.105	2019-6Ah	Target value of position comparison 36	-2147483648–2147483647	0	-	Real-time	
H19.107	2019-6Ch	Attribute value of position comparison 36	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.108	2019-6Dh	Target value of position comparison 37	-2147483648–2147483647	0	-	Real-time	
H19.110	2019-6Fh	Attribute value of position comparison 37	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.111	2019-70h	Target value of position comparison 38	-2147483648–2147483647	0	-	Real-time	
H19.113	2019-72h	Attribute value of position comparison 38	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.114	2019-73h	Target value of position comparison 39	-2147483648–2147483647	0	-	Real-time	
H19.116	2019-75h	Attribute value of position comparison 39	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.117	2019-76h	Target value of position comparison 40	-2147483648–2147483647	0	-	Real-time	
H19.119	2019-78h	Attribute value of position comparison 40	bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: DO1 output bit8: DO2 output bit9: DO3 output bit10: DO4 output bit11: DO5 output bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	

20.24H1F Software Tool Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H1F.90	201F-5Bh	DI function status 1 read through communication	0–65535	0	-	Unchangeable	
H1F.91	201F-5Ch	DI function status 2 read through communication	0–65535	0	-	Unchangeable	
H1F.92	201F-5Dh	DI function status 3 read through communication	0–65535	0	-	Unchangeable	
H1F.93	201F-5Eh	DI function status 4 read through communication	0–65535	0	-	Unchangeable	
H1F.94	201F-5Fh	DO function status 1 read through communication	0–65535	0	-	Unchangeable	
H1F.95	201F-60h	DO function status 2 read through communication	0–65535	0	-	Unchangeable	

20.25H21 Current Loop Gain Switchover Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H21.00	2021-01h	Current loop gain switchover	0: No operation 1: Enabled	0	-	Real-time	

20.26H22 Process Segment Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H22.00	2022-01h	Process segment command trigger	0–1000	0	-	Real-time	
H22.01	2022-02h	Process segment triggered by the event rising edge	0–65535	0	-	Real-time	
H22.02	2022-03h	Process segment triggered by the event falling edge	0–65535	0	-	Real-time	
H22.03	2022-04h	Acceleration/Deceleration time upon technology segment pause	0: Acceleration/Deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 5: Acceleration/Deceleration time 5 6: Acceleration/Deceleration time 6 7: Acceleration/Deceleration time 7	0	-	Real-time	
H22.04	2022-05h	Positive software position limit	-2147483648 to 2147483647	2147483647	Reference unit	Real-time	
H22.06	2022-07h	Negative software position limit	-2147483648 to 2147483647	-2147483648	Reference unit	Real-time	
H22.08	2022-09h	Process segment number	0–65535	0	-	Unchangeable	
H22.09	2022-0Ah	Process segment function switch	0–65535	0	-	At stop	
H22.10	2022-0Bh	Process segment state	0–65535	0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H22.19	2022-14h	Target speed	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	50.0	[mm/s]/[rpm]	Real-time	
H22.20	2022-15h	Target speed 1	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	200.0	[mm/s]/[rpm]	Real-time	
H22.21	2022-16h	Target speed 2	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	500.0	[mm/s]/[rpm]	Real-time	
H22.22	2022-17h	Target speed 3	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	1000.0	[mm/s]/[rpm]	Real-time	
H22.23	2022-18h	Target speed 4	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	1500.0	[mm/s]/[rpm]	Real-time	
H22.24	2022-19h	Target speed 5	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	2000.0	[mm/s]/[rpm]	Real-time	
H22.25	2022-1Ah	Target speed 6	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	2500.0	[mm/s]/[rpm]	Real-time	
H22.26	2022-1Bh	Target speed 7	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	3000.0	[mm/s]/[rpm]	Real-time	
H22.35	2022-24h	Accel/Decel time	0 ms–65535 ms	50	ms	Real-time	
H22.36	2022-25h	Acceleration/Deceleration time 1	0 ms–65535 ms	200	ms	Real-time	
H22.37	2022-26h	Acceleration/Deceleration time 2	0 ms–65535 ms	500	ms	Real-time	
H22.38	2022-27h	Acceleration/Deceleration time 3	0 ms–65535 ms	1000	ms	Real-time	
H22.39	2022-28h	Acceleration/Deceleration time 4	0 ms–65535 ms	1500	ms	Real-time	
H22.40	2022-29h	Acceleration/Deceleration time 5	0 ms–65535 ms	2000	ms	Real-time	
H22.41	2022-2Ah	Acceleration/Deceleration time 6	0 ms–65535 ms	2500	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H22.42	2022-2Bh	Acceleration/ Deceleration time 7	0 ms–65535 ms	3000	ms	Real-time	
H22.51	2022-34h	Delay after completion of the process segment	0 ms–65535 ms	0	ms	Real-time	
H22.52	2022-35h	Delay time 1 after completion of the process segment	0 ms–65535 ms	50	ms	Real-time	
H22.53	2022-36h	Delay time 2 after completion of the process segment	0 ms–65535 ms	200	ms	Real-time	
H22.54	2022-37h	Delay time 3 after completion of the process segment	0 ms–65535 ms	500	ms	Real-time	
H22.55	2022-38h	Delay time 4 after completion of the process segment	0 ms–65535 ms	1000	ms	Real-time	
H22.56	2022-39h	Delay time 5 after completion of the process segment	0 ms–65535 ms	1500	ms	Real-time	
H22.57	2022-3Ah	Delay time 6 after completion of the process segment	0 ms–65535 ms	2000	ms	Real-time	
H22.58	2022-3Bh	Delay time 7 after completion of the process segment	0 ms–65535 ms	3000	ms	Real-time	
H22.70	2022-47h	Process segment homing mode	-32768–32767	-2	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H22.71	2022-48h	Speed of high-speed search for home switch signal	0[mm/s]/[rpm]–3000[mm/s]/[rpm]	100	[mm/s]/[rpm]	Real-time	
H22.72	2022-49h	Speed of low-speed search for home switch signal	0[mm/s]/[rpm]–1000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	
H22.73	2022-4Ah	Acceleration/ Deceleration time during homing	0 ms–1000 ms	1000	ms	Real-time	
H22.74	2022-4Bh	Home search time limit	0 ms–65535 ms	10000	ms	Real-time	
H22.75	2022-4Ch	Mechanical home offset	-2147483648 to 2147483647	0	Reference unit	Real-time	
H22.79	2022-50h	Relative/ Absolute homing	0–65535	0	-	Real-time	
H22.83	2022-54h	Jump count threshold	0–65534	0	-	Real-time	
H22.84	2022-55h	Jump count threshold 1	0–65534	20	-	Real-time	
H22.85	2022-56h	Jump count threshold 2	0–65534	40	-	Real-time	
H22.86	2022-57h	Jump count threshold 3	0–65534	80	-	Real-time	
H22.87	2022-58h	Jump count threshold 4	0–65534	160	-	Real-time	
H22.88	2022-59h	Jump count threshold 5	0–65534	320	-	Real-time	
H22.89	2022-5Ah	Jump count threshold 6	0–65534	640	-	Real-time	
H22.90	2022-5Bh	Jump count threshold 7	0–65534	1280	-	Real-time	

20.27H23 Process Segment Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H23.00	2023-01h	Definition of homing	0–4294967295	0	-	Real-time	
H23.02	2023-03h	Homing data	-2147483648–2147483647	0	-	Real-time	
H23.04	2023-05h	Definition of process segment 1	0–4294967295	0	-	Real-time	
H23.06	2023-07h	Data of process segment 1	-2147483648–2147483647	0	-	Real-time	
H23.08	2023-09h	Definition of process segment 2	0–4294967295	0	-	Real-time	
H23.10	2023-0Bh	Data of process segment 2	-2147483648–2147483647	0	-	Real-time	
H23.12	2023-0Dh	Definition of process segment 3	0–4294967295	0	-	Real-time	
H23.14	2023-0Fh	Data of process segment 3	-2147483648–2147483647	0	-	Real-time	
H23.16	2023-11h	Definition of process segment 4	0–4294967295	0	-	Real-time	
H23.18	2023-13h	Data of process segment 4	-2147483648–2147483647	0	-	Real-time	
H23.20	2023-15h	Definition of process segment 5	0–4294967295	0	-	Real-time	
H23.22	2023-17h	Data of process segment 5	-2147483648–2147483647	0	-	Real-time	
H23.24	2023-19h	Definition of process segment 6	0–4294967295	0	-	Real-time	
H23.26	2023-1Bh	Data of process segment 6	-2147483648–2147483647	0	-	Real-time	
H23.28	2023-1Dh	Definition of process segment 7	0–4294967295	0	-	Real-time	
H23.30	2023-1Fh	Data of process segment 7	-2147483648–2147483647	0	-	Real-time	
H23.32	2023-21h	Definition of process segment 8	0–4294967295	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H23.34	2023-23h	Data of process segment 8	-2147483648–2147483647	0	-	Real-time	
H23.36	2023-25h	Definition of process segment 9	0–4294967295	0	-	Real-time	
H23.38	2023-27h	Data of process segment 9	-2147483648–2147483647	0	-	Real-time	
H23.40	2023-29h	Definition of process segment 10	0–4294967295	0	-	Real-time	
H23.42	2023-2Bh	Data of process segment 10	-2147483648–2147483647	0	-	Real-time	
H23.44	2023-2Dh	Definition of process segment 11	0–4294967295	0	-	Real-time	
H23.46	2023-2Fh	Data of process segment 11	-2147483648–2147483647	0	-	Real-time	
H23.48	2023-31h	Definition of process segment 12	0–4294967295	0	-	Real-time	
H23.50	2023-33h	Data of process segment 12	-2147483648–2147483647	0	-	Real-time	
H23.52	2023-35h	Definition of process segment 13	0–4294967295	0	-	Real-time	
H23.54	2023-37h	Data of process segment 13	-2147483648–2147483647	0	-	Real-time	
H23.56	2023-39h	Definition of process segment 14	0–4294967295	0	-	Real-time	
H23.58	2023-3Bh	Data of process segment 14	-2147483648–2147483647	0	-	Real-time	
H23.60	2023-3Dh	Definition of process segment 15	0–4294967295	0	-	Real-time	
H23.62	2023-3Fh	Data of process segment 15	-2147483648–2147483647	0	-	Real-time	

20.28H30 Related Variables Read through Communication

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H30.00	2030-01h	Servo state read via communication	0–65535	0	-	Unchangeable	
H30.01	2030-02h	DO function status 1 read through communication	0–65535	0	-	Unchangeable	
H30.02	2030-03h	DO function status 2 read through communication	0–65535	0	-	Unchangeable	
H30.03	2030-04h	Input pulse reference sampling value read through communication	0–65535	0	-	Unchangeable	
H30.16	2030-11h	1st encoder communication timeout count	0–65535	0	-	Unchangeable	
H30.17	2030-12h	1st encoder communication CRC error count	0–65535	0	-	Unchangeable	
H30.18	2030-13h	1st encoder communication frame stop bit error count	0–65535	0	-	Unchangeable	

20.29H31 References Set through Communication

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H31.00	2031-01h	VDI virtual level set through communication	0–65535	0	-	Real-time	
H31.01	2031-02h	Frequency-division output	0 Hz–16000000 Hz	0	Hz	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		frequency set through communication					
H31.04	2031-05h	DO status set through communication	0–65535	0	-	Real-time	
H31.05	2031-06h	AO status set through communication	-10000 mV–10000 mV	0	mV	Real-time	
H31.09	2031-0Ah	Speed reference set through communication	-9999.000[mm/s]/[rpm]–9999.000[mm/s]/[rpm]	0.000	[mm/s]/[rpm]	Real-time	
H31.11	2031-0Ch	Torque reference set through communication	-100.000% to 100.000%	0.000	%	Real-time	

20.30H32 Direct Drive Parameters

Parameter	Hex	Name	Value	Default	Unit	Change Mode	Page
H32.00	2032-01h	Encoder interpolator mismatch alarm (E124)	0: Disabled 1: Enabled	1	-	At stop	
H32.01	2032-02h	Encoder interface switchover switch	0: Default encoder interface 1: Switching encoder interface	0	-	At stop	
H32.02	2032-03h	Angle auto-tuning upon power-on	0: Disabled 1: Enabled	0	-	At stop	
H32.03	2032-04h	Angle auto-tuning switch controlled by control word	0: Disabled 1: Control word 6 2: Control word 7	0	-	At stop	
H32.04	2032-05h	Angle auto-tuning state	bit0: bit7 of 6041 bit1: E602.9	0	-	At stop	
H32.05	2032-06h	Pre-positioning retract selection	0: Disabled 1: Enabled	0	-	At stop	
H32.06	2032-07h	Position feedback	0: Disabled 1: Enabled	0	-	At stop	

Parameter	Hex	Name	Value	Default	Unit	Change Mode	Page
H32.07	2032-08h	Incremental homing method	0: Z Signal short circuit 1: Only first short circuit	1	-	At stop	
H32.08	2032-09h	Homing signal width	100–65535	800	-	At stop	
H32.10	2032-0Bh	Max. reference current in angle auto-tuning through inching	10.0% to 300.0%	100.0	%	At stop	
H32.13	2032-0Eh	Motor operation threshold (ROT/DDR) in angle auto-tuning through inching	0.001deg to 20.000deg	0.200	deg	At stop	
H32.14	2032-0Fh	Motor standstill threshold (ROT/DDR) in angle auto-tuning through inching	0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	
H32.15	2032-10h	Motor operation threshold (DDL) in angle auto-tuning through inching	0.001 millimeters–20.000 millimeters	0.200	mm	At stop	
H32.16	2032-11h	Motor standstill threshold (DDL) in angle auto-tuning through inching	0.1 mm/s–100.0 mm/s	1.0	mm/s	At stop	
H32.18	2032-13h	Motor standstill threshold for inching angle auto-tuning	0.1s to 10.0s	0.5	s	At stop	
H32.20	2032-15h	Max. reference current in angle auto-tuning through pre-positioning (closed-loop)	10.0% to 300.0%	100.0	%	At stop	
H32.22	2032-17h	Electrical angle reference in angle auto-tuning through pre-positioning (closed-loop)	0.0deg to 360.0deg	0.0	deg	At stop	

Parameter	Hex	Name	Value	Default	Unit	Change Mode	Page
H32.23	2032-18h	Electrical angle reference change range in angle auto-tuning through pre-positioning (closed-loop)	10.0deg to 170.0deg	90.0	deg	At stop	
H32.24	2032-19h	Motor stop threshold (ROT/DDR) in angle auto-tuning through pre-positioning (closed-loop)	0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	
H32.25	2032-1Ah	Motor stop threshold (DDL) in angle auto-tuning through pre-positioning (closed-loop)	0.1 mm/s–100.0 mm/s	1.0	mm/s	At stop	
H32.26	2032-1Bh	Damping in angle auto-tuning through pre-positioning (closed-loop)	0.00[N/(m/s)]/[N·m/rpm]–655.35[N/(m/s)]/[N·m/rpm]	0.00	[N/(m/s)]/[N·m/rpm]	At stop	
H32.29	2032-1Eh	Motor standstill threshold for close-loop pre-positioning angle auto-tuning	0.1s to 10.0s	0.5	s	At stop	
H32.30	2032-1Fh	Max. reference current in angle auto-tuning through position lock	10.0% to 300.0%	100.0	%	At stop	
H32.33	2032-22h	Motor operation threshold (ROT/DDR) in angle auto-tuning through position lock	0.001deg to 20.000deg	0.200	deg	At stop	
H32.34	2032-23h	Motor standstill threshold (ROT/DDR) in angle auto-tuning	0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	

Parameter	Hex	Name	Value	Default	Unit	Change Mode	Page
		through position lock					
H32.35	2032-24h	Motor operation threshold (DDL) in angle auto-tuning through position lock	0.001 millimeters–20.000 millimeters	0.200	mm	At stop	
H32.36	2032-25h	Motor standstill threshold (DDL) in angle auto-tuning through position lock	0.1 mm/s–100.0 mm/s	1.0	mm/s	At stop	
H32.37	2032-26h	Angle gain in angle auto-tuning through position lock	0deg/(p/s)–10000deg/(p/s)	1000	deg/(p/s)	At stop	
H32.38	2032-27h	Inertia ratio in angle auto-tuning through position lock	0.00–120.00	0.00	-	At stop	
H32.39	2032-28h	Gain class in angle auto-tuning through position lock	4level to 31level	16	level	At stop	
H32.40	2032-29h	Left/Right limit function	1. Left limit being positive 2. Left limit being negative	0	-	Real-time	
H32.41	2032-2Ah	Angle auto-tuning delay after power-on	0s to 65535s	3	s	Real-time	
H32.45	2032-2Eh	Black box channel 21 function	0: Real-time target speed (607Ah) 1: Electric angle	0	-	At stop	
H32.50	2032-33h	32-bit range compatibility	0–99	1	-	At stop	
H32.53	2032-36h	Motor standstill threshold for position lock angle auto-tuning	0.1s to 10.0s	0.5	s	At stop	
H32.54	2032-37h	Hall auto-tuning selection	0–65535	0	-	At stop	
H32.55	2032-38h	Hall signal UVW manual adjustment	0–7	0	-	At stop	

Parameter	Hex	Name	Value	Default	Unit	Change Mode	Page
H32.56	2032-39h	UVW filter time of Hall signal	0 ms–10 ms	5	ms	Real-time	
H32.57	2032-3Ah	Hall closed-loop locked-rotor speed	0[mm/s]/[rpm]–65535[mm/s]/[rpm]	2	[mm/s]/[rpm]	At stop	
H32.58	2032-3Bh	Hall closed-loop locked-rotor current	0.0% to 300.0%	120.0	%	At stop	
H32.59	2032-3Ch	Hall closed-loop locked-rotor window time	0 ms–2000 ms	10	ms	At stop	
H32.60	2032-3Dh	Hall closed-loop inertia ratio	0.00–120.00	0.00	-	At stop	
H32.61	2032-3Eh	Hall closed-loop rigidity	4–31	16	-	At stop	
H32.62	2032-3Fh	Electrical angle save flag	0–65535	0	-	Real-time	
H32.63	2032-40h	Hall1 electric angle	0–65535	0	-	At stop	
H32.64	2032-41h	Hall2 electric angle	0–65535	0	-	At stop	
H32.65	2032-42h	Hall3 electric angle	0–65535	0	-	At stop	
H32.66	2032-43h	Hall4 electric angle	0–65535	0	-	At stop	
H32.67	2032-44h	Hall5 electric angle	0–65535	0	-	At stop	
H32.68	2032-45h	Hall6 electric angle	0–65535	0	-	At stop	
H32.70	2032-47h	Motor overload protection mode	0: Internal motor overload curve 1: External motor overload curve 2: Current limit overload protection 3: Hide motor overload protection	0	-	At stop	
H32.73	2032-4Ah	Thermal threshold current of overload current limit	10.0% to 750.0%	115.0	%	At stop	

Parameter	Hex	Name	Value	Default	Unit	Change Mode	Page
H32.74	2032-4Bh	Peak current of overload current limit	100.0% to 750.0%	300.0	%	At stop	
H32.75	2032-4Ch	Max. current duration of overload protection	0.01s to 655.35s	1.00	s	At stop	
H32.76	2032-4Dh	Current limit time constant of overload protection	0.01–655.35	1.00	-	At stop	
H32.77	2032-4Eh	Current limit alarm threshold of overload protection	0.0% to 750.0%	0.0	%	At stop	
H32.78	2032-4Fh	Current limit fault threshold of overload protection	0.0% to 750.0%	0.0	%	At stop	
H32.79	2032-50h	Thermal threshold current of overload	10.0% to 750.0%	115.0	%	At stop	
H32.80	2032-51h	Thermal current interval of overload	0.1% to 204.8%	6.4	%	At stop	
H32.81	2032-52h	Overload heat dissipation current interval	0.1% to 204.8%	6.4	%	At stop	
H32.82	2032-53h	Length of overload heat dissipation curve	1–200	1	-	At stop	
H32.83	2032-54h	Length of overload heat dissipation curve	1–200	1	-	At stop	

20.31H33 Compensation Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.00	2033-01h	Compensation data BUFFER0	0–65535	0	-	At stop	
H33.01	2033-02h	Compensation data BUFFER1	0–65535	0	-	At stop	
H33.02	2033-03h	Compensation data BUFFER2	0–65535	0	-	At stop	
H33.03	2033-04h	Compensation data BUFFER3	0–65535	0	-	At stop	
H33.04	2033-05h	Compensation data BUFFER4	0–65535	0	-	At stop	
H33.05	2033-06h	Compensation data BUFFER5	0–65535	0	-	At stop	
H33.06	2033-07h	Compensation data BUFFER6	0–65535	0	-	At stop	
H33.07	2033-08h	Compensation data BUFFER7	0–65535	0	-	At stop	
H33.08	2033-09h	Compensation data BUFFER8	0–65535	0	-	At stop	
H33.09	2033-0Ah	Compensation data BUFFER9	0–65535	0	-	At stop	
H33.10	2033-0Bh	Compensation data BUFFER10	0–65535	0	-	At stop	
H33.11	2033-0Ch	Compensation data BUFFER11	0–65535	0	-	At stop	
H33.12	2033-0Dh	Compensation data BUFFER12	0–65535	0	-	At stop	
H33.13	2033-0Eh	Compensation data BUFFER13	0–65535	0	-	At stop	
H33.14	2033-0Fh	Compensation data BUFFER14	0–65535	0	-	At stop	
H33.15	2033-10h	Compensation data BUFFER15	0–65535	0	-	At stop	
H33.16	2033-11h	Compensation data BUFFER16	0–65535	0	-	At stop	
H33.17	2033-12h	Compensation data BUFFER17	0–65535	0	-	At stop	
H33.18	2033-13h	Compensation data BUFFER18	0–65535	0	-	At stop	
H33.19	2033-14h	Compensation data BUFFER19	0–65535	0	-	At stop	
H33.20	2033-15h	Compensation data BUFFER20	0–65535	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.21	2033-16h	Compensation data BUFFER21	0–65535	0	-	At stop	
H33.22	2033-17h	Compensation data BUFFER22	0–65535	0	-	At stop	
H33.23	2033-18h	Compensation data BUFFER23	0–65535	0	-	At stop	
H33.24	2033-19h	Compensation data BUFFER24	0–65535	0	-	At stop	
H33.25	2033-1Ah	Compensation data BUFFER25	0–65535	0	-	At stop	
H33.26	2033-1Bh	Compensation data BUFFER26	0–65535	0	-	At stop	
H33.27	2033-1Ch	Compensation data BUFFER27	0–65535	0	-	At stop	
H33.28	2033-1Dh	Compensation data BUFFER28	0–65535	0	-	At stop	
H33.29	2033-1Eh	Compensation data BUFFER29	0–65535	0	-	At stop	
H33.30	2033-1Fh	Compensation data BUFFER30	0–65535	0	-	At stop	
H33.31	2033-20h	Compensation data BUFFER31	0–65535	0	-	At stop	
H33.32	2033-21h	Compensation data BUFFER32	0–65535	0	-	At stop	
H33.33	2033-22h	Compensation data BUFFER33	0–65535	0	-	At stop	
H33.34	2033-23h	Compensation data BUFFER34	0–65535	0	-	At stop	
H33.35	2033-24h	Compensation data BUFFER35	0–65535	0	-	At stop	
H33.36	2033-25h	Compensation data BUFFER36	0–65535	0	-	At stop	
H33.37	2033-26h	Compensation data BUFFER37	0–65535	0	-	At stop	
H33.38	2033-27h	Compensation data BUFFER38	0–65535	0	-	At stop	
H33.39	2033-28h	Compensation data BUFFER39	0–65535	0	-	At stop	
H33.40	2033-29h	Current Compensation BUFFER group number	0–65535	0	-	At stop	
H33.41	2033-2Ah	Compensation data sum	0–32767	0	-	At stop	
H33.44	2033-2Dh	Data command	0–1	1	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.45	2033-2Eh	Data storage position	0: Servo RAM 1: Servo FLASH 2: Encoder FLASH	1	-	At stop	
H33.46	2033-2Fh	Data clear	0–3	0	-	At stop	
H33.47	2033-30h	Software tool write status	0–2	0	-	At stop	
H33.48	2033-31h	Servo read status	0–65535	0	-	Unchangeable	
H33.49	2033-32h	Software tool read status	0–2	0	-	At stop	
H33.50	2033-33h	Servo write status	0–65535	0	-	Unchangeable	
H33.51	2033-34h	Data transmission completed flag	0–1	0	-	At stop	
H33.52	2033-35h	Servo data transfer completed flag	0–65535	0	-	Unchangeable	
H33.60	2033-3Dh	Accuracy compensation function	0–1	0	-	At stop	
H33.61	2033-3Eh	Accuracy compensation sum	0count to 2048count	0	count	At stop	
H33.62	2033-3Fh	Starting offset address of accuracy compensation	-21474836.48[mm]/[deg]–21474836.47[mm]/[deg]	0.00	[mm]/[deg]	At stop	
H33.64	2033-41h	Accuracy compensation data interval	-327.67[mm]/[deg]–327.67[mm]/[deg]	0.00	[mm]/[deg]	At stop	
H33.65	2033-42h	Accuracy compensation dial phase sequence	0x0 to 0xFFFF	0x0	-	At stop	
H33.66	2033-43h	Accuracy compensation dial reference direction	0–1	0	-	At stop	
H33.67	2033-44h	Servo homing completed	0–65535	0	-	Unchangeable	
H33.68	2033-45h	Current acting index of accuracy compensation	0–65535	0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.69	2033-46h	Forced homing start	0–1	0	-	At stop	
H33.70	2033-47h	Forced homing mode	-32768–32767	-2	-	At stop	
H33.71	2033-48h	Forced homing at low speed	0[mm/s]/[rpm]–1000[mm/s]/[rpm]	10	[mm/s]/[rpm]	At stop	
H33.72	2033-49h	Single-turn absolute position of accuracy compensation home of absolute encoder	0 to 4294967295	0	Encoder unit	At stop	
H33.74	2033-4Bh	Min.pulse width of frequency-division output accuracy compensation	2count to 7count	3	count	At stop	
H33.75	2033-4Ch	Accuracy compensation data unit	0: [um]/[arcsec] 1: [mm]/[mrad]	0	-	At stop	
H33.81	2033-52h	Motor cogging torque ripple compensation sum	0count to 65535count	2000	count	At stop	

20.32H34 Servo Motor Parameters 2

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H34.12	2034-0Dh	Error type supported by Endat2.2 encoder	0x0 to 0xFFFF	0x0	-	Unchangeable	
H34.13	2034-0Eh	Alarm types supported by EnDat2.2 encoders	0x0 to 0xFFFF	0x0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H34.14	2034-0Fh	Error value output by EnDat2.2 encoder	0x0 to 0xFFFF	0x0	-	Unchangeable	
H34.15	2034-10h	Alarm value output by EnDat2.2 encoder	0x0 to 0xFFFF	0x0	-	Unchangeable	

20.33List of 1000h Object Dictionary

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
1005h	1005h	SYNC message COB-ID	0x80 to 0xFFFFFFFF	0x80	-	Real-time	
1006h	1006h	Synchronization cycle	0μs to 2147483647μs	0	μs	Real-time	
100Ch	100Ch	Node guarding time	0 ms–65535 ms	0	ms	Real-time	
100dh	100dh	Life factor	0–255	0	-	Real-time	
1014h	1014h	Emergency message COB-ID	0x0 to 0xFFFFFFFF	0x80	-	Real-time	
1016.01h	1016-01h	Consumer heartbeat time 1	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1016.02h	1016-02h	Consumer heartbeat time 2	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1016.03h	1016-03h	Consumer heartbeat time 3	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1016.04h	1016-04h	Consumer heartbeat time 4	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1016.05h	1016-05h	Consumer heartbeat time 5	0x0 to 0x7FFFFFFF	0x0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
1017h	1017h	Producer heartbeat time	0 ms–65535 ms	0	ms	Real-time	
1400.01h	1400-01h	COB-ID of RPDO1	0x0 to 0xFFFFFFFF	0x200	-	Real-time	
1400.02h	1400-02h	Transmission type of RPDO1	0–255	255	-	Real-time	
1401.01h	1401-01h	COB-ID of RPDO2	0x0 to 0xFFFFFFFF	0x300	-	Real-time	
1401.02h	1401-02h	Transmission type of RPDO2	0–255	255	-	Real-time	
1402.01h	1402-01h	COB-ID of RPDO3	0x0 to 0xFFFFFFFF	0x80000400	-	Real-time	
1402.02h	1402-02h	Transmission type of RPDO3	0–255	255	-	Real-time	
1403.01h	1403-01h	COB-ID of RPDO4	0x0 to 0xFFFFFFFF	0x80000500	-	Real-time	
1403.02h	1403-02h	Transmission type of RPDO4	0–255	255	-	Real-time	
1600.00h	1600-00h	Number of valid mapped objects in RPDO1	0–4	3	-	Real-time	
1600.01h	1600-01h	Mapped object 1 in RPDO1	0x0 to 0x7FFFFFFF	0x60400010	-	Real-time	
1600.02h	1600-02h	Mapped object 2 in RPDO1	0x0 to 0x7FFFFFFF	0x60FF0020	-	Real-time	
1600.03h	1600-03h	Mapped object 3 in RPDO1	0x0 to 0x7FFFFFFF	0x60600008	-	Real-time	
1600.04h	1600-04h	Mapped object 4 in RPDO1	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1601.00h	1601-00h	Number of valid mapped objects in RPDO2	0–4	2	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
1601.01h	1601-01h	Mapped object 1 in RPDO2	0x0 to 0x7FFFFFFF	0x607A0020	-	Real-time	
1601.02h	1601-02h	Mapped object 2 in RPDO2	0x0 to 0x7FFFFFFF	0x60810020	-	Real-time	
1601.03h	1601-03h	Mapped object 3 in RPDO2	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1601.04h	1601-04h	Mapped object 4 in RPDO2	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1602.00h	1602-00h	Number of valid mapped objects in RPDO3	0–4	0	-	Real-time	
1602.01h	1602-01h	Mapped object 1 in RPDO3	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1602.02h	1602-02h	Mapped object 2 in RPDO3	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1602.03h	1602-03h	Mapped object 3 in RPDO3	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1602.04h	1602-04h	Mapped object 4 in RPDO3	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1603.00h	1603-00h	Number of valid mapped objects in RPDO4	0–4	0	-	Real-time	
1603.01h	1603-01h	Mapped object 1 in RPDO4	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1603.02h	1603-02h	Mapped object 2 in RPDO4	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1603.03h	1603-03h	Mapped object 3 in RPDO4	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1603.04h	1603-04h	Mapped object 4 in RPDO4	0x0 to 0x7FFFFFFF	0x0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
1800.01h	1800-01h	COB-ID of TPDO1	0x0 to 0xFFFFFFFF	0x40000180	-	Real-time	
1800.02h	1800-02h	Transmission type of TPDO1	0–255	255	-	Real-time	
1800.03h	1800-03h	Inhibit time of TPDO1	0μs to 65535μs	500	100μs	Real-time	
1800.05h	1800-05h	Event counter of TPDO1	0 ms–65535 ms	0	ms	Real-time	
1801.01h	1801-01h	COB-ID of TPDO2	0x0 to 0xFFFFFFFF	0x40000280	-	Real-time	
1801.02h	1801-02h	Transmission type of TPDO2	0–255	255	-	Real-time	
1801.03h	1801-03h	Inhibit time of TPDO2	0μs to 65535μs	500	100μs	Real-time	
1801.05h	1801-05h	Event counter of TPDO2	0 ms–65535 ms	0	ms	Real-time	
1802.01h	1802-01h	COB-ID of TPDO3	0x0 to 0xFFFFFFFF	0xC0000380	-	Real-time	
1802.02h	1802-02h	Transmission type of TPDO3	0–255	255	-	Real-time	
1802.03h	1802-03h	Inhibit time of TPDO3	0μs to 65535μs	500	100μs	Real-time	
1802.05h	1802-05h	Event counter of TPDO3	0 ms–65535 ms	0	ms	Real-time	
1803.01h	1803-01h	COB-ID of TPDO4	0x0 to 0xFFFFFFFF	0xC0000480	-	Real-time	
1803.02h	1803-02h	Transmission type of TPDO4	0–255	255	-	Real-time	
1803.03h	1803-03h	Inhibit time of TPDO4	0μs to 65535μs	500	100μs	Real-time	
1803.05h	1803-05h	Event counter of TPDO4	0 ms–65535 ms	0	ms	Real-time	
1A00.00h	1A00-00h	Number of valid mapped objects in TPDO1	0–4	3	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
1A00.01h	1A00-01h	Mapped object 1 in TPDO1	0x0 to 0x7FFFFFFF	0x60410010	-	Real-time	
1A00.02h	1A00-02h	Mapped object 2 in TPDO1	0x0 to 0x7FFFFFFF	0x60FD0020	-	Real-time	
1A00.03h	1A00-03h	Mapped object 3 in TPDO1	0x0 to 0x7FFFFFFF	0x60610008	-	Real-time	
1A00.04h	1A00-04h	Mapped object 4 in TPDO1	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1A01.00h	1A01-00h	Number of valid mapped objects in TPDO2	0–4	2	-	Real-time	
1A01.01h	1A01-01h	Mapped object 1 in TPDO2	0x0 to 0x7FFFFFFF	0x60640020	-	Real-time	
1A01.02h	1A01-02h	Mapped object 2 in TPDO2	0x0 to 0x7FFFFFFF	0x606C0020	-	Real-time	
1A01.03h	1A01-03h	Mapped object 3 in TPDO2	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1A01.04h	1A01-04h	Mapped object 4 in TPDO2	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1A02.00h	1A02-00h	Number of valid mapped objects in TPDO3	0–4	0	-	Real-time	
1A02.01h	1A02-01h	Mapped object 1 in TPDO3	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1A02.02h	1A02-02h	Mapped object 2 in TPDO3	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1A02.03h	1A02-03h	Mapped object 3 in TPDO3	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1A02.04h	1A02-04h	Mapped object 4 in TPDO3	0x0 to 0x7FFFFFFF	0x0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
1A03.00h	1A03-00h	Number of valid mapped objects in TPDO4	0–4	0	-	Real-time	
1A03.01h	1A03-01h	Mapped object 1 in TPDO4	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1A03.02h	1A03-02h	Mapped object 2 in TPDO4	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1A03.03h	1A03-03h	Mapped object 3 in TPDO4	0x0 to 0x7FFFFFFF	0x0	-	Real-time	
1A03.04h	1A03-04h	Mapped object 4 in TPDO4	0x0 to 0x7FFFFFFF	0x0	-	Real-time	

20.34List of 6000h Object Dictionary

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
603Fh	603Fh	Error code	0x0 to 0xFFFF	0x0	-	Unchangeable	
6040h	6040h	Control word	0x0 to 0xFFFF	0x0	-	Real-time	
6041h	6041h	Status word	0x0 to 0xFFFF	0x0	-	Unchangeable	
605Ah	605Ah	Quick stop mode	0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state 6: Ramp to stop as defined by 6085h, keeping position lock state	2	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			7: Stop at emergency stop torque, keeping position lock state				
605Ch	605Ch	Stop mode at S-OFF	–4: Ramp to stop as defined by 6085h, keeping dynamic braking state –3: Stop at zero speed, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/ 609Ah, keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah, keeping de-energized state 2: Dynamic braking stop, keeping de-energized state	0	-	Real-time	
605Dh	605Dh	Halt mode	1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping position lock state 2: Ramp to stop as defined by 6085h, keeping position lock state 3: Stop at emergency stop torque, keeping position lock state	1	-	Real-time	
605Eh	605Eh	Stop mode at No. 2 fault	–5: Stop at zero speed, keeping dynamic braking state –4: Stop at emergency stop torque, keeping dynamic braking state –3: Ramp to stop as defined by 6085h, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state	2	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state				
6060h	6060h	Servo drive mode	1: Profile position mode (pp) 3: Profile velocity mode (pv) 4: Profile torque mode (pt) 6: Homing mode (hm) 7: Interpolation mode (ip)	0	-	Real-time	
6061h	6061h	Operation mode display	1: Profile position mode (pp) 3: Profile velocity mode (pv) 4: Profile torque mode (pt) 6: Homing mode (hm) 7: Interpolation mode (ip)	0	-	Unchangeable	
6062h	6062h	Position reference	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
6063h	6063h	Position actual value	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
6064h	6064h	Position actual value	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
6065h	6065h	Following error window	0 to 4294967295	219895614	Reference unit	Real-time	
6066h	6066h	Defines the time lapse to trigger excessive position deviation (EB00.0).	0 ms–65535 ms	0	ms	Real-time	
6067h	6067h	Position window	0 to 4294967295	46976	Reference unit	Real-time	
6068h	6068h	Position window time	0 ms–65535 ms	0	ms	Real-time	
606Ch	606Ch	Actual speed	–2147483648 to +2147483647	0	Reference unit/s	Unchangeable	
606Dh	606Dh	Velocity window	0 RPM to 65535 RPM	10	rpm	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
606Eh	606Eh	Velocity window time	0 ms–65535 ms	0	ms	Real-time	
606Fh	606Fh	Zero speed signal threshold	0 RPM to 65535 RPM	10	rpm	Real-time	
6070h	6070h	Velocity threshold time	0 ms–65535 ms	0	ms	Real-time	
6071h	6071h	Target torque	-4000.%–4000.%	0	0.10%	Real-time	
6072h	6072h	Max. torque reference	0.%–4000.%	3500	0.10%	Real-time	
6074h	6074h	Torque reference	-4000.%–4000.%	0	0.10%	Unchangeable	
6077h	6077h	Actual torque	-4000.%–4000.%	0	0.10%	Unchangeable	
607Ah	607Ah	Target position	-2147483648 to 2147483647	0	Reference unit	Real-time	
607Ch	607Ch	Home offset	-2147483648 to 2147483647	0	Reference unit	Real-time	
607D.01h	607D-01h	Min. position limit	-2147483648 to 2147483647	-2147483648	Reference unit	Real-time	
607D.02h	607D-02h	Max. position limit	-2147483648 to 2147483647	2147483647	Reference unit	Real-time	
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time	
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time	
6081h	6081h	Profile velocity	0 to 4294967295	111848106	Reference unit/s	Real-time	
6083h	6083h	Profile acceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time	
6084h	6084h	Profile deceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
6085h	6085h	Quick stop deceleration	0 to 4294967295	2147483647	Reference unit/s²	Real-time	
6087h	6087h	Torque slope	0.%/s–4294967295.%/s	4294967295	0.1%/s	Real-time	
6091.01h	6091-01h	Motor resolution	1–4294967295	1	-	At stop	
6091.02h	6091-02h	Shaft resolution	1–4294967295	1	-	At stop	
6098h	6098h	Homing method	-3–35	1	-	Real-time	
6099.01h	6099-01h	Speed during search for switch	0 to 4294967295	111848106	Reference unit/s	At stop	
6099.02h	6099-02h	Speed during search for zero	0 to 4294967295	11184810	Reference unit/s	At stop	
609Ah	609Ah	Homing acceleration	0 to 4294967295	4294967295	Reference unit/s²	Real-time	
60B8h	60B8h	Touch probe function	0x0 to 0xFFFF	0x0	-	Real-time	
60B9h	60B9h	Touch probe status	0x0 to 0xFFFF	0x0	-	Unchangeable	
60BAh	60BAh	Touch probe 1 positive edge position value	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
60BBh	60BBh	Touch probe 1 negative edge position value	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
60BCh	60BCh	Touch probe 2 positive edge position value	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
60BDh	60BDh	Touch probe 2 negative edge	-2147483648 to 2147483647	0	Reference unit	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		position value					
60C1.01h	60C1-01h	Interpolation displacement	-2147483648 to 2147483647	0	Reference unit	Real-time	
60C2.01h	60C2-01h	Interpolation time period	1–20	1	-	Real-time	
60C2.02h	60C2-02h	Interpolation time units	-3–-3	-3	-	Real-time	
60C5h	60C5h	Max. acceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time	
60C6h	60C6h	Max. deceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time	
60D5h	60D5h	Touch probe 1 positive edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable	
60D6h	60D6h	Touch probe 1 negative edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable	
60D7h	60D7h	Touch probe 2 positive edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable	
60D8h	60D8h	Touch probe 2 negative edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable	
60E0h	60E0h	Positive torque limit	0.%–4000.%	3500	0.10%	Real-time	
60E1h	60E1h	Negative torque limit	0.%–4000.%	3500	0.10%	Real-time	
60F4h	60F4h	Position deviation	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
60FCh	60FCh	Position reference	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
60FDh	60FDh	DI state	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
60FFh	60FFh	PV target velocity	–2147483648 to +2147483647	0	Reference unit/s	Real-time	
60FE.01h	60FE-01h	Physical output	0x0 to 0xFFFFFFFF	0x0	-	Real-time	
60FE.02h	60FE-02h	Bitmask	0x0 to 0xFFFFFFFF	0x0	-	Real-time	

21 Description of Parameters [Standard P]

21.1 H00 Servo Motor Parameters

H00.00 Motor SN

Address:	2000-01h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	14102	Change:	At stop

Value Range:

20000: linear motor-pulse encoder
14203: linear motor-BiSS-C encoder
14206: linear motor-SSI encoder
14207: linear motor-EnDat2.2 encoder
14202: linear motor-Inovance communication 23-bit encoder
14205: linear motor-Inovance interpolator 23-bit encoder
20001: DDR motor-pulse encoder
14210: DDR motor-Inovance interpolator 23-bit encoder
14201: DDR motor-Inovance communication 23-bit encoder
14211: DDR motor-BiSS-C encoder
14212: DDR motor-EnDat2.2 encoder
14213: DDR motor-SSI encoder
20002: rotary motor-pulse encoder
14000: rotary motor-Inovance communication 20-bit encoder
14101: rotary motor-Inovance communication 23-bit encoder
14102: rotary motor-Inovance communication 26-bit encoder
14020: rotary motor-Harmonic 20-bit encoder-2.5M baud rate
14021: rotary motor-Harmonic 17-bit encoder-2.5M baud rate
14022: rotary motor-Harmonic 17-bit encoder-4M baud rate
14120: rotary motor-Nikon 20-bit encoder-2.5M baud rate
14121: rotary motor-Nikon 17-bit encoder-2.5M baud rate
14122: rotary motor-Nikon 17-bit encoder-4M baud rate
14130: rotary motor-TAMAGAWA 17-bit encoder
14131: rotary motor-TAMAGAWA 23-bit encoder
14140: rotary motor-EnDat2.2 encoder
14150: rotary motor-SSI encoder
14160: rotary motor-BiSS-C encoder

Description

20000: linear motor-pulse encoder
14203: linear motor-BiSS-C encoder
14206: linear motor-SSI encoder
14207: linear motor-EnDat2.2 encoder
14202: linear motor-Inovance communication 23-bit encoder
14205: linear motor-Inovance interpolator 23-bit encoder
20001: DDR motor-pulse encoder
14210: DDR motor-Inovance interpolator 23-bit encoder
14201: DDR motor-Inovance communication 23-bit encoder
14211: DDR motor-BiSS-C encoder
14212: DDR motor-EnDat2.2 encoder
14213: DDR motor-SSI encoder
20002: rotary motor-pulse encoder
14000: rotary motor-Inovance communication 20-bit encoder
14101: rotary motor-Inovance communication 23-bit encoder
14102: rotary motor-Inovance communication 26-bit encoder
14020: rotary motor-Harmonic 20-bit encoder-2.5M baud rate
14021: rotary motor-Harmonic 17-bit encoder-2.5M baud rate
14022: rotary motor-Harmonic 17-bit encoder-4M baud rate
14120: rotary motor-Nikon 20-bit encoder-2.5M baud rate
14121: rotary motor-Nikon 17-bit encoder-2.5M baud rate
14122: rotary motor-Nikon 17-bit encoder-4M baud rate
14130: rotary motor-TAMAGAWA 17-bit encoder
14131: rotary motor-TAMAGAWA 23-bit encoder
14140: rotary motor-EnDat2.2 encoder
14150: rotary motor-SSI encoder
14160: rotary motor-BiSS-C encoder

H00.02 Customized No.

Address:	2000-03h	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	42949672.95	Data Type:	UInt32
Default:	0.00	Change:	Unchangeable

Value Range:

0.00–42949672.95

Description

Differentiates the customized MCU software version, which is not applicable to standard models.

H00.04 Encoder version

Address:	2000-05h	Effective mode:	-
Min.:	0.0	Unit:	-

Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0–6553.5

Description

Saved in the encoder and used to differentiate the encoder software version.

H00.05 Serial-type motor code

Address:	2000-06h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Displays the code of the serial-type motor, which is determined by the motor model and unchangeable.

H00.06 FPGA customized SN

Address:	2000-07h	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:

0.00–655.35

Description

Differentiates the customized FPGA software version, which is not applicable to standard models.

H00.07 STO version

Address:	2000-08h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0–6553.5

Description

Display the software version number of STO function.

H00.08 **Bus encoder type**

Address:	2000-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
14100: Multi-turn absolute encoder
Others: Single-turn absolute encoder

H00.14 **Rated speed**

Address:	2000-0Fh	Effective mode:	Upon the next power-on
Min.:	50	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	3000	Change:	At stop

Value Range:
50[mm/s]/[rpm]–10000[mm/s]/[rpm]
Description
Set the motor rated speed.

H00.15 **Maximum speed**

Address:	2000-10h	Effective mode:	Upon the next power-on
Min.:	50	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	6000	Change:	At stop

Value Range:
50[mm/s]/[rpm]–10000[mm/s]/[rpm]
Description
Set the maximum motor speed.

H00.18 **Stator resistance**

Address:	2000-13h	Effective mode:	Upon the next power-on
Min.:	0.001	Unit:	Ω
Max.:	65.535	Data Type:	UInt16
Default:	0.500	Change:	At stop

Value Range:
0.001Ω to 65.535Ω

Description

Set the motor stator resistance.

H00.19 **Stator inductance Lq**

Address:	2000-14h	Effective mode:	Upon the next power-on
Min.:	0.01	Unit:	mH
Max.:	655.35	Data Type:	UInt16
Default:	3.27	Change:	At stop

Value Range:

0.01mH to 655.35mH

Description

Set the motor stator inductance Lq.

H00.20 **Stator inductance Ld**

Address:	2000-15h	Effective mode:	Upon the next power-on
Min.:	0.01	Unit:	mH
Max.:	655.35	Data Type:	UInt16
Default:	3.87	Change:	At stop

Value Range:

0.01mH to 655.35mH

Description

Set the motor stator inductance Ld.

H00.22 **Torque coefficient Kt**

Address:	2000-17h	Effective mode:	Upon the next power-on
Min.:	0.01	Unit:	[N/Arms]/[N·m/Arms]
Max.:	655.35	Data Type:	UInt16
Default:	0.51	Change:	At stop

Value Range:

0.01[N/Arms]/[N·m/Arms]–655.35[N/Arms]/[N·m/Arms]

Description

Set the motor torque coefficient Kt.

H00.40 **Motor control type**

Address:	2000-29h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0: General-purpose rotary motor (ROT)
1: Direct drive rotary motor (DDR)
2: Direct drive linear motor (DDL)
3: Voice coil motor (VOL)

Description

The motor type supported by the drive.
0: General-purpose rotary motor (ROT)
1: Direct drive rotary motor (DDR)
2: Direct drive linear motor (DDL)
3: Voice coil motor (VOL)

H00.41 **Master encoder configuration**

Address:	2000-2Ah	Effective mode:	
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Unchangeable

Value Range:
0: CN2
1: CN7

Description

Set the terminal for the master encoder.

H00.43 **Number of BiSS-C/SSI/EnDat2.2 data bits**

Address:	2000-2Ch	Effective mode:	Upon next power-on
Min.:	0	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	32	Change:	At stop

Value Range:
0 –40

Description

Defines the length of the data configured based on BiSS-C/SSI/EnDat2.2 protocol.

H00.44 **Number of BiSS-C/SSI fault bits**

Address:	2000-2Dh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:
0–31

Description

Defines the length of the fault configured based on BiSS-C/SSI protocol.

H00.45 **Encoder pitch 1**

Address:	2000-2Eh	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	[mm]/[deg]
Max.:	655.35	Data Type:	UInt16
Default:	2.00	Change:	At stop

Value Range:

0.00[mm]/[deg]–655.35[mm]/[deg]

Description

Defines the encoder pitch characteristics, which should be used together with encoder pitch fluctuation suppressor 1 (see details in H08.90).

H00.46 **Encoder pitch 2**

Address:	2000-2Fh	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	[mm]/[deg]
Max.:	655.35	Data Type:	UInt16
Default:	0.50	Change:	At stop

Value Range:

0.00[mm]/[deg]–655.35[mm]/[deg]

Description

Defines the encoder pitch characteristics, which should be used together with encoder pitch fluctuation suppressor 2 (see details in H08.90).

H00.47 **Encoder Type**

Address:	2000-30h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Optical scale

1: Magnetic scale

Description

Pulse Encoder type:

0: Optical scale

1: Magnetic scale

H00.48 **Linear motor pole pitch (N-S)**

Address:	2000-31h	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	mm
Max.:	655.35	Data Type:	UInt16
Default:	16.00	Change:	At stop

Value Range:

0.00 millimeters–655.35 millimeters

Description

Linear motor pole pitch.

H00.49 Direct drive motor encoder resolution

Address:	2000-32h	Effective mode:	Upon the next power-on
Min.:	0.000	Unit:	um/p
Max.:	65.535	Data Type:	UInt16
Default:	1.000	Change:	At stop

Value Range:

0.000um/p–65.535um/p

Description

Direct drive motor encoder resolution.

H00.54 BiSS-C/SSI CRC

Address:	2000-37h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0–1

Description

Defines the CRC polarity of the BiSS-C/SSI protocol.

0: Positive

1: Negative

H00.55 Rated torque (Uint32)

Address:	2000-38h	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	[N]/[N·m]
Max.:	42949672.95	Data Type:	UInt32
Default:	2.00	Change:	At stop

Value Range:

0.00[N]/[N·m]–42949672.95[N]/[N·m]

Description

Set the motor rated torque.

H00.57 Max. torque (Uint32)

Address:	2000-3Ah	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	[N]/[N·m]
Max.:	42949672.95	Data Type:	UInt32

Default: 7.00 Change: At stop

Value Range:

0.00[N]/[N·m]–42949672.95[N]/[N·m]

Description

Set the maximum motor torque.

H00.59 Encoder counting direction

Address: 2000-3Ch Effective mode: Upon the next power-on

Min.: 0 Unit: -

Max.: 65535 Data Type: UInt16

Default: 0 Change: At stop

Value Range:

0: Forward

1: Reverse

Description

Motor phase sequence:

0: Forward

1: Reverse

H00.63 Max. current (Uint32)

Address: 2000-40h Effective mode: Upon the next power-on

Min.: 0.00 Unit: A

Max.: 42949672.95 Data Type: UInt32

Default: 3.00 Change: At stop

Value Range:

0.00A–42949672.95A

Description

Set the maximum current.

H00.65 Rated current (Uint32)

Address: 2000-42h Effective mode: Upon the next power-on

Min.: 0.00 Unit: A

Max.: 42949672.95 Data Type: UInt32

Default: 1.00 Change: At stop

Value Range:

0.00A–42949672.95A

Description

Set the rated current.

H00.67 **Moment of inertia (Uint32)**

Address:	2000-44h	Effective mode:	Upon the next power-on
Min.:	0.00000	Unit:	[g]/[0.00001kg·cm²]
Max.:	42949.67295	Data Type:	UInt32
Default:	0.00001	Change:	At stop

Value Range:

0.00000[g]/[0.00001kg·cm²]–42949.67295[g]/[0.00001kg·cm²]

Description

Set the moment of inertia.

H00.69 **Linear back EMF coefficient (Uint32)**

Address:	2000-46h	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	[V/(m/s)]/[100mV/rpm]
Max.:	42949672.95	Data Type:	UInt32
Default:	33.00	Change:	At stop

Value Range:

0.00[V/(m/s)]/[100mV/rpm]–42949672.95[V/(m/s)]/[100mV/rpm]

Description

Set the Linear back EMF coefficient.

21.2 H01 Servo Drive Parameters

H01.00 **MCU software version**

Address:	2001-01h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0–6553.5

Description

Displays the MCU software version.

H01.01 **FPGA software version**

Address:	2001-02h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0–6553.5

Description

Display the FPGA software version.

H01.02 **Servo drive series No.**

Address:	2001-03h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display servo drive series number.

H01.06 **Board software version**

Address:	2001-07h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0~6553.5

Description

Display board software version.

H01.10 **Drive series No.**

Address:	2001-0Bh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	3	Change:	At stop

Value Range:

2: S1R6
3: S2R8
5: S5R5
6: S7R6
7: S012
8: S018
9: S022
10: S027
10001: T3R5
10002: T5R4
10003: T8R4
10004: T012
10005: T017
10006: T021
10007: T026

Description

Display the serial number of the drive.

2: S1R6
3: S2R8
5: S5R5
6: S7R6
7: S012
8: S018
9: S022
10: S027
10001: T3R5
10002: T5R4
10003: T8R4
10004: T012
10005: T017
10006: T021
10007: T026

H01.11 DC-AC voltage class

Address:	2001-0Ch	Effective mode:	-
Min.:	0	Unit:	V
Max.:	65535	Data Type:	UInt16
Default:	220	Change:	Unchangeable

Value Range:

0 V–65535 V

Description

Display DC-AC voltage class.

H01.12 Drive rated power

Address:	2001-0Dh	Effective mode:	-
Min.:	0.00	Unit:	kW
Max.:	42949672.95	Data Type:	UInt32
Default:	0.40	Change:	Unchangeable

Value Range:

0.00 kW–42949672.95kW

Description

Display drive rated power.

H01.14 Max. output power of the drive

Address:	2001-0Fh	Effective mode:	-
Min.:	0.00	Unit:	kW
Max.:	42949672.95	Data Type:	UInt32

Default:	0.40	Change:	Unchangeable

Value Range:

0.00 kW–42949672.95kW

Description

Display the maximum output power of the drive.

H01.16 Rated output current of the drive

Address:	2001-11h	Effective mode:	-
Min.:	0.00	Unit:	A
Max.:	42949672.95	Data Type:	UInt32
Default:	2.80	Change:	Unchangeable

Value Range:

0.00 A–42949672.95 A

Description

Display the rated output current of the drive.

H01.18 Max. output current of the drive

Address:	2001-13h	Effective mode:	-
Min.:	0.00	Unit:	A
Max.:	42949672.95	Data Type:	UInt32
Default:	10.10	Change:	Unchangeable

Value Range:

0.00 A–42949672.95 A

Description

Display the maximum output current of the drive.

H01.40 DC bus overvoltage protection threshold

Address:	2001-29h	Effective mode:	Real time
Min.:	0	Unit:	V
Max.:	2000	Data Type:	UInt16
Default:	420	Change:	Real-time

Value Range:

0 V–2000 V

Description

Display the DC bus overvoltage protection threshold.

H01.75 Current loop amplification factor

Address:	2001-4Ch	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:
0.00–655.35
Description
Display current loop amplification factor.

H01.88 Junction temperature parameter version 1

Address:	2001-59h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0–6553.5
Description
Displays version 1 of the junction temperature parameter.

H01.89 Junction temperature parameter version 2

Address:	2001-5Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Displays version 2 of the junction temperature parameter.

H01.90 Motor property mask

Address:	2001-5Bh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
The setpoint 1 indicates the bit function of H0060 is being masked.

21.3 H02 Basic Control Parameters

H02.00 **Control mode**

Address:	2002-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Speed control mode
1: Position control mode
2: Torque control mode
3: Torque/Speed control mode
4: Speed/Position control mode
5: Torque/Position control mode
6: Torque/Speed/Position compound mode
7: Process segment
8: CANopen mode

Description

Select the servo control mode.
0: Speed control mode
1: Position control mode
2: Torque control mode
3: Torque/Speed control mode
4: Speed/Position control mode
5: Torque/Position control mode
6: Torque/Speed/Position compound mode
7: Process segment
8: CANopen mode

H02.01 **Absolute system selection**

Address:	2002-02h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Incremental mode
1: Absolute position linear mode
2: Absolute position rotation mode
3: Absolute position linear mode (without encoder overflow alarm)
4: Absolute position single-turn mode

Description

Absolute system mode selection

0: Incremental mode

1: Absolute position linear mode

2: Absolute position rotation mode

3: Absolute position linear mode (without encoder overflow alarm)

4: Absolute position single-turn mode

H02.02 Rotation direction selection

Address:	2002-03h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

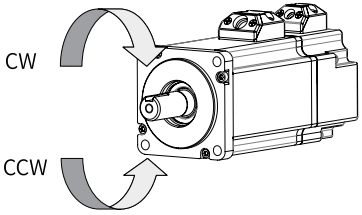
0: Counterclockwise (CCW) as forward direction

1: Clockwise (CW) as forward direction

Description

Defines the forward direction of the motor when viewed from the motor shaft side.

Value	Rotating direction	Remarks
0	Counterclockwise (CCW) as forward direction	Defines the CCW direction as the forward direction when a forward run command is received, indicating the motor rotates in the CCW direction when viewed from the motor shaft side.
1	Counterclockwise (CW) as forward direction	When a forward command is input, the motor rotates in CW direction viewed from the motor shaft side, that is, the motor rotates clockwise.



H02.03 Output pulse phase

Address:	2002-04h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

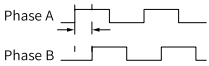
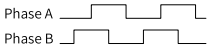
Value Range:

0: Phase A leads phase B

1: Phase A lags behind phase B

Description

Defines the relationship between phase A and phase B on the condition that the motor direction of rotation remains unchanged when pulse output is enabled.

Value	Output pulse phase	Remarks
0	Phase A leads phase B.	Phase A leads phase B by 90° in encoder frequency-division output pulses. 
1	Phase A lags phase B.	Phase A lags phase B by 90° in encoder frequency-division output pulses. 

H02.05 Stop mode at S-ON OFF

Address:	2002-06h	Effective mode:	At stop
Min.:	-4	Unit:	-
Max.:	2	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-4: Stop based on ramp 2, keeping dynamic braking state

-3: Stop at zero speed, keeping dynamic braking state

-2: Stop based on ramp 1, keeping dynamic braking state

-1: Dynamic braking stop, keeping dynamic braking state

0: Coast to stop, keeping de-energized state

1: Stop based on ramp 1, keeping de-energized state

2: Dynamic braking stop, keeping de-energized state

Description

Defines the deceleration mode of the motor for stopping rotating upon S-ON OFF and the motor status after stop.

–4: Stop based on ramp 2, keeping dynamic braking state

–3: Stop at zero speed, keeping dynamic braking state

–2: Stop based on ramp 1, keeping dynamic braking state

–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Stop based on ramp 1, keeping de-energized status
2: Dynamic braking stop, keeping de-energized state
Note: After the brake is enabled, H02.05 is forced to "4: Stop based on ramp 2, keeping dynamic braking state".

H02.06 Stop mode at No. 2 fault

Address:	2002-07h	Effective mode:	At stop
Min.:	-5	Unit:	-
Max.:	4	Data Type:	Int16
Default:	2	Change:	Real-time

Value Range:

-5: Stop at zero speed, keeping dynamic braking state
-4: Stop at emergency stop torque, keeping dynamic braking state
-3: Stop based on ramp 2, keeping dynamic braking state
-2: Stop based on ramp 1, keeping dynamic braking state
-1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Stop based on ramp 1, keeping de-energized state
2: Stop based on ramp 2, keeping de-energized state
3: Stop at emergency stop torque, keeping de-energized state
4: Dynamic braking stop, keeping de-energized state

Description

Defines the deceleration mode of the servo motor for stopping rotating and the servo motor status when a No. 2 fault occurs.
–5: Stop at zero speed, keeping dynamic braking state
–4: Stop at emergency stop torque, keeping dynamic braking state
–3: Stop based on ramp 2, keeping dynamic braking state
–2: Stop based on ramp 1, keeping dynamic braking state
–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Stop based on ramp 1, keeping de-energized state
2: Stop based on ramp 2, keeping de-energized stat
3: Stop at emergency stop torque, keeping de-energized state
4: Dynamic braking stop, keeping de-energized state
Note: If the brake is enabled, H02.06 is forced to "3: Stop based on ramp 2, keeping dynamic braking state".

H02.07 Stop mode at overtravel

Address:	2002-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16

Default:	1	Change:	At stop

Value Range:

0: Coast to stop, keeping de-energized state
1: Stop at zero speed, keeping position lock state
2: Stop at zero speed, keeping de-energized state
3: Stop based on ramp 2, keeping de-energized state
4: Stop based on ramp 2, keeping position lock state
5: Dynamic braking stop, keeping de-energized state
6: Dynamic braking stop, keeping dynamic braking state
7: Not responding to overtravel

Description

Defines the deceleration mode of the servo motor for stopping rotating and servo motor status when overtravel occurs.
0: Coast to stop, keeping de-energized state
1: Stop at zero speed, keeping position lock state
2: Stop at zero speed, keeping de-energized state
3: Stop based on ramp 2, keeping de-energized state
4: Stop based on ramp 2, keeping position lock state
5: Dynamic braking stop, keeping de-energized state
6: Dynamic braking stop, keeping dynamic braking state
7: Not responding to overtravel
When H02.07 is set to 7 (Not responding to overtravel), some PLC may stop sending position references to stop the drive.
Note: After the brake function is enabled, H02.07 will be forcibly set to "4: Ramp to stop as defined by 6085h, keeping position lock state".

H02.08 Stop mode at No.1 fault

Address:	2002-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0: Coast to stop, keeping de-energized state
1: Dynamic braking stop, keeping de-energized state
2: Dynamic braking stop, keeping dynamic braking state

Description

Defines the deceleration mode of the servo motor for stopping rotating and the servo motor status when a No. 1 fault occurs.
0: Coast to stop, keeping de-energized state
1: Dynamic braking stop, keeping de-energized status
2: Dynamic braking stop, keeping de-energized state
Note: After the brake is enabled, H02.08 is forced to "2: Dynamic braking stop, keeping dynamic braking state".

H02.09 **Delay from brake output ON to command received**

Address:	2002-0Ah	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	500	Data Type:	UInt16
Default:	250	Change:	Real-time

Value Range:

0 ms–500 ms

Description

Defines the delay from the moment the brake output signal is ON to the moment the servo drive starts to receive commands after power-on.

H02.10 **Delay from brake output OFF to motor de-energized**

Address:	2002-0Bh	Effective mode:	Real time
Min.:	50	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	150	Change:	Real-time

Value Range:

50 ms–1000 ms

Description

Defines the delay from the moment brake output is OFF to the moment when the motor at standstill enters the de-energized status.

H02.11 **Motor speed threshold at brake output OFF in rotation state**

Address:	2002-0Ch	Effective mode:	Real time
Min.:	20	Unit:	[mm/s]/[rpm]
Max.:	3000	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:

20[mm/s]/[rpm]–3000[mm/s]/[rpm]

Description

Defines the motor speed threshold when brake (BK) output is OFF in the rotating state.

H02.12 **Delay from S-ON OFF to brake output OFF in rotation state**

Address:	2002-0Dh	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.:	65535	Data Type:	UInt16

Default:	500	Change:	Real-time

Value Range:

1 ms–65535 ms

Description

Sets the delay time from BK OFF to S-ON OFF when the motor is in rotating state.

H02.15 LED Alarm Display

Address:	2002-10h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output alarm information immediately

1: Not output alarm information

Description

Defines whether to switch the keypad to the fault display mode when a No. 3 fault occurs.

0: Output alarm information immediately

1: Not output alarm information

H02.16 Brake enable switch

Address:	2002-11h	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: OFF

1: ON

Description

Turn on or off the brake function.

0: OFF

1: ON

If H00.98 ⩾ A502, and the hardware of both the motor and servo drive support brake holding, H02.16 will be forced to be set to 1； If the motor does not support the brake holding function, even if drive supports the brake holding, H02.16 will be forced to be set to 0. If H00.98 < A502, the servo drive cannot obtain whether the motor supports brake holding. If the servo drive supports brake holding, the function can be turned on by setting H02.16 = 1. If the servo drive does not support the function, you can open the brake by configuring the DO brake function.

H02.17 Stop mode upon main circuit power failure

Address:	2002-12h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0: Keep current action

1: Stop upon fault as defined by H02.06

2: Stop at S-ON OFF as defined by H02.05

3: Stop quickly as defined by H02.18

Description circuit

Defines the stop mode of the motor for stopping rotating upon main power failure.

0: Keep current action

1: Stop upon fault as defined by H02.06

2: Stop at S-ON OFF as defined by H02.05

3: Stop quickly as defined by H02.18

H02.18 Quick stop mode

Address:	2002-13h	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0: Coast to stop, keeping de-energized state

1: Stop by ramp 1, keeping de-energized state

2: Stop by ramp 2, keeping de-energized state

3: Stop at emergency stop torque, keeping de-energized state

5: Stop by ramp 1, keeping position lock state

6: Stop by ramp 2, keeping position lock state

7: Stop at emergency stop torque, keeping position lock state

Description

Defines the deceleration mode of the motor for stopping rotating upon quick stop and the motor status after stop.
0: Coast to stop, keeping de-energized state
1: Stop based on ramp 1, keeping de-energized state

2: Ramp based on ramp 2, keeping de-energized state
3: Stop at emergency stop torque, keeping de-energized state
5: Stop based on ramp 1, keeping position lock state
6: Stop based on ramp 2, keeping position lock state
7: Stop at emergency stop torque, keeping position lock state
Note: When the brake function is enabled and the value of H02.18 is lower than 4, the stop mode is forcibly set to "2: Ramp to stop as defined by 6085h, keeping de-energized state".

H02.21 Permissible minimum resistance of braking resistor

Address:	2002-16h	Effective mode:	-
Min.:	1	Unit:	Ω
Max.:	1000	Data Type:	UInt16
Default:	40	Change:	Unchangeable

Value Range:
1Ω to 1000Ω
Description
The permissible minimum resistance of the braking resistor is only related to the servo drive model.

H02.22 Power of built-in braking resistor

Address:	2002-17h	Effective mode:	-
Min.:	0	Unit:	W
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Unchangeable

Value Range:
0W–65535W
Description
The power of the built-in braking resistor is only related to the servo drive model, which is unmodifiable.

H02.23 Resistance of built-in braking resistor

Address:	2002-18h	Effective mode:	-
Min.:	0	Unit:	Ω

Max.: 65535 Data Type: UInt16
Default: 50 Change: Unchangeable

Value Range:

0Ω to 65535Ω

Description

The resistance of the built-in braking resistor is only related to the servo drive model, which is unmodifiable.

Table 2–1 Specifications of the braking resistor

Servo Drive Model	Specifications of Built-in Braking Resistor			Min. Permissible Resistance of External Braking Resistor (Ω) (H02.21)
	Resistance (Ω)	Power (Pr) (W)	Processing Power (Pa) (W)	
SV680*S1R6I-*INT	-	-	-	40
SV680*S2R8I-*INT	-	-	-	
SV680*S5R5I-*INT	50	50	40	
SV680*S7R6I-*INT	25	80	64	20
SV680*S012I-*INT				15
SV680*S018I-*INT	20	100	80	20
SV680*S022I-*INT				
SV680*S027I-*INT				
SV680*T5R4I-*INT	100	80	64	60
SV680*T8R4I-*INT	50			45
SV680*T012I-*INT				40
SV680*T017I-*INT	35	100	80	35
SV680*T021I-*INT				25
SV680*T026I-*INT				

H02.24 Resistor heat dissipation coefficient

Address: 2002-19h Effective mode: Real time
Min.: 10 Unit: %
Max.: 100 Data Type: UInt16
Default: 30 Change: Real-time

Value Range:

10% to 100%

Description

Defines the heat dissipation coefficient of the braking resistor, which is applicable to both external and built-in braking resistors.

Set this parameter properly according to actual heat dissipation conditions of the resistor.

Recommendations:

Generally, the value of H02.24 cannot exceed 30% for natural cooling.

The value of H02.24 cannot exceed 50% for forced air cooling.

H02.25 Braking resistor type

Address:	2002-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:

0: Built-in

1: External, natural cooling

2: External, forced air cooling

3: No resistor needed

Description

Defines the resistor type and the mode of absorbing and releasing the braking energy.

0: Built-in

1: External, natural cooling

2: External, forced air cooling

3: No resistor needed

H02.26 Power of external braking resistor

Address:	2002-1Bh	Effective mode:	Real time
Min.:	1	Unit:	W
Max.:	65535	Data Type:	UInt16
Default:	40	Change:	Real-time

Value Range:

1 W–65535W

Description

Defines the power of external braking resistor.

H02.27 Resistance of external braking resistor

Address:	2002-1Ch	Effective mode:	Real time
Min.:	15	Unit:	Ω
Max.:	1000	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

15Ω to 1000Ω

Description

Defines the resistance of the external braking resistor.

H02.28 Parameters Initialization

Address:	2002-1Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Parameters in group H02 and above initialized

1: Parameters in group H00, H02 and above initialized

2: All parameters initialized (default values used for model-related parameters)

Description

Settings of factory restore.

0: Parameters in group H02 and above initialized

1: Parameters in group H00, H02 and above initialized

2: All parameters initialized (default values used for model-related parameters)

H02.30 User password

Address:	2002-1Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

Set the user password.

H02.31 System parameter initialization

Address:	2002-20h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Restore default settings

2: Clear fault records

Description

Used to restore default values or clear fault records.

0: No operation

1: Restore default settings

2: Clear fault records

H02.32 Selection of parameters in group H0b

Address:	2002-21h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0–99

Description

Sets the offset of H0b parameters to be displayed on the operating panel.

For example, the setpoint 0 indicates the value of H0b.00 (Motor speed actual value) is displayed on the keypad.

The setpoint 1 indicates the value of H0b.01 is displayed on the operating panel.

H02.35 Keypad data update frequency

Address:	2002-24h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	20	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 Hz–20 Hz

Description

Set the keypad data update frequency.

H02.38 Overload time of external resistor

Address:	2002-27h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	s
Max.:	200	Data Type:	UInt16
Default:	40	Change:	Real-time

Value Range:

0s to 200s

Description

Set the overload time threshold of the external braking resistor.

H02.41 Manufacturer password

Address:	2002-2Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

You need to input this manufacturer password to enable the access to protected manufacturer parameters.

H02.47 Delay time from power cable breakage to brake OFF

Address:	2002-30h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–1000 ms

Description

Sets the delay time from power cable breakage to brake OFF.

21.4 H03 Terminal Input Parameters

H03.00 DI function allocation 1 (activated upon power-on)

Address:	2003-01h	Effective mode:	Upon the next power-on
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0: 0x00: Corresponding to null
1: 0x01: Corresponding to FunIN.1
2: 0x02: Corresponding to FunIN.2
4: 0x04: Corresponding to FunIN.3
8: 0x08: Corresponding to FunIN.4
16: 0x10: Corresponding to FunIN.5
32: 0x20: Corresponding to FunIN.6
64: 0x40: Corresponding to FunIN.7
128: 0x80: Corresponding to FunIN.8
256: 0x100: Corresponding to FunIN.9
512: 0x200: Corresponding to FunIN.10
1024: 0x400: Corresponding to FunIN.11
2048: 0x800: Corresponding to FunIN.12
4096: 0x1000: Corresponding to FunIN.13
8192: 0x2000: Corresponding to FunIN.14
16384: 0x4000: Corresponding to FunIN.15
32768: 0x8000: Corresponding to FunIN.16

Description

Used to enable a certain DI function (FunIN.1 to FunIN.16) to be activated immediately at next power-on.

H03.01 **DI function allocation 2 (activated upon power-on)**

Address:	2003-02h	Effective mode:	Upon the next power-on
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0: 0x00: Corresponding to null
1: 0x01: Corresponding to FunIN.17
2: 0x02: Corresponding to FunIN.18
4: 0x04: Corresponding FunIN.19
8: 0x08: Corresponding FunIN.20
16: 0x10: Corresponding FunIN.21
32: 0x20: Corresponding FunIN.22
64: 0x40: Corresponding FunIN.23
128: 0x80: Corresponding FunIN.24
256: 0x100: Corresponding FunIN.25
512: 0x200: Corresponding FunIN.26
1024: 0x400: Corresponding FunIN.27
2048: 0x800: Corresponding FunIN.28
4096: 0x1000: Corresponding FunIN.29
16384: 0x4000: Corresponding FunIN.31
32768: 0x8000: Corresponding FunIN.32

Description

Used to enable a certain DI function (FunIN.17 to FunIN.32) to be activated immediately at next power-on.

H03.02 **DI1 function**

Address:	2003-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	14	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands

5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
38: Touch probe 1
39: Touch probe 2
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
45: Interrupt positioning enable
46: Process segment enable
47: Process segment command switchover 1

48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of DI1.

H03.03 DI1 logic selection

Address:	2003-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Used to set the level logic of DI1 when the function assigned to DI is active.

H03.04 DI2 function

Address:	2003-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	15	Change:	Real-time

Value Range:

0: Undefined
1: Servo enabled
2: Alarm reset signal
3: Gain changeover switch
4: Main and auxiliary operation command switching
5: Multi-segment running command direction selection
6: Multi-segment operation command switching CMD1
7: Multi-segment operation command switching CMD2
8: Multi-segment operation command switching CMD3
9: Multi-segment operation command switching CMD4

10: Mode switching M 1 - SEL
11: Mode switching M2-SEL
12: Zero fixed enable signal
13: Position command prohibited
14: Forward overtravel switch
15: Reverse overtravel switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enabled
21: Handwheel ratio signal 1
22: Handwheel ratio signal 2
23: Handwheel enable signal
24: Electronic gear selection
25: Torque command direction setting
26: Speed command direction setting
27: Position command direction setting
28: Multi-segment position command enabled
29: Interrupt positioning state release signal
31: Home switch
32: Homing enabled
33: Interrupt positioning prohibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse command prohibited
38: Probe 1
39: Probe 2
40: Multi-segment speed enabled
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completion signal clear
45: Interrupt positioning enabled
46: Process segment enabled
47: Process segment command switching 1
48: Process segment command switching 2
49: Process segment command switching 3
50: Process segment command switching 4
51: Event trigger process segment 1
52: Event trigger process segment 2

53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment suspended
56: Gantry torque alignment
57: Gantry DI alignment enabled
58: Gantry DI alignment clear
59: Gantry synchronization enabled

Description

Defines the function of DI2.

H03.05 **DI2 logic selection**

Address:	2003-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Set the DI2 logic when the DI function allocated to DI2 is enabled.

H03.06 **DI3 function**

Address:	2003-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	13	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited

14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
38: Touch probe 1
39: Touch probe 2
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
45: Interrupt positioning enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment

57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of DI3.

H03.07 DI3 logic selection

Address:	2003-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Set the DI3 logic when the DI function allocated to DI3 is enabled.

H03.08 DI4 function

Address:	2003-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit

18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
38: Touch probe 1
39: Touch probe 2
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
45: Interrupt positioning enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of DI4.

H03.09 DI4 logic selection

Address:	2003-0Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open

1: Closed

Description

Set the DI4 logic when the DI function allocated to DI4 is enabled.

H03.10 DI5 function

Address:	2003-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: No assignment

1: Servo ON

2: Alarm reset signal

3: Gain switchover switch

4: Switchover of main and auxiliary commands

5: Multi-reference direction

6: Multi-reference switchover CMD1

7: Multi-reference switchover CMD2

8: Multi-reference switchover CMD3

9: Multi-reference switchover CMD4

10: Mode switchover M1-SEL

11: Mode switchover M2-SEL

12: Zero clamp enable signal

13: Position command inhibited

14: Positive limit switch

15: Negative limit switch

16: Positive external torque limit

17: Negative external torque limit

18: Forward jog

19: Reverse jog

20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
38: Touch probe 1
39: Touch probe 2
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
45: Interrupt positioning enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of DI5.

H03.11 **DI5 logic selection**

Address:	2003-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open

1: Closed

Description

Set the DI5 logic when the DI function allocated to DI5 is enabled.

H03.12 **DI6 function**

Address:	2003-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment

1: Servo ON

2: Alarm reset signal

3: Gain switchover switch

4: Switchover of main and auxiliary commands

5: Multi-reference direction

6: Multi-reference switchover CMD1

7: Multi-reference switchover CMD2

8: Multi-reference switchover CMD3

9: Multi-reference switchover CMD4

10: Mode switchover M1-SEL

11: Mode switchover M2-SEL

12: Zero clamp enable signal

13: Position command inhibited

14: Positive limit switch

15: Negative limit switch

16: Positive external torque limit

17: Negative external torque limit

18: Forward jog

19: Reverse jog

20: Step enable

21: Handwheel override signal 1

22: Handwheel override signal 2

23: Handwheel enable signal

24: Electronic gear

25: Torque reference direction

26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
38: Touch probe 1
39: Touch probe 2
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
45: Interrupt positioning enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable
Description
Defines the function of DI6.

H03.13 **DI6 logic selection**

Address:	2003-0Eh	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed
Description
Set the DI6 logic when the DI function allocated to DI6 is enabled.

H03.14 **DI7 function**

Address:	2003-0Fh	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	45	Change:	Real-time

Value Range:
0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch

32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
38: Touch probe 1
39: Touch probe 2
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
45: Interrupt positioning enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable
Description
Defines the function of DI7.

H03.15 DI7 logic selection

Address:	2003-10h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Set the DI7 logic when the DI function allocated to DI7 is enabled.

H03.16 **DI8 function**

Address:	2003-11h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	31	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited

38: Touch probe 1
39: Touch probe 2
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
45: Interrupt positioning enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable
Description
Defines the function of DI8.

H03.17 DI8 logic selection

Address:	2003-12h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Normally open
1: Closed
Description
Set the DI8 logic when the DI function allocated to DI8 is enabled.

H03.34 DI function allocation 3 (activated upon power-on)

Address:	2003-23h	Effective mode:	Upon next power-on
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0: 0x00: Corresponding to null
1: 0x01: Corresponding to FunIN.33
2: 0x02: Corresponding to FunIN.34
4: 0x04: Corresponding to FunIN.35
8: 0x08: Corresponding to FunIN.36
16: 0x10: Corresponding to FunIN.37
32: 0x20: Corresponding to FunIN.38
64: 0x40: Corresponding to FunIN.39
128: 0x80: Corresponding to FunIN.40
256: 0x100: Corresponding to FunIN.41
512: 0x200: Corresponding to FunIN.42
1024: 0x400: Corresponding to FunIN.43
2048: 0x800: Corresponding to FunIN.44
4096: 0x1000: Corresponding to FunIN.45
8192: 0x2000: Corresponding to FunIN.46
16384: 0x4000: Corresponding to FunIN.47
32768: 0x8000: Corresponding to FunIN.48

Description

Used to enable a certain DI function (FunIN.33 to FunIN.37) to be activated immediately at next power-on.

H03.35 DI function allocation 4 (activated upon power-on)

Address:	2003-24h	Effective mode:	Upon next power-on
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0: 0x00: Corresponding to null
1: 0x01: Corresponding to FunIN.49
2: 0x02: Corresponding to FunIN.50
4: 0x04: Corresponding FunIN.51
8: 0x08: Corresponding FunIN.52
16: 0x10: Corresponding FunIN.53
32: 0x20: Corresponding FunIN.54
64: 0x40: Corresponding FunIN.55
128: 0x80: Corresponding FunIN.56
256: 0x100: Corresponding FunIN.57
512: 0x200: Corresponding FunIN.58
1024: 0x400: Corresponding FunIN.59
2048: 0x800: Corresponding FunIN.60
4096: 0x1000: Corresponding FunIN.61
8192: 0x2000: Corresponding FunIN.62
16384: 0x4000: Corresponding FunIN.63

Description
Used to enable a certain DI function (FunIN.49 to FunIN.64) to be activated immediately at next power-on.

H03.50 Voltage-type AI1 offset

Address:	2003-33h	Effective mode:	Real-time
Min.:	-5000	Unit:	mV
Max.:	5000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:
-5000mV –5000mV

Description
Defines the actual AI1 input voltage when the drive sampling voltage is 0 after zero drift correction.

H03.51 Voltage-type AI1 input filter time constant

Address:	2003-34h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	655.35	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:
0.00 ms–655.35 ms

Description
It sets the filter time constant of voltage signal input from AI1.
Set this parameter properly to avoid motor reference fluctuation caused by unstable analog voltage input and reduce motor misoperation caused by interference signals.
The filter function cannot eliminate or suppress zero drift or dead zone.

H03.53 Voltage-type AI1 dead zone

Address:	2003-36h	Effective mode:	Real time
Min.:	0.0	Unit:	mV
Max.:	1000.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:
0.0 mV–1000.0 mV

Description
Defines the AI1 input voltage range when the drive sampling voltage is 0.

H03.54 Voltage-type AI1 zero drift

Address:	2003-37h	Effective mode:	Real-time

Min.:	-500.0	Unit:	mV
Max.:	500.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:

-500.0mV –500.0mV

Description

Zero drift refers to the value of the drive o sampling voltage relative to GND upon zero AI voltage.
Set H0d.10 to 1 (AI1 adjustment) to perform automatic adjustment on AI1 zero drift. The adjusted AI1 zero drift will be saved into H03.54.

H03.55 Voltage-type AI2 offset

Address:	2003-38h	Effective mode:	Real time
Min.:	-5000	Unit:	mV
Max.:	5000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-5000 mV–5000 mV

Description

Defines the actual AI2 input voltage when the drive sampling voltage is 0 after zero drift correction.

H03.56 Voltage-type AI2 input filter time constant

Address:	2003-39h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	655.35	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:

0.00 ms–655.35 ms

Description

It sets the filter time constant of voltage signal input from AI2.

Set this parameter properly to avoid motor reference fluctuation caused by unstable analog voltage input and reduce motor misoperation caused by interference signals.

The filter function cannot eliminate or suppress zero drift or dead zone.

H03.58 Voltage-type AI2 dead zone

Address:	2003-3Bh	Effective mode:	Real-time
Min.:	0.0	Unit:	mV
Max.:	1000.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:
0.0mV –1000.0mV
Description
Defines the AI2 input voltage range when the drive sampling voltage is 0.

H03.59 **Voltage-type AI2 zero drift**

Address:	2003-3Ch	Effective mode:	Real-time
Min.:	-500.0	Unit:	mV
Max.:	500.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:
-500.0mV –500.0mV
Description
Zero drift refers to the value of the drive o sampling voltage relative to GND upon zero AI voltage.
Set H0d.10 to 2 (AI2 adjustment) to perform automatic adjustment on AI2 zero drift. The adjusted AI2 zero drift will be saved into H03.59.

H03.60 **DI1 fitter time**

Address:	2003-3Dh	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:
0.00ms –500.00ms
Description
Defines the filter time of DI1. The DI function is active only after the effective level is kept within the time defined by H03.60.

H03.61 **DI2 fitter time**

Address:	2003-3Eh	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:
0.00 ms–500.00 ms
Description
Defines the filter time of DI2. The DI function is active only after the effective level is kept within the time defined by H03.61.

H03.62 **DI3 fitter time**

Address:	2003-3Fh	Effective mode:	Real time

Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:

0.00 ms–500.00 ms

Description

Defines the filter time of DI3. The DI function is active only after the effective level is kept within the time defined by H03.62.

H03.63 **DI4 fitter time**

Address:	2003-40h	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:

0.00ms –500.00ms

Description

Defines the filter time of DI4. The DI function is active only after the effective level is kept within the time defined by H03.63.

H03.64 **DI5 fitter time**

Address:	2003-41h	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:

0.00ms –500.00ms

Description

Defines the filter time of DI5. The DI function is active only after the effective level is kept within the time defined by H03.64.

H03.65 **DI6 fitter time**

Address:	2003-42h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:

0.00 ms–500.00 ms

Description

Defines the filter time of DI6. The DI function is active only after the effective level is kept within the time defined by H03.65.

H03.66 **DI7 fitter time**

Address:	2003-43h	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	0.00	Change:	Real-time

Value Range:

0.00ms –500.00ms

Description

Defines the filter time of DI7. The DI function is active only after the effective level is kept within the time defined by H03.66.

H03.67 **DI8 fitter time**

Address:	2003-44h	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:

0.00ms –500.00ms

Description

Defines the filter time of DI8. The DI function is active only after the effective level is kept within the time defined by H03.67.

H03.80 **Speed corresponding to analog 10 V**

Address:	2003-51h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	3000	Change:	At stop

Value Range:

0[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the corresponding motor speed when the sampling voltage is 10 V.

Speed reference value = Sampling voltage/10 x H03.80

H03.81 **Torque corresponding to analog 10 V**

Address:	2003-52h	Effective mode:	Real-time
Min.:	0.00	Unit:	Multiplier
Max.:	8.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:

0.00 –8.00

Description

Defines the motor torque corresponding to a sampling voltage of 10 V.
Torque reference value = Sampling voltage/10 × H03.81

21.5 H04 Terminal Output Parameters

H04.00 **DO1 function**

Address:	2004-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
25: Comparison DO
26: Closed-loop state
27: Left limit
28: Right limit
30: Alarm or fault output
31: Communication-forced DO
32: EDM output
33: Gantry alignment

Description

Defines the function of DO1.

H04.01 **DO1 logic selection**

Address:	2004-02h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Defines the level logic of DO1 when the function assigned to DO1 is active.

H04.02 **DO2 function**

Address:	2004-03h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	5	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
25: Comparison DO
26: Closed-loop state
27: Left limit
28: Right limit
30: Alarm or fault output

31: Communication-forced DO
32: EDM output
33: Gantry alignment

Description

Defines the function of DO2.

H04.03 DO2 logic selection

Address:	2004-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Defines the level logic of DO2 when the function assigned to DO2 is active.

H04.04 DO3 function

Address:	2004-05h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed

22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
25: Comparison DO
26: Closed-loop state
27: Left limit
28: Right limit
30: Alarm or fault output
31: Communication-forced DO
32: EDM output
33: Gantry alignment

Description

Defines the function of DO3.

H04.05 **DO3 logic selection**

Address:	2004-06h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Defines the level logic of DO3 when the function assigned to DO3 is active.

H04.06 **DO4 function**

Address:	2004-07h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	11	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning

11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
25: Comparison DO
26: Closed-loop state
27: Left limit
28: Right limit
30: Alarm or fault output
31: Communication-forced DO
32: EDM output
33: Gantry alignment

Description

Defines the function of DO4.

H04.07 DO4 logic selection

Address:	2004-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Defines the level logic of DO4 when the function assigned to DO4 is active.

H04.08 DO5 function

Address:	2004-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	16	Change:	Real-time

Value Range:

0: No function
1: Servo ready

2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
25: Comparison DO
26: Closed-loop state
27: Left limit
28: Right limit
30: Alarm or fault output
31: Communication-forced DO
32: EDM output
33: Gantry alignment

Description

Defines the function of DO5.

H04.09 DO5 logic selection

Address:	2004-0Ah	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Defines the level logic of DO5 when the function assigned to DO5 is active.

H04.22 **DO source selection**

Address:	2004-17h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: DO1
0: DO1 function output
1: bit0 of H31.04
bit1: DO2
0: DO2 function output
1: bit1 of H31.04
bit2: DO3
0: DO3 function output
1: bit2 of H31.04
bit3: DO4
0: DO4 function output
1: bit3 of H31.04
bit4: DO5
0: DO5 function output
1: bit4 of H31.04

Description

Defines whether the logic of a physical DO terminal is defined by the actual state of the drive or by communication.
The value of H04.22 is displayed in decimal on the keypad. When the value is converted to a binary equivalent: If bit(n) is 0, it indicates the logic of DO(n+1) is defined by the actual state of the drive. If bit(n) is 1, it indicates the logic of DO (n+1) is defined by communication (H31.04).

Setpoint (decimal)	Setpoint (binary)					DO logic	
	bit4	bit3	bit2	bit1	bit0	Defined by the Drive State	Defined by Communication (H31.04)
	DO5	DO4	DO3	DO2	DO1		
0	0	0	0	0	0	DO1–DO5	N/A
1	0	0	0	0	1	DO2–DO5	DO1
…	…	…	…	…	…	…	…
31	1	1	1	1	1	N/A	DO1–DO5

Set H04.22 to a value listed in the preceding table.
H31.04 is not displayed on the keypad and can only be modified through communication. For H31.04, "bit(n) = 1" indicates the logic of DO(n+1) is active. "bit(n) = 0" indicates the logic of DO(n+1) is inactive.

H04.23 **Communication-forced DO logic in non-OP status**

Address:	2004-18h	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	31	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: DO1
0: Status unchanged
1: No output
bit1: DO2
0: Status unchanged
1: No output
bit2: DO3
0: Status unchanged
1: No output
bit3: DO4
0: Status unchanged
1: No output
bit4: DO5
0: Status unchanged
1: No output

Description

Sets DO state upon communication failure.

H04.24 **DO brake enable**

Address:	2004-19h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled
1: Enabled

Description

0: You can only control the motor brake through the built-in brake terminal even if the DO brake function is available.
1: The DO brake function must be available.
Note: This function is not available for functional safety models.

H04.50 **AO1 signal selection**

Address:	2004-33h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Motor speed (1 V/1000 [mm/s]/[rpm])
1: Speed reference (1 V/1000 [mm/s]/[rpm])
2: Torque reference (1 V/100 x rated torque)

3: Position deviation (0.5 mV/1 reference unit)
4: Position deviation (0.5 mV/1 encoder unit)
5: Position reference speed (1 V/1000 [mm/s]/[rpm])
6: Positioning completed
8: AI1 voltage
9: AI2 voltage
10: Defined by H31.05

Description

Defines the physical value source of AO1.
0: Motor speed (1 V/1000 [mm/s]/[rpm])
1: Speed reference (1 V/1000 [mm/s]/[rpm])
2: Torque reference (1 V/100 x rated torque)
3: Position deviation (0.5 mV/1 reference unit)
4: Position deviation (0.5 mV/1 encoder unit)
5: Position reference speed (1 V/1000 [mm/s]/[rpm])
6: Positioning completed
8: AI1 voltage
9: AI2 voltage
10: Defined by H31.05

H04.51 AO1 offset voltage

Address:	2004-34h	Effective mode:	Real time
Min.:	-10000	Unit:	mV
Max.:	10000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-10000 mV–10000 mV

Description

Defines the actual AO1 output voltage after offset when the output voltage is 0 V in theory.

H04.52 AO1 ratio

Address:	2004-35h	Effective mode:	Real-time
Min.:	-99.99	Unit:	-
Max.:	99.99	Data Type:	Int16
Default:	1.00	Change:	Real-time

Value Range:

-99.99 –99.99

Description

Defines the actual AO1 output voltage after amplification when the output voltage is 1V in theory.

21.6 H05 Position Control Parameters

H05.00 **Primary position reference source**

Address:	2005-01h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Pulse reference
1: Step reference
2: Multi-position reference

Description

Defines the position reference source in position control mode.
0: Pulse reference
1: Step reference
2: Multi-position reference

H05.01 **Position pulse reference input terminal**

Address:	2005-02h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Low speed
1: High speed

Description

Used to select the physical input terminal based on the input pulse frequency when the pulse reference acts as the position reference source in the position control mode.
0: Low speed
1: High speed

H05.02 **Pulses per revolution**

Address:	2005-03h	Effective mode:	Upon next power-on
Min.:	0	Unit:	[P/N-N]/[P/Rev]
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	At stop

Value Range:

0 –4294967295

Description

Defines the number of pulses required per revolution of the motor.

H05.04 **First-order low-pass filter time constant**

Address:	2005-05h	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	At stop

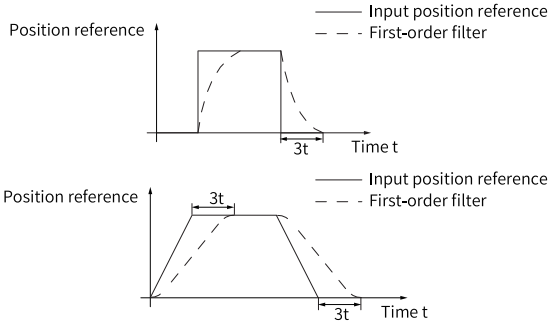
Value Range:

0.0 ms–6553.5 ms

Description

Defines the first-order low pass filter time constant of position references.

If position reference P is rectangular wave or trapezoidal wave, the position reference after first-order low pass filtering is as follows:



This function does not affect the displacement value (position reference sum). An excessively high setpoint delays the responsiveness, so set a proper filter time constant based on actual conditions.

H05.05 **Step amount**

Address:	2005-06h	Effective mode:	Real-time
Min.:	-9999	Unit:	Reference unit
Max.:	9999	Data Type:	Int16
Default:	50	Change:	At stop

Value Range:

-9999 to +9999

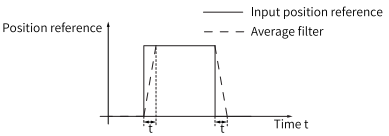
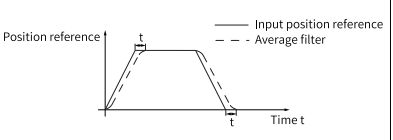
Description

Defines the position reference sum when the step reference acts as the main position reference source.

H05.06 **Moving average filter time constant 1**

Address:	2005-07h	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	128.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:
0.0ms –128.0ms
Description
Defines the moving average filter time constant of position references. If position reference P is rectangular wave or trapezoidal wave, the position reference after moving average filtering is as follows. This function does not affect the displacement value (position reference sum). An excessively high setpoint delays the responsiveness, so set a proper filter time constant based on actual conditions.

Position reference being rectangular wave	Position reference being trapezoidal wave
	

H05.07 **Electronic gear ratio 1 (numerator)**

Address:	2005-08h	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	1073741824	Data Type:	UInt32
Default:	67108864	Change:	Real-time

Value Range:
1 –1073741824
Description
Defines the numerator of electronic gear ratio 1.

H05.09 **Electronic gear ratio 1 (denominator)**

Address:	2005-0Ah	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	1073741824	Data Type:	UInt32
Default:	10000	Change:	Real-time

Value Range:
1 –1073741824
Description
Defines the denominator of electronic gear ratio 1.

H05.11 **Electronic gear ratio 2 (numerator)**

Address:	2005-0Ch	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	1073741824	Data Type:	UInt32
Default:	67108864	Change:	Real-time

Value Range:
1–1073741824

Description

Defines the numerator of electronic gear ratio 2.

H05.13 **Electronic gear ratio 2 (denominator)**

Address:	2005-0Eh	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	1073741824	Data Type:	UInt32
Default:	10000	Change:	Real-time

Value Range:

1 –1073741824

Description

Defines the denominator of electronic gear ratio 2.

H05.15 **Pulse reference form**

Address:	2005-10h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Direction + Pulse, positive logic

1: Direction + Pulse, negative logic

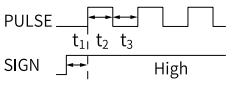
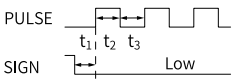
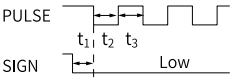
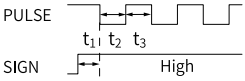
2: Phase A + phase B quadrature pulse, quadrupled frequency

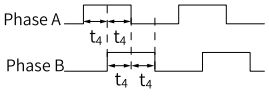
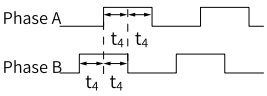
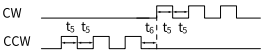
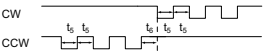
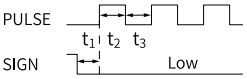
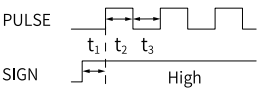
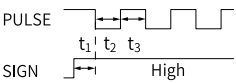
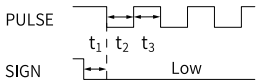
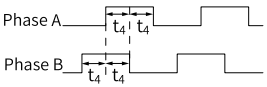
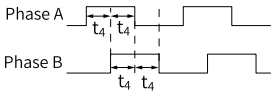
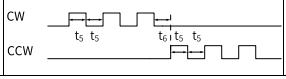
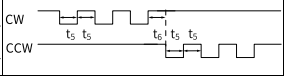
3: CW + CCW

Description

Defines the input pulse form when the pulse reference acts as the main position reference source. See details in *"Table 21–2 " on page 1306*.

Table 21–2 Descriptions of the pulse form

H02.02	H05.15	Pulse input form	Signal	Diagram of forward pulses	Diagram of reverse pulses
0	0	Pulse + Direction Positive Logic	PULSE SIGN		
	1	Pulse + Direction Negative Logic	PULSE SIGN		
	2	Phase A + Phase B	PULSE (phase A) SIGN (phase B)	Phase A leads phase B by 90°.	Phase B leads phase A by 90°.

H02.02	H05.15	Pulse input form	Signal	Diagram of forward pulses	Diagram of reverse pulses
1		Quadrature pulse Quadrupled frequency			
	3	CW+CCW	PULSE (CW) SIGN (CCW)		
	0	Pulse + Direction Positive Logic	PULSE SIGN		
	1	Pulse + Direction Negative Logic	PULSE SIGN		
	2	Phase A + Phase B Quadrature pulse Quadrupled frequency	PULSE (phase A) SIGN (phase B)	Phase B leads phase A by 90°. 	Phase A leads phase B by 90°. 
	3	CW+CCW	PULSE (CW) SIGN (CCW)		

Note

The rising time and falling time of position pulse references must be shorter than 0.1 μs.

Table 21–3 Specifications of pulse references

Input terminal	Single-channel max. input frequency (pps)	Min. Time Width (us)	
High-speed pulse input terminal	4M	t1	0.125
		t2	0.125
		t3	0.125
		t4	0.0625
		t5	0.125
		t6	0.125

Input terminal	Single-channel max. input frequency (pps)	Min. Time Width (us)	
Low-speed pulse input terminal	200k	t1	2.5
		t2	2.5
		t3	2.5
		t4	1.25
		t5	2.5
		t6	2.5

H05.16 Clear action

Address:	2005-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Position deviation cleared upon S-OFF or fault

1: Position deviation cleared upon S-OFF or fault

2: Position deviation cleared upon non-operational state or active DI function 35

Description

Defines the condition for clearing the position deviation.

0: Position deviation cleared upon S-OFF or fault

1: Position deviation cleared upon S-OFF or fault

2: Position deviation cleared upon non-operational state or active DI function 35

H05.17 Number of encoder frequency-division pulses

Address:	2005-12h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	[P/N-N]/[P/Rev]
Max.:	4194303	Data Type:	UInt32
Default:	2500	Change:	At stop

Value Range:

0–4194303

Description

Defines the number of pulses output by PAO or PBO per revolution.

Pulse output resolution per revolution = (H05.17) x 4

H05.19 Speed feedforward control

Address:	2005-14h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: No speed feedforward

1: Internal speed feedforward

2: H05.72

3: Zero phase

Description

Defines the source of the speed loop feedforward signal.

0: No speed feedforward

1: Internal speed feedforward

2: H05.72

3: Zero phase

Note: If you select external speed feedforward, you must set the feedforward source through H05.72.

H05.20 Condition for positioning completed signal output

Address:	2005-15h		
Min.:	0		
Max.:	10	Effective mode:	Real-time
Default:	0	Unit:	-
Value Range:		Data Type:	UInt16
		Change:	Real-time

0: When absolute value of position deviation is smaller than the value of H05.21, a positioning completion ON signal is output.
1: When filtered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
2: When unfiltered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
3: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the unfiltered position command and the absolute value of the position deviation.
4: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the filtered position command and the absolute value of the position deviation.
5: When the unfiltered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
6: When the filtered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.

7: When the unfiltered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
8: When the filtered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
9: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.10: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
Description
Defines the condition for outputting positioning completed/proximity signal. In the position control mode, if the absolute value of the position deviation during operation is within the setpoint of H05.21, the drive outputs the positioning completed/proximity signal. You can set the condition for outputting the positioning completed/proximity signal in H05.20.
0: When absolute value of position deviation is smaller than the value of H05.21, a positioning completion ON signal is output.
1: When filtered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
2: When unfiltered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
3: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the unfiltered position command and the absolute value of the position deviation.
4: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the filtered position command and the absolute value of the position deviation.
5: When the unfiltered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
6: When the filtered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
7: When the unfiltered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
8: When the filtered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
9: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
10: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
Note: The parameter takes effect when H02.00 is not 9.

H05.21 Threshold of positioning completed

Address:	2005-16h	Effective mode:	Real time
Min.:	1	Unit:	Encoder unit
Max.:	65535	Data Type:	UInt16
Default:	46976	Change:	Real-time

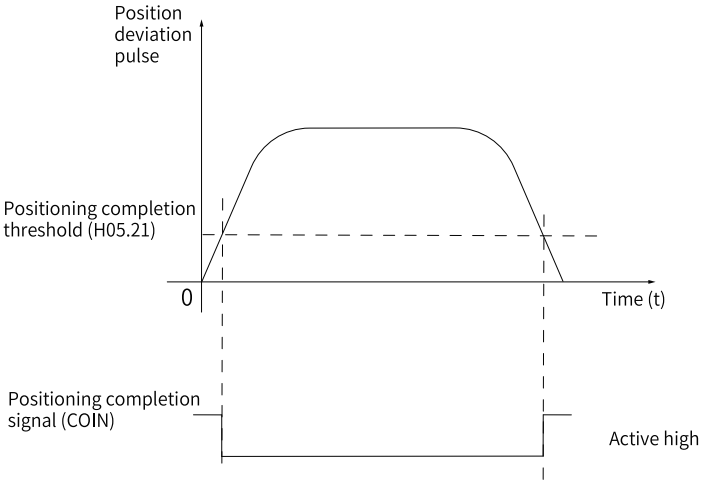
Value Range:

1 to 65535

Description

Defines the threshold of the absolute value of position deviation when the drive outputs the positioning completed signal.

Positioning completed signal: DO function 5 (FunOUT.5: COIN).



Note: The parameter takes effect when H02.00 is not 8.

H05.22 Proximity threshold

Address:	2005-17h	Effective mode:	Real time
Min.:	1	Unit:	Encoder unit
Max.:	65535	Data Type:	UInt16
Default:	65535	Change:	Real-time

Value Range:

1 to 65535

Description

Defines the threshold of the absolute value of position deviation when the drive outputs the proximity signal.

Note: The parameter takes effect when H02.00 is not 8.

H05.24 Interrupt positioning displacement

Address:	2005-19h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

Defines the position reference value during interrupt positioning.

H05.26 Constant operating speed in interrupt positioning

Address:	2005-1Bh	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

0[mm/s]/[rpm] –10000[mm/s]/[rpm]

Description

Defines the maximum speed during interrupt positioning.

H05.27 Acc./Dec. time of interrupt positioning

Address:	2005-1Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Defines the time for the motor to change from 0[mm/s]/[rpm] to 1000[mm/s]/[rpm] at a constant speed during interrupt positioning.

H05.29 Interruption fixed length unlock

Address:	2005-1Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

Defines whether to unlock the interrupt positioning signal.

0: Disabled

1: Enabled

H05.30 Homing enable selection

Address:	2005-1Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Homing enabled through the HomingStart signal input from DI

2: Electrical homing enabled through the HomingStart signal input from DI

3: Homing started immediately upon power-on

4: Homing executed immediately

5: Electrical homing started

6: Current position as home

8: D-triggered position as home

Description

Defines the homing mode and the trigger signal source.

0: Disabled

1: Homing enabled through the HomingStart signal input from DI

2: Electrical homing enabled through the HomingStart signal input from DI

3: Homing started immediately upon power-on

4: Homing executed immediately

5: Electrical homing started

6: Current position as home

8: D-triggered position as home

Note: When H05.30 = 6, position feedback is the setpoint of H05.36 regardless of the value of H05.40.

H05.31 Homing mode

Address:	2005-20h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	16	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Forward, home switch as deceleration point and home
1: Reverse, home switch as deceleration point and home
2: Forward, Z signal as deceleration point and home
3: Reverse, motor Z signal as deceleration point and home
4: Forward, home switch as deceleration point and Z signal as home
5: Reverse, home switch as deceleration point and Z signal as home
6: Forward, positive limit switch as deceleration point and home
7: Reverse, negative limit switch as deceleration point and home
8: Forward, positive limit switch as deceleration point and Z signal as home
9: Reverse, negative limit switch as deceleration point and Z signal as home
10: Forward, mechanical limit position as deceleration point and home
11: Reverse, mechanical limit position as deceleration point and home
12: Forward, mechanical limit position as deceleration point and Z signal as home
13: Reverse, mechanical limit position as deceleration point and Z signal as home
14: Forward single-turn homing
15: Reverse single-turn homing
16: Nearby single-turn homing

Description

Defines the default motor direction of rotation, deceleration point, and home during homing.

0: Forward, home switch as deceleration point and home
1: Reverse, home switch as deceleration point and home
2: Forward, Z signal as deceleration point and home
3: Reverse, motor Z signal as deceleration point and home
4: Forward, home switch as deceleration point and Z signal as home
5: Reverse, home switch as deceleration point and Z signal as home
6: Forward, positive limit switch as deceleration point and home
7: Reverse, negative limit switch as deceleration point and home
8: Forward, positive limit switch as deceleration point and Z signal as home
9: Reverse, negative limit switch as deceleration point and Z signal as home
10: Forward, mechanical limit position as deceleration point and home
11: Reverse, mechanical limit position as deceleration point and home
12: Forward, mechanical limit position as deceleration point and Z signal as home
13: Reverse, mechanical limit position as deceleration point and Z signal as home
14: Forward single-turn homing
15: Reverse single-turn homing
16: Nearby single-turn homing

H05.32 Defines the maximum speed during interrupt positioning

Address:	2005-21h	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	3000	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0[mm/s]/[rpm] –3000[mm/s]/[rpm]

Description

Defines the motor speed for searching for the deceleration point signal during homing.

H05.33 Speed of low-speed search for home switch signal

Address:	2005-22h	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0[mm/s]/[rpm] –1000[mm/s]/[rpm]

Description

Defines the motor speed for searching for the home signal during homing.

H05.34 Acceleration/Deceleration time during homing

Address:	2005-23h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	1000	Change:	Real-time

Value Range:

0 ms–1000 ms

Description

Defines the time for the motor to accelerate from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed during homing.

H05.35 Home search time limit

Address:	2005-24h	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10000	Change:	Real-time

Value Range:

0ms –65535ms

Description

Defines the maximum homing time.

H05.36 Mechanical home offset

Address:	2005-25h	Effective mode:	Real-time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 –2147483647

Description

Defines the absolute position of the motor after homing.

H05.38 Frequency-division output source

Address:	2005-27h	Effective mode:	Upon next power-on
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Encoder frequency-division output
1: Pulse reference synchronous output
2: Frequency-division output inhibited
3: Second encoder frequency-division output
4: H31.01 reference frequency output

Description

Defines the output source of the pulse output terminal.

Value	Output Source	Remarks
0	Encoder frequency-division output	The encoder feedback signal is outputted only after being divided by the value of H05.17 during rotation of the motor. Encoder frequency-division output mode is recommended when the host controller is used for closed-loop feedback.
1	Pulse reference synchronous output	The input pulse references are outputted synchronously only when H05.00 is set to 0. When the pulses of multi-axis servo is tracked synchronously, synchronous output of pulse references is recommended.
2	Frequency-division output inhibited	No output is generated from pulse output terminals. In this case, frequency-division output terminals act as the input terminals of fully closed-loop external scale signals.
3	Second encoder frequency-division output	The encoder feedback signal is outputted only after being divided by the value of H05.17 during rotation of the motor.
4	H31.01 Reference frequency output	-

H05.39 Electronic gear ratio switchover condition

Address:	2005-28h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Switchover after position reference is kept 0 for 2.5 ms
1: Switched in real time
Description
Defines the condition for switching the electronic gear ratio. After the fully closed-loop function is enabled and H0F.00 is set to 2, the setpoint is forcibly set to 0.
When its value is 0: when H0F.00 = 2, the switching condition is that the position command is 0 and positioning is completed and lasts for 2.5 ms; when H0F.00 is not 2, the switching condition is that the position command keeps at 0 for 2.5 ms.

H05.40 Mechanical home offset and action upon overtravel

Address:	2005-29h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: H05.36 as the coordinate after homing, reverse homing applied after homing triggered again on overtravel
1: H05.36 as the relative offset after homing, reverse homing applied after homing triggered again on overtravel
2: H05.36 as the coordinate after homing, reverse homing auto-applied on overtravel
3: H05.36 as the relative offset after homing, reverse homing auto-applied on overtravel
Description
Defines the offset relationship between the mechanical home and mechanical zero point, and the action upon overtravel during homing.
0: H05.36 as the coordinate after homing, reverse homing applied after homing triggered again on overtravel
1: H05.36 as the relative offset after homing, reverse homing applied after homing triggered again on overtravel
2: H05.36 as the coordinate after homing, reverse homing auto-applied on overtravel
3: H05.36 as the relative offset after homing, reverse homing auto-applied on overtravel

H05.41 Z pulse output polarity

Address:	2005-2Ah	Effective mode:	Upon the next power-on
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x1	Change:	At stop

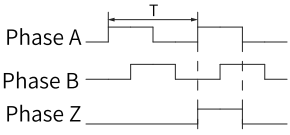
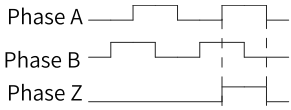
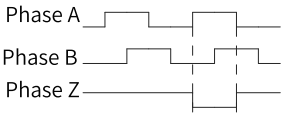
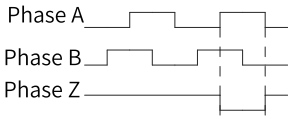
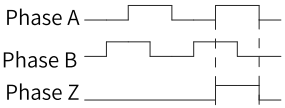
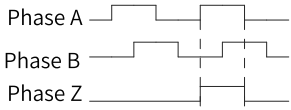
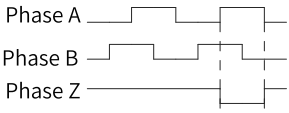
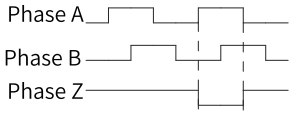
Value Range:
bit0: Frequency-division Z output polarity
0: Positive (high level upon active Z pulse)
1: Negative (low level upon active Z pulse)
bit1: OCZ output polarity
0: Positive (high level upon active Z pulse)

1: Negative (low level upon active Z pulse)
bit2: Inner loop probe Z signal source
0: Motor Z signal
1: Frequency-division output Z signal

Description

Defines the output level when the Z pulse of pulse output terminal is active.

Table 21–4 Pulse diagrams of encoder frequency-division output (H05.38 = 0)

H02.03 (Output pulse phase)	H05.41 (Z pulse output polarity)	Pulse Output Diagram of Forward RUN	Pulse Output Diagram of Reverse RUN
0	0	 Phase A leads phase B by 90°.	 Phase B leads phase A by 90°.
	1	 Phase A leads phase B by 90°.	 Phase B leads phase A by 90°.
1	0	 Phase B leads phase A by 90°.	 Phase A leads phase B by 90°.
	1	 Phase B leads phase A by 90°.	 Phase A leads phase B by 90°.

It is recommended to use the active edge outputted by Z signal when a high precision frequency-division output of Z signal is required.

Value	Z pulse output polarity
0	Positive (high level upon active Z pulse)
1	Negative (low level upon active Z pulse)

H05.41 = 0: Falling-edge triggered; H05.41 = 1: Rising-edge triggered

H05.43 Position pulse edge

Address: 2005-2Ch
Min.: 0
Max.: 1
Default: 0
Effective mode: Upon next power-on
Unit: -
Data Type: UInt16
Change: Real-time

Value Range:

0: rising edgeactive

1: falling edgeactive

Description

The setpoint 0 indicates calculation starts from the falling edge of pulse input.
The setpoint 1 indicates calculation starts from the rising edge of pulse input.

H05.44 Numerator of frequency-division output reduction ratio

Address: 2005-2Dh
Min.: 1
Max.: 16383
Default: 1
Effective mode: Real-time
Unit: -
Data Type: UInt16
Change: At stop

Value Range:

1 –16383

Description

Defines the numerator of frequency-division output reduction ratio.

H05.45 Denominator of frequency-division output reduction ratio

Address: 2005-2Eh
Min.: 1
Max.: 8191
Default: 1
Effective mode: Real-time
Unit: -
Data Type: UInt16
Change: At stop

Value Range:

1 –8191

Description

Defines the denominator of frequency-division output reduction ratio.

H05.46 DI selection of multi-turn frequency-division Z starting point

Address: 2005-2Fh
Min.: 0
Max.: 8
Default: 0
Effective mode: Upon next power-on
Unit: -
Data Type: UInt16
Change: Real-time

Value Range:
0: No selection
1: DI1
2: DI2
3: DI3
4: DI4
5: DI5
6: DI6
7: DI7
8: DI8

Description
Sets the start point for frequency-division output. It is only effective when the frequency division ratio is greater than 1.
0: No selection
1: DI1
2: DI2
3: DI3
4: DI4
5: DI5
6: DI6
7: DI7
8: DI8

H05.47 Frequency-division Z pulse width

Address:	2005-30h	Effective mode:	Real time
Min.:	0	Unit:	μs
Max.:	400	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0μs to 400μs

Description
Defines the minimum output width (us) of frequency-division output PZ. When the pulse signal is used as master encoder and fully closed-loop encoder, the setpoint 0 indicates the original Z signal will be outputted. Other setpoints indicate the frequency-division Z signal will be output.

H05.48 Frequency-division output dead zone setting threshold

Address:	2005-31h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–255
Description
Defines the dead zone threshold of frequency-division output to prevent frequency-division output caused by encoder jitter.
Note: After this function is enabled, during uniform low-speed operation, intermittent frequency-division pulse output may occur. Set this parameter with caution.

H05.50 Mechanical gear ratio in absolute position rotation mode (numerator)

Address:	2005-33h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1–65535
Description
Set the mechanical gear ratio (numerator) in absolute position rotation mode.

H05.51 Mechanical gear ratio in absolute position rotation mode (denominator)

Address:	2005-34h	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1 –65535
Description
Set the mechanical gear ratio (denominator) in absolute position rotation mode.

H05.52 Pulses per revolution of load in absolute position rotation mode (low 32 bits)

Address:	2005-35h	Effective mode:	Real-time
Min.:	0	Unit:	EncoderUnit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	At stop

Value Range:
0EncoderUnit –4294967295EncoderUnit
Description
Defines the number of pulses per revolution of the rotary load in the absolute position rotation mode (low 32 bits).

H05.54 Pulses per revolution of the load in absolute position rotation mode (high 32 bits)

Address:	2005-37h	Effective mode:	Real time
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	At stop

Value Range:

0 to 4294967295

Description

Defines the number of pulses per revolution of the rotary load in the absolute position rotation mode (high 32 bits).

H05.58 Torque threshold in homing upon hit-and-stop

Address:	2005-3Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:

0.0% to 400.0%

Description

Defines the maximum positive/negative torque limit in homing upon hit-and-stop.

H05.59 Positioning window time

Address:	2005-3Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	30000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–30000 ms

Description

If the positioning deviation is less than the time threshold of positioning completed, the positioning completed signal is active only if the set time threshold is exceeded.

H05.60 Hold time of positioning completed

Address:	2005-3Dh	Effective mode:	Real-time
Min.:	0	Unit:	ms

Max.:	30000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms –30000ms

Description

Defines the hold time of an active positioning completed signal.

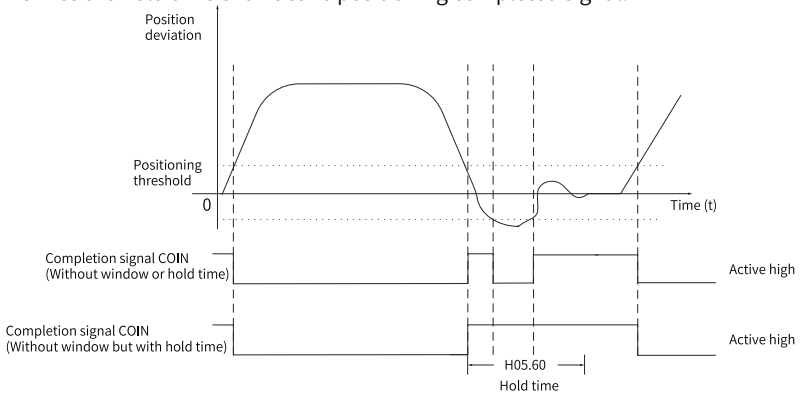


Figure 21-1 2-1 Schematic diagram for the window time (H05.59) and hold time (H05.60) of positioning completed signal

When the COIN (positioning completed) signal has a hold time of 0, it remains active until the next position reference is received.

H05.66 **Homing time unit**

Address:	2005-43h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0：1ms

1：10ms

2：100ms

Description

Select the unit of homing time.

0：1ms

1：10ms

2：100ms

Note: The actual timeout is H05.35xH05.66ms

H05.67 **Offset between zero point and single-turn absolute position**

Address:	2005-44h	Effective mode:	Real time

Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	At stop

Value Range:

-2147483648 to 2147483647

Description

Display or set the offset position relative to the home when the servo system is in absolute single-turn mode (H0201=4).

H05.71 Motor Z signal width

Address:	2005-48h	Effective mode:	Real-time
Min.:	1	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	4	Change:	Real-time

Value Range:

1ms –100ms

Description

Output pulse width when motor Z signal is active.

H05.72 External speed feedforward source selection

Address:	2005-49h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: 60B1

1: AI1

2: AI2

Description

External speed feedforward source selection

0: 60B1

1: AI1

2: AI2

21.7 H06 Speed Control Parameters

H06.00 Source of main speed reference A

Address:	2006-01h	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Digital setting (H06.03)

1: AI1

2: AI2

Description

Defines the source of main speed reference A.

0: Digital setting (H06.03)

1: AI1

2: AI2

H06.01 Source of auxiliary speed reference B

Address:	2006-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	5	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Digital setting (H06.03)

1: AI1

2: AI2

5: Multi-speed reference

Description

Defines the source of auxiliary speed reference B.

0: Digital setting (H06.03)

1: AI1

2: AI2

5: Multi-speed reference

H06.02 Speed reference source

Address:	2006-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Source of main speed reference A

1: Source of auxiliary speed reference B

2: A+B

3: Switched between A and B

4: Communication

Description

Defines the source of speed references.

<table>
<tr><th>Value</th><th>Control mode</th><th>Remarks</th></tr>
<tr><td>0</td><td>Source of main speed reference A</td><td>The reference source is defined by H06.00.</td></tr>
<tr><td>1</td><td>Source of auxiliary speed reference B</td><td>The reference source is defined by H06.01.</td></tr>
<tr><td>2</td><td>A+B</td><td>The reference source is the product of A + B (H06.00 + H06.01).</td></tr>
<tr><td>3</td><td>Switched between A and B</td><td>The reference source is switched between A and B as defined by FunIN.4 (Cmd_SEL).
<table><tr><th>State of FunIN.4 (Cmd_SEL)</th><th>Reference Source</th></tr><tr><td>Inactive</td><td>Source of main speed reference A</td></tr><tr><td>Active</td><td>Source of auxiliary speed reference B</td></tr></table></td></tr>
<tr><td>4</td><td>Communication</td><td>The speed reference is defined by operating on H31.09 through communication (unit: 0.001 RPM).</td></tr>
</table>

H06.03 Speed reference set through keypad

Address:	2006-04h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	200	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the speed reference value set through the keypad.

H06.04 DI jog speed reference

Address:	2006-05h	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	150	Change:	Real-time

Value Range:

0[mm/s]/[rpm] –10000[mm/s]/[rpm]

Description

Defines the DI jog speed reference.

H06.05 **Acc. ramp time of speed reference**

Address:	2006-06h	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms –65535ms

Description

Sets acceleration ramp time of speed reference.
H06.05 defines the time for the speed reference to change from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm].
The formulas for calculating the actual acceleration and deceleration time are as follows:
Actual acceleration time t = Speed reference ÷ 1000 x Acceleration ramp time of speed reference

H06.06 **Dec. ramp time of speed reference**

Address:	2006-07h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Sets deceleration ramp time of speed reference.
H06.06 defines the time for the speed reference to change from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm].
The formulas for calculating the actual acceleration and deceleration time are as follows:
Actual deceleration time t = Speed reference ÷ 1000 x Deceleration ramp time of speed reference

H06.07 **Maximum speed limit**

Address:	2006-08h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	7000	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the maximum speed limit.

H06.08 Forward speed threshold

Address:	2006-09h	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	7000	Change:	Real-time

Value Range:

0[mm/s]/[rpm] –10000[mm/s]/[rpm]

Description

Defines the forward speed threshold.

H06.09 Reverse speed threshold

Address:	2006-0Ah	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	7000	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the reverse speed threshold.

H06.10 Deceleration unit in emergency stop

Address:	2006-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Multiplied by 1

1: Multiplied by 10

2: Multiplied by 100

Description

Sets the deceleration unit in emergency stop.

0: Multiplied by 1

1: Multiplied by 10

2: Multiplied by 100

H06.11 Torque feedforward control

Address:	2006-0Ch	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16

Default: 1 Change: Real-time

Value Range:

0: No torque feedforward
1: Internal torque feedforward
3: STune mode 5

Description

Defines the source for torque feedforward control.
0: No torque feedforward
1: Internal torque feedforward
3: STune mode 5

H06.12 Acc./dec. ramp time of speed jog

Address:	2006-0Dh	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0ms –65535ms

Description

Set the acceleration/deceleration ramp time of speed jog.
The time is that for the speed reference to accelerate from 0 to 1000 [mm/s]/[rpm] or to decelerate from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm].
The formulas for calculating the actual acceleration and deceleration time are as follows:
Actual acc./dec. time t = Speed reference ÷ 1000 x Acceleration ramp time of speed reference

H06.13 Speed feedforward smoothing filter

Address:	2006-0Eh	Effective mode:	Real time
Min.:	0	Unit:	μs
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0μs to 65535μs

Description

Defines the speed feedforward smoothing filter time.

H06.15 Zero clamp speed threshold

Address:	2006-10h	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0[mm/s]/[rpm] –10000[mm/s]/[rpm]

Description

Defines the zero clamp speed threshold.

H06.16 Threshold of TGON (motor rotation) signal

Address:	2006-11h	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:

0[mm/s]/[rpm] –1000[mm/s]/[rpm]

Description

Sets the threshold of TGON (motor rotation) signal.

H06.17 Threshold of V-Cmp (speed matching) signal

Address:	2006-12h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	100	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–100[mm/s]/[rpm]

Description

Defines the threshold of speed match signal.

H06.18 Threshold of speed reach signal

Address:	2006-13h	Effective mode:	Real time
Min.:	20	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	1000	Change:	Real-time

Value Range:

20[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the threshold of speed reached signal.

H06.19 Threshold of zero speed output signal

Address:	2006-14h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16

Default:	10	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the threshold of zero speed output signal.

H06.40 Ramp 1 deceleration time

Address:	2006-29h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

The time for deceleration from 1000 RPM to 1000 RPM.

H06.41 Ramp 2 deceleration time

Address:	2006-2Ah	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms –65535ms

Description

The time for deceleration from 1000 RPM to 1000 RPM

H06.50 Speed S-curve enable switch

Address:	2006-33h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

0: Accelerate/Decelerate at fixed acceleration rate

1: Accelerate/Decelerate based on the S-curve

H06.51 Increasing acceleration 1 of speed S-curve acceleration segment

Address:	2006-34h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.52 Decreasing acceleration 1 of speed S-curve acceleration segment A

Address:	2006-35h	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.53 Decreasing deceleration 1 of speed S-curve deceleration segment

Address:	2006-36h	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.54 Decreasing acceleration 1 of speed S-curve deceleration segment

Address:	2006-37h	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% –100.0%

Description
8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.55 Increasing acceleration 2 of speed S-curve acceleration segment

Address:	2006-38h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% to 100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference.
Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.56 Decreasing acceleration 2 of speed S-curve acceleration segment

Address:	2006-39h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% to 100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.57 Decreasing deceleration 2 of speed S-curve deceleration segment

Address:	2006-3Ah	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% to 100.0%
Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.58 Decreasing acceleration 2 of speed S-curve deceleration segment

Address:	2006-3Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% to 100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.59 Increasing acceleration 3 of speed S-curve acceleration segment

Address:	2006-3Ch	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% –100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference.
Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.60 Decreasing acceleration 3 of speed S-curve acceleration segment

Address:	2006-3Dh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% to 100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.61 Decreasing deceleration 3 of speed S-curve deceleration segment

Address:	2006-3Eh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.62 Decreasing acceleration 3 of speed S-curve deceleration segment

Address:	2006-3Fh	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.63 Increasing acceleration 4 of speed S-curve acceleration segment

Address:	2006-40h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.64 Decreasing acceleration 4 of speed S-curve acceleration segment

Address:	2006-41h	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% –100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.65 Decreasing deceleration 4 of speed S-curve deceleration segment

Address:	2006-42h	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% –100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.66 Decreasing acceleration 4 of speed S-curve deceleration segment

Address:	2006-43h	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% –100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.67 Increasing acceleration 5 of speed S-curve acceleration segment

Address:	2006-44h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% to 100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference. Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.68 Decreasing acceleration 5 of speed S-curve acceleration segment

Address:	2006-45h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.69 Decreasing deceleration 5 of speed S-curve deceleration segment

Address:	2006-46h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.70 Decreasing acceleration 5 of speed S-curve deceleration segment

Address:	2006-47h	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.71 Increasing acceleration 6 of speed S-curve acceleration segment

Address:	2006-48h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16

Default: 50.0 Change: At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.72 Decreasing acceleration 6 of speed S-curve acceleration segment

Address: 2006-49h Effective mode: Real-time

Min.: 0.0 Unit: %

Max.: 100.0 Data Type: UInt16

Default: 50.0 Change: At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.73 Decreasing deceleration 6 of speed S-curve deceleration segment

Address: 2006-4Ah Effective mode: Real-time

Min.: 0.0 Unit: %

Max.: 100.0 Data Type: UInt16

Default: 50.0 Change: At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.74 Decreasing acceleration 6 of speed S-curve deceleration segment

Address: 2006-4Bh Effective mode: Real-time

Min.: 0.0 Unit: %

Max.: 100.0 Data Type: UInt16

Default: 50.0 Change: At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.75 **Increasing acceleration 7 of speed S-curve acceleration segment**

Address:	2006-4Ch	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.76 **Decreasing acceleration 7 of speed S-curve acceleration segment**

Address:	2006-4Dh	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time

H06.77 **Decreasing deceleration 7 of speed S-curve deceleration segment**

Address:	2006-4Eh	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.78 **Decreasing acceleration 7 of speed S-curve deceleration segment**

Address:	2006-4Fh	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.79 Increasing acceleration 8 of speed S-curve acceleration segment

Address:	2006-50h	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% –100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.80 Decreasing acceleration 8 of speed S-curve acceleration segment

Address:	2006-51h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.81 Decreasing deceleration 8 of speed S-curve deceleration segment

Address:	2006-52h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.82 **Decreasing acceleration 8 of speed S-curve deceleration segment**

Address:	2006-53h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

21.8 H07 Torque Control Parameters

H07.00 **Source of main torque reference A**

Address:	2007-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Keypad (H07.03)

1: AI1

2: AI2

Description

Defines the source of the main torque reference A.

0: Keypad (H07.03)

1: AI1

2: AI2

H07.01 **Source of auxiliary torque reference B**

Address:	2007-02h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Keypad (H07.03)

1: AI1

2: AI2

Description

Defines the source of auxiliary torque references.
0: Keypad (H07.03)
1: AI1
2: AI2

H07.02 Torque reference source

Address:	2007-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Source of main torque reference A
1: Source of auxiliary torque reference B
2: Source of A+B
3: Switched between A and B
4: Communication

Description

Selects torque reference.

<table>
<tr><th>Value</th><th>Control mode</th><th>Remarks</th></tr>
<tr><td>0</td><td>Source of main torque reference A</td><td>The reference source is defined by H07.00.</td></tr>
<tr><td>1</td><td>Source of auxiliary torque reference B</td><td>The reference source is defined by H07.01.</td></tr>
<tr><td>2</td><td>A+B</td><td>The reference source is the product of A+B (H07.00+H07.01).</td></tr>
<tr><td>3</td><td>Switched between A and B</td><td>The reference source is switched between A and B as defined by FunIN.4 (Cmd_SEL).
<table><tr><th>State of FunIN.4 (Cmd_SEL)</th><th>Reference Source</th></tr><tr><td>Inactive</td><td>Source of main torque reference A</td></tr><tr><td>Active</td><td>Source of auxiliary torque reference B</td></tr></table></td></tr>
<tr><td>4</td><td>Communication</td><td>The torque reference is defined by operating on H31.11 through communication.</td></tr>
</table>

H07.03 Torque reference set through keypad

Address:	2007-04h	Effective mode:	Real-time
Min.:	-400.0	Unit:	%
Max.:	400.0	Data Type:	Int16

Default:	0.0	Change:	Real-time

Value Range:

-400.0% –400.0%

Description

Set torque reference.

H07.05 Torque reference filter time constant 1

Address:	2007-06h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	30.00	Data Type:	UInt16
Default:	0.50	Change:	Real-time

Value Range:

0.00 ms–30.00 ms

Description

Defines the torque reference filter time constant 1.

H07.06 Torque reference filter time constant 2

Address:	2007-07h	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	30.00	Data Type:	UInt16
Default:	0.27	Change:	Real-time

Value Range:

0.00ms –30.00ms

Description

Defines the torque reference filter time constant 2.

H07.07 Torque Limit source

Address:	2007-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Positive/Negative internal torque limit

1: Internal or external limit as defined by DI

2: T_LMT

3: T_LMT or external limit as defined by DI (FunIN.16 or FunIN.17)

4: T_LMT or internal limit (FunIN.16 or FunIN.17) as defined by DI

Description

Defines the torque limit source.
0: Positive/Negative internal torque limit
1: Internal or external limit as defined by DI
2: T_LMT
3: T_LMT or external limit as defined by DI (FunIN.16 or FunIN.17)
4: T_LMT or internal limit (FunIN.16 or FunIN.17) as defined by DI

H07.08 T-LMT selection

Address:	2007-09h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
1: AI1
2: AI2
Description
Set the AI as the torque limit source.
1: AI1
2: AI2

H07.09 Positive internal torque limit

Address:	2007-0Ah	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:
0.0% –400.0%
Description
Sets the forward run internal torque limit.

H07.10 Negative internal torque limit

Address:	2007-0Bh	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:
0.0% –400.0%
Description
Sets the reverse run internal torque limit.

H07.11 Positive external torque limit

Address:	2007-0Ch	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:
0.0% –400.0%
Description
Set the forward external torque limit.

H07.12 Negative external torque limit

Address:	2007-0Dh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
Set the reverse external torque limit.

H07.15 Emergency-stop torque

Address:	2007-10h	Effective mode:	At stop
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:
0.0% –400.0%
Description
Set the torque for emergency stop.

H07.17 Speed limit source

Address:	2007-12h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Internal speed limit
1: V-LMT
2: H07.19 or H07.20 as defined by DI

Description

Select the speed limit source
0: Internal speed limit
1: V-LMT
2: H07.19 or H07.20 as defined by DI
Note: This parameter takes effect when H02.00 is not 8

H07.18 V-LMT selection

Address:	2007-13h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
1: AI1
2: AI2
Description
Set the AI as the speed limit source.
1: AI1
2: AI2

H07.19 Positive speed limit/Speed limit 1 in torque control

Address:	2007-14h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:
0[mm/s]/[rpm]–10000[mm/s]/[rpm]
Description
Set the positive speed limit/Speed limit 1 in torque control.

H07.20 Negative speed limit/Speed limit 2 in torque control

Address:	2007-15h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:
0[mm/s]/[rpm]–10000[mm/s]/[rpm]
Description
Set the negative speed limit/Speed limit 2 in torque control.

H07.21 **Torque reach base value**

Address:	2007-16h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
Set torque reach base value.

H07.22 **Torque reach valid value**

Address:	2007-17h	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	20.0	Change:	Real-time

Value Range:
0.0% –400.0%
Description
Set torque reach valid value

H07.23 **Torque reach invalid value**

Address:	2007-18h	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:
0.0% –400.0%
Description
Set torque reach invalid value.

H07.24 **Field weakening depth**

Address:	2007-19h	Effective mode:	Real-time
Min.:	60	Unit:	%
Max.:	115	Data Type:	UInt16
Default:	115	Change:	Real-time

Value Range:
60% –115%
Description
Set the flux weakening depth.

H07.25 Max. permissible demagnetizing current

Address:	2007-1Ah	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	300	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0% to 300%

Description

Set the maximum allowable demagnetization current value.

H07.26 Field weakening selection

Address:	2007-1Bh	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled
1: Enabled

Description

Enable/disable field weakening.
0: Disabled
1: Enabled

H07.27 Flux weakening gain

Address:	2007-1Ch	Effective mode:	Real time
Min.:	0.001	Unit:	kHz
Max.:	1.000	Data Type:	UInt16
Default:	0.030	Change:	Real-time

Value Range:

0.001 kHz–1.000 kHz

Description

Set the gain of flux weakening.

H07.28 Speed of flux weakening point

Address:	2007-1Dh	Effective mode:	
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 –65535

Description
Set the speed of flux weakening point.

H07.35 Torque non-standard feature enable

Address:	2007-24h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
bit0: Motor output correction enable
bit1: Shield compensation data enable
Description
Torque non-standard feature enable switch.
Bit0: motor torque output correction enable
Bit1: Shield compensation data enable

H07.36 Time constant of low-pass filter 2

Address:	2007-25h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	10.00	Data Type:	UInt16
Default:	0.00	Change:	Real-time

Value Range:
0.00 ms–10.00 ms
Description
Set the time constant of low-pass filter 2.

H07.37 Torque reference filter selection

Address:	2007-26h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: First-order filter
1: Biquad filter
Description

Select the torque reference filter.
0: First-order filter1: Biquad filter
When second-order filter is selected, the filter structure is biquad filter for ROT motors, and the filter parameters are set through H07.38. For DDR/DDL motors, the filter structure is biquad low-pass filter, and the filter parameters are set through H07.42.

H07.38 Biquad filter attenuation ratio

Address:	2007-27h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	50	Data Type:	UInt16
Default:	16	Change:	Real-time

Value Range:
0–50
Description
Defines the attenuation ratio of biquad filter.

H07.40 Speed limit threshold in torque control mode

Address:	2007-29h	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	300	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0ms –300ms
Description
Sets speed limit time window in the torque control mode.

H07.42 Biquad low pass filter damping coefficient

Address:	2007-2Bh	Effective mode:	Real-time
Min.:	0.001	Unit:	-
Max.:	10.000	Data Type:	UInt16
Default:	1.000	Change:	Real-time

Value Range:
0.001 –10.000
Description
Defines the damping coefficient of biquad low-pass filter.

21.9 H08 Gain Parameters

H08.00 Speed loop gain

Address:	2008-01h	Effective mode:	Real-time
Min.:	0.0	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	40.0	Change:	Real-time

Value Range:

0.0Hz –2000.0Hz

Description

Defines the responsiveness of the speed loop. The higher the setpoint, the faster the speed loop response is. Note that an excessively high setpoint may cause vibration.

In the position control mode, the position loop gain must be increased together with the speed loop gain.

H08.01 Speed loop integral time constant

Address:	2008-02h	Effective mode:	Real time
Min.:	0.15	Unit:	ms
Max.:	512.00	Data Type:	UInt16
Default:	19.89	Change:	Real-time

Value Range:

0.15 ms–512.00 ms

Description

Defines the integral time constant of the speed loop.

The lower the setpoint, the better the integral action, and the quicker will the deviation value be close to 0.

Note:

There is no integral action when H08.01 is set to 512.00.

H08.02 Position loop gain

Address:	2008-03h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	64.0	Change:	Real-time

Value Range:

0.0 Hz–2000.0 Hz

Description

Defines the proportional gain of the position loop.

Defines the responsiveness of the position loop. A high setpoint shortens the positioning time. Note that an excessively high setpoint may cause vibration.
The 1st group of gain parameters include H08.00 (Speed loop gain), H08.01 (Speed loop integral time constant), H08.02, and H07.05 (Filter time constant 1 of torque reference).

H08.03 2nd speed loop gain

Address:	2008-04h	Effective mode:	Real-time
Min.:	0.1	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	75.0	Change:	Real-time

Value Range:
0.1Hz –2000.0Hz
Description
Set 2nd speed loop gain.

H08.04 2nd speed loop integral time constant

Address:	2008-05h	Effective mode:	Real-time
Min.:	0.15	Unit:	ms
Max.:	512.00	Data Type:	UInt16
Default:	10.61	Change:	Real-time

Value Range:
0.15ms –512.00ms
Description
Set the 2nd speed loop integral time constant.

H08.05 2nd position loop gain

Address:	2008-06h	Effective mode:	Real-time
Min.:	0.1	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	120.0	Change:	Real-time

Value Range:
0.1Hz –2000.0Hz
Description
Defines the second gain set of the position loop and speed loop. The 2nd group of gain parameters include H08.03 (Speed loop gain), H08.04 (Speed loop integral time constant), H08.05, and H07.06 (Torque reference filter time constant 2).

H08.08 2nd gain mode setting

Address:	2008-09h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
0: Fixed to the 1st gain, switched between P and PI as defined by bit26 of external 60FEh
1: Switched between the 1st and 2nd gain sets as defined by H08.09
Description
Defines the mode for switching to the 2nd gain set.
0: Fixed to the 1st gain, switched between P and PI as defined by bit26 of external 60FEh
1: Switched between the 1st and 2nd gain sets as defined by H08.09

H08.09 Gain switchover condition

Address:	2008-0Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Fixed to the 1st gain set (PS)
1: Switched as defined by bit26 of 60FEh
2: Torque reference too large (PS)
3: Speed reference too large (PS)
4: Speed reference change rate too large (PS)
5: Speed reference low/high speed threshold (PS)
6: Position deviation too large (P)
7: Position reference available (P)
8: Positioning unfinished (P)
9: Actual speed (P)
10: Position reference + Actual speed (P)
Description
Defines the gain switchover condition.

Value	Gain switchover condition	Remarks
0	Fixed to the 1st gain set	The 1st gain set applies.
1	Switched as defined by bit26 of 60FEh	-
2	Torque reference too large	If the torque reference absolute value exceeds (Level + Dead time) [%] in the last 1st gain set, the drive switches to the 2nd gain set. If the absolute value of the torque reference is lower than (level – Dead time) [%] and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain, the drive returns to the 1st gain set.

Value	Gain switchover condition	Remarks
3	Speed reference too large	If the speed reference absolute value exceeds (Level + Dead time) [rpm] in the last 1st gain set, the drive switches to the 2nd gain set. If the absolute value of the speed reference is lower than (level - Dead time) [rpm] and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain, the drive returns to the 1st gain set.
4	Speed reference change rate too large	Active in the control modes other than speed control If the absolute value of the change rate of the speed reference exceeds (Level + Dead time) [10 rpm/s] in the last 1st gain set, the drive switches to the 2nd gain set. If the absolute value of the speed reference change rate is lower than (level – hysteresis) [10 rpm/s] and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain, the drive returns to the 1st gain set. In the speed control mode, the 1st gain set always applies.
5	Speed reference high/low-speed threshold	If the speed reference absolute value exceeds (Level - Dead time) [rpm] in the last 1st gain set, the drive starts to switch to the 2nd gain set, with gains changed gradually. When the speed reference absolute value reaches (Level + Dead time) [rpm], the 2nd gain set applies. If the speed reference absolute value is lower than (Level + Dead time) [rpm] in the last 2nd gain set, the drive starts to return to the 1st gain set, with gains changed gradually. When the speed reference absolute value reaches (Level - Dead time) [rpm], the 1st gain set applies.
6	Position deviation too large	Active only in position control and full closed-loop control. If the position deviation absolute value exceeds (Level + Dead time) [encoder unit] in the last 1st gain set, the drive switches to the 2nd gain set. When the absolute value of the position deviation is lower than (Level - Dead time) [encoder unit] and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain, the drive returns to the 1st gain set. If the drive is not in position control or full closed-loop control, the 1st gain set always applies.
7	Position reference available	Active only in position control and full closed-loop control. If the position reference is not 0 in the last 1st gain set, the drive switches to the 2nd gain set. When the position reference is 0 and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain, the drive returns to the 1st gain set. If the drive is not in position control or full closed-loop control, the 1st gain set always applies.
8	Positioning uncompleted	Active only in position control and full closed-loop control. If positioning has not been completed in the last 1st gain set, the drive switches to the 2nd gain set. If positioning is not completed and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain set, the servo drive returns to the 1st gain set. If the drive is not in position control or full closed-loop control, the 1st gain set always applies.

Value	Gain switchover condition	Remarks
9	Actual speed too high	Active only in position control and full closed-loop control. If the absolute value of actual speed exceeds (Level + Dead time) [rpm] in the last 1st gain set, the drive switches to the 2nd gain set. If the absolute value of actual speed is lower than (Level - Dead time) [rpm] and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain set, the drive returns to the 1st gain set. If the drive is not in position control or full closed-loop control, the 1st gain set always applies.
10	Position reference + Actual speed	Active only in position control and full closed-loop control. If the position reference is not 0 in the last 1st gain set, the drive switches to the 2nd gain set. If the position reference is 0 and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain set, the 2nd gain set applies. When the position reference is 0 and the delay defined by (H08.10) is reached, if the absolute value of actual speed is lower than (Level) [rpm], the speed loop integral time constant is fixed to the setpoint of H08.04 (2nd speed loop integral time constant), and others return to the 1st gain set; if the absolute value of actual speed does not reach (Level - Dead time) [rpm], the speed integral also returns to the setpoint of H08.01 (Speed loop integral time constant). If the drive is not in position control or full closed-loop control, the 1st gain set always applies.

H08.10 Gain switchover delay

Address:	2008-0Bh	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0 ms–1000.0 ms

Description

Defines the delay when the drive switches from the 2nd gain set to the 1st gain set.

H08.11 Gain switchover level

Address:	2008-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20000	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0–20000

Description

Defines the gain switchover level.

Gain switchover is affected by both the level and the dead time, as defined by H08.09. The unit of gain switchover level varies with the switchover condition.

H08.12 Gain switchover hysteresis

Address:	2008-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20000	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:

0–20000

Description

Defines the dead time for gain switchover.

Gain switchover is affected by both the level and the dead time, as defined by H08.09. The unit of gain switchover hysteresis varies with the switchover condition.

Note:

The set value of H08.11 (Gain switchover level) must be no less than that of H08.12; otherwise, the H08.11 will be set to a value equal to H08.12 automatically.

H08.13 Position gain switchover time

Address:	2008-0Eh	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	3.0	Change:	Real-time

Value Range:

0.0ms –1000.0ms

Description

In position control, if H08.05 (2nd position loop gain) is much higher than H08.02 (Position loop gain), set the time for switching from H08.02 to H08.05. This parameter can be used to reduce the impact caused by an increase in the position loop gain.

H08.15 Load moment of inertia ratio

Address:	2008-10h	Effective mode:	Real-time
Min.:	0.00	Unit:	-
Max.:	120.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:

0.00 –120.00

Description

Defines the mechanical load inertia ratio relative to the motor moment of inertia.

When H08.15 is set to 0, it indicates the motor carries no load; if it is set to 1.00, it indicates the mechanical load inertia is the same as the motor moment of inertia.

H08.17 **Zero phase delay**

Address:	2008-12h	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	4.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0ms –4.0ms

Description

Set zero phase delay.

H08.18 **Time constant of speed feedforward filter**

Address:	2008-13h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	64.00	Data Type:	UInt16
Default:	0.50	Change:	Real-time

Value Range:

0.00 ms–64.00 ms

Description

Defines the filter time constant of speed feedforward.

H08.19 **Speed feedforward gain**

Address:	2008-14h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0% to 100.0%

Description

In position control and full closed-loop control, speed feedforward is the product of speed feedforwad signal multiplied by H08.19 and is part of the speed reference.

Increasing the setpoint improves the responsiveness to position references and reduces the position deviation during operation at a constant speed.

Set H08.18 to a fixed value first, and then increase the value of H08.19 gradually from 0 to a certain value at which speed feedforward achieves the desired effect.

Adjust H08.18 and H08.19 repeatedly until a balanced performance is achieved.

Note:

For how to enable the speed feedforward function and select the speed feedforward signal, see H05.19 (Speed feedforward control).

H08.20 **Torque feedforward filter time constant**

Address:	2008-15h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	64.00	Data Type:	UInt16
Default:	0.50	Change:	Real-time

Value Range:

0.00 ms–64.00 ms

Description

Defines the filter time constant of torque feedforward.

H08.21 **Torque feedforward gain**

Address:	2008-16h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0% to 300.0%

Description

In control modes other than torque control, torque feedforward is the product of torque feedforwad signal multiplied by H08.21 and is part of the torque reference.

Increasing the setpoint improves the responsiveness to variable speed references.

Increasing the setpoint improves the responsiveness to position references and reduces the position deviation during operation at a constant speed.

During parameter adjustment, set H08.20 (Torque feedforward filter time constant) to the default value first, and then increase H08.21 gradually to enhance the effect of torque feedforward. When speed overshoot occurs, keep H08.21 unchanged and increase the value of H08.20. Adjust H08.20 and H08.21 repeatedly until a balanced performance is achieved.

Note:

For how to enable the torque feedforward function and select the torque feedforward signal, see H06.11 (Torque feedforward control).

H08.22 **Speed feedback filtering option**

Address:	2008-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inhibited

1: 2 times

2: 4 times

3: 8 times

4: 16 times

Description

Defines the moving average filtering times for speed feedback.

0: Inhibited

1: 2 times

2: 4 times

3: 8 times

4: 16 times

Note: The larger the parameter value, the smaller the speed feedback ripple, but the larger the feedback delay.

H08.23 Cutoff frequency of speed feedback low-pass filter

Address:

Min.:	2008-18h	Effective mode:	Real-time
Max.:	100	Unit:	Hz
Default:	8000	Data Type:	UInt16
Value Range:	8000	Change:	Real-time

100Hz –8000Hz

Description

Defines the cutoff frequency for first-order low-pass filtering on the speed feedback.

Note:

The lower the setpoint, the weaker the speed feedback fluctuation, and the longer the feedback delay will be.

Setting this parameter to 8000 Hz negates the filtering effect.

H08.24 PDFF control coefficient

Address:

Min.:	2008-19h	Effective mode:	Real-time
Max.:	0.0	Unit:	%
Default:	200.0	Data Type:	UInt16
Value Range:	100.0	Change:	Real-time

0.0% –200.0%

Description

Defines the control mode of the speed loop.

When this parameter is set to 100.0, the speed loop adopts PI control (default) with quick dynamic response.

When this parameter is set to 0.0, speed loop integral action is enhanced, which filters out low-frequency interference but also slows down the dynamic response.

H08.24 can be used to keep a good responsiveness of the speed loop, with the anti-interference capacity in low-frequency bands improved and the speed feedback overshoot unaffected.

H08.25 Speed measurement method

Address:	2008-1Ah	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: M-method
1: MT-method

Description

Speed measurement method
Activated only when it is set to 1 and a pulse encoder is used.

H08.27 Speed observer cutoff frequency

Address:	2008-1Ch	Effective mode:	Real time
Min.:	50	Unit:	Hz
Max.:	600	Data Type:	UInt16
Default:	170	Change:	Real-time

Value Range:

50 Hz–600 Hz

Description

Defines the cutoff frequency of the speed observer. Note that an excessively high setpoint may incur resonance. Decrease the setpoint properly in case of large speed feedback noise.

H08.28 Speed observer inertia correction coefficient

Address:	2008-1Dh	Effective mode:	Real-time
Min.:	1	Unit:	%
Max.:	1600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

1% –1600%

Description

Defines the speed observer inertia correction coefficient. If H08.15 is set based on the actual inertia, there is no need to adjust this parameter.

H08.29 Speed observer filter time

Address:	2008-1Eh	Effective mode:	Real time
Min.:	0.00	Unit:	ms

Max.:	10.00	Data Type:	UInt16
Default:	0.80	Change:	Real-time

Value Range:

0.00 ms–10.00 ms

Description

Defines the speed observer filter time. It is recommended to set this parameter to a value equal to the sum of H07.05 plus 0.2 ms.

H08.31 Disturbance cutoff frequency

Address:	2008-20h	Effective mode:	Real time
Min.:	1	Unit:	Hz
Max.:	4000	Data Type:	UInt16
Default:	600	Change:	Real-time

Value Range:

1 Hz–4000 Hz

Description

Defines the cutoff frequency of the disturbance observer. Increasing the setpoint improves the responsiveness of the disturbance observer and the compensation effect. Note that an excessively high setpoint may incur resonance.

H08.32 Disturbance compensation gain

Address:	2008-21h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	100	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0% to 100%

Description

Defines the compensation gain of the disturbance observer. The setpoint 100% indicates full compensation.

H08.33 Disturbance observer inertia correction coefficient

Address:	2008-22h	Effective mode:	Real time
Min.:	1	Unit:	%
Max.:	1600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

1% to 1600%

Description

Defines the disturbance observer inertia correction coefficient. If H08.15 is set based on the actual inertia, there is no need to adjust this parameter.

H08.37 Phase modulation for medium-frequency jitter suppression 2

Address:	2008-26h	Effective mode:	Real-time
Min.:	-90	Unit:	°
Max.:	90	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-90° –90°

Description

Defines the compensation phase of medium-frequency jitter suppression 2.

H08.38 Medium-frequency suppression 2 frequency

Address:	2008-27h	Effective mode:	Real-time
Min.:	0	Unit:	Hz
Max.:	1000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0Hz –1000Hz

Description

Set this parameter based on actual resonance frequency. The valid suppression frequency range for medium-frequency jitter suppression 2 is 100 Hz to 1000 Hz.

H08.39 Compensation gain of medium-frequency jitter suppression 2

Address:	2008-28h	Effective mode:	Real-time
Min.:	0	Unit:	%
Max.:	300	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0% –300%

Description

Defines the compensation gain for medium-frequency jitter suppression 2. Set this parameter to 40%...55% in general cases. Setting this parameter to 0 negates the effect of medium-frequency jitter suppression 2.

H08.40 Speed observer selection

Address:	2008-29h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled
1: Enabled
Description
Used to set the enable bit for speed observer.
0: Disabled
1: Enabled

H08.42 **Model control selection**

Address:	2008-2Bh	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Disabled
1: Enabled
2: Reserved
4: Model tracking B
Description
Used to enable model tracking control.

H08.43 **Model gain**

Address:	2008-2Ch	Effective mode:	Real time
Min.:	0.1	Unit:	-
Max.:	2000.0	Data Type:	UInt16
Default:	40.0	Change:	Real-time

Value Range:
0.1–2000.0
Description
Defines the single inertia model gain. The higher the gain, the faster the position response. Note that an excessively high setpoint may incur excessive overshoot.

H08.46 **Feedforward value**

Address:	2008-2Fh	Effective mode:	Real-time
Min.:	0.0	Unit:	-
Max.:	102.4	Data Type:	UInt16
Default:	95.0	Change:	Real-time

Value Range:
0.0 –102.4
Description
Defines the speed feedforward gain for single inertia model control. If overshoot occurs, reduce the setpoint properly

H08.48 Model torque feedforward forward compensation coefficient

Address:	2008-31h	Effective mode:	Real-time
Min.:	0.0	Unit:	-
Max.:	204.8	Data Type:	UInt16
Default:	102.4	Change:	Real-time

Value Range:

0.0 –204.8

Description

Defines the speed feedforward gain for single inertia model control. If overshoot occurs, reduce the setpoint properly

H08.49 Model torque feedforward reverse compensation coefficient

Address:	2008-32h	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	204.8	Data Type:	UInt16
Default:	102.4	Change:	Real-time

Value Range:

0.0–204.8

Description

Defines the speed feedforward gain for single inertia model control. If overshoot occurs, reduce the setpoint properly.

H08.53 Medium- and low-frequency jitter suppression frequency 3

Address:	2008-36h	Effective mode:	Real-time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0Hz –300.0Hz

Description

Set this parameter based on actual resonance frequency. The resonance suppression range is 100 Hz to 300 Hz.

H08.54 Medium- and low-frequency jitter suppression compensation 3

Address:	2008-37h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	200	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0% to 200%

Description

Defines the compensation gain for medium- and low-frequency suppression compensation 3. The setpoint 200% indicates full compensation.

H08.56 Medium- and low-frequency jitter suppression phase modulation 3

Address:	2008-39h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0% to 600%

Description

Adjust this parameter based on the actual compensation effect.

H08.59 Medium- and low-frequency jitter suppression frequency 4

Address:	2008-3Ch	Effective mode:	Real-time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0Hz –300.0Hz

Description

Set this parameter based on actual resonance frequency. The resonance suppression range is 100 Hz to 300 Hz.

H08.60 Medium- and low-frequency jitter suppression compensation 4

Address:	2008-3Dh	Effective mode:	Real-time
Min.:	0	Unit:	%
Max.:	200	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0% –200%

Description

Defines the compensation gain for medium- and low-frequency suppression compensation 4. The setpoint 200% indicates full compensation.

H08.61 Medium- and low-frequency jitter suppression phase modulation 4

Address:	2008-3Eh	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	600	Data Type:	UInt16

Default:	100	Change:	Real-time

Value Range:

0% to 600%

Description

Adjust this parameter based on the actual compensation effect.

H08.62 Position loop integral time constant

Address:	2008-3Fh	Effective mode:	Real time
Min.:	0.15	Unit:	-
Max.:	512.00	Data Type:	UInt16
Default:	512.00	Change:	Real-time

Value Range:

0.15–512.00

Description

Defines the position loop integral time constant.

H08.63 2nd position loop integral time constant

Address:	2008-40h	Effective mode:	Real-time
Min.:	0.15	Unit:	-
Max.:	512.00	Data Type:	UInt16
Default:	512.00	Change:	Real-time

Value Range:

0.15 –512.00

Description

Defines the 2nd position loop integral time constant.

H08.64 Speed observer feedback source

Address:	2008-41h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Observer output speed
1: Observer observed speed

Description

Select the speed observer feedback source.
0: Observer output speed
1: Observer observed speed

H08.65 Zero deviation control selection

Address:	2008-42h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Disabled
1: Enabled
Description
Used to enable/disable zero deviation control.
0: Disabled
1: Enabled

H08.66 Zero deviation control position average filter

Address:	2008-43h	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	320.0	Data Type:	UInt16
Default:	5.0	Change:	At stop

Value Range:
0.0 ms–320.0 ms
Description
Defines the average filter time of zero deviation control position. It is recommended to increase the setpoint in case of large noise caused by low command resolution.

H08.68 Speed feedforward of zero deviation control

Address:	2008-45h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:
0.0% to 100.0%
Description
Defines the speed feedforward of zero deviation control.

H08.69 Torque feedforward of zero deviation control

Address:	2008-46h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16

Default: 100.0 Change: Real-time

Value Range:

0.0% to 100.0%

Description

Defines the torque feedforward of zero deviation control.

H08.90 Encoder scale spacing ripple suppressor enable

Address:	2008-5Bh	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	6	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled
1: 1st group activated only-adaptive mode
2: 1st group activated only-hysteresis mode
3: Two groups activated-adaptive mode
4: Two groups activated-hysteresis mode

Description

Sets encoder scale pitch ripple suppression.
0: Disabled
1: 1st group activated only-adaptive mode. This function is used only to suppress or clear the control loop torque ripple caused by encoder pitch ripple and reduce speed fluctuation and operational noise to some extent.
2: 1st group activated only-hysteresis mode. This function is not suitable for applications with frequent speed changes and short travel, but works better for long travel with slow speed changes (for example, digital printing)
3: Two groups activated-adaptive mode. This function decides the number of suppressors needed based on the amount of torque ripple caused by encoder pitch ripple.
4: Two groups activated-hysteresis mode. Hysteresis mode is only suitable for reciprocating constant speed operation, while adaptive mode is suitable for slow speed change scenarios. Choose the suitable mode as needed.

21.10H09 Auto-tuning Parameters

H09.00 Auto-adjustment mode

Address:	2009-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	9	Data Type:	UInt16
Default:	4	Change:	Real-time

Value Range:

0: Disabled, manual gain tuning required

1: Enabled, gain parameters generated automatically based on the stiffness level
2: Positioning mode, gain parameters generated automatically based on the stiffness level
3: Interpolation mode+Inertia auto-tuning
4: Normal mode+Inertia auto-tuning
5: Stune mode 5
6: Quick positioning mode+Inertia auto-tuning
9: Model tracking + Inertia auto-tuning + Friction force compensation

Description

Defines different gain tuning modes. Related gain parameters can be set manually or automatically according to the stiffness level.
0: Disabled, manual gain tuning required

1: Enabled, gain parameters generated automatically based on the stiffness level
2: Positioning mode, gain parameters generated automatically based on the stiffness level
3: Interpolation mode+Inertia auto-tuning
4: Normal mode+Inertia auto-tuning
5: Stune mode 5
6: Quick positioning mode+Inertia auto-tuning
9: Model tracking + Inertia auto-tuning + Friction force compensation

H09.01 Stiffness level selection

Address:	2009-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	41	Data Type:	UInt16
Default:	15	Change:	Real-time

Value Range:

0–41

Description

Defines the stiffness level of the servo system. The higher the stiffness level, the stronger the gains and the quicker the response will be. But an excessively high stiffness level will cause vibration.
The setpoint 0 indicates the weakest stiffness and 41 indicates the strongest stiffness.

H09.02 Mode selection of adaptive notch

Address:	2009-03h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Adaptive notch no longer updated

1: One adaptive notch activated (3rd notch)

2: Two adaptive notches activated (3rd and 4th notches)

3: Resonance point tested only (displayed in H09.24)

4: Adaptive notch cleared, values of 3rd and 4th notches restored to default

Description

Defines the operation mode of the adaptive notch.

0: Adaptive notch no longer updated

1: One adaptive notch activated (3rd notch)

2: Two adaptive notches activated (3rd and 4th notches)

3: Resonance point tested only (displayed in H09.24)

4: Adaptive notch cleared, values of 3rd and 4th notches restored to default

H09.03 Online inertia auto-tuning mode

Address:	2009-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled, changing slowly

2: Enabled, changing normally

3: Enabled, changing quickly

Description

Defines whether to enable online inertia auto-tuning and the inertia ratio update speed during online inertia auto-tuning.

0: Disabled

1: Enabled, changing slowly

2: Enabled, changing normally

3: Enabled, changing quickly

H09.05 Offline inertia auto-tuning mode

Address:	2009-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16

Default:	0	Change:	At stop

Value Range:

0: Bi-directional

1: Unidirectional

Description

Defines the offline inertia auto-tuning mode. The offline inertia auto-tuning function can be enabled through H0d.02.

0: Bi-directional

1: Unidirectional

H09.06 Max. speed of inertia auto-tuning

Address:	2009-07h	Effective mode:	Real time
Min.:	100	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	500	Change:	At stop

Value Range:

100[mm/s]/[rpm]–1000[mm/s]/[rpm]

Description

Defines the maximum permissible speed reference in offline inertia auto-tuning mode.

During inertia auto-tuning, the higher the speed, the more accurate the auto-tuned values. Use the default setpoint in general cases.

H09.07 Time constant for accelerating to max. speed during inertia auto-tuning

Address:	2009-08h	Effective mode:	Real time
Min.:	10	Unit:	ms
Max.:	5000	Data Type:	UInt16
Default:	125	Change:	At stop

Value Range:

10 ms–5000 ms

Description

Defines the time for the motor to accelerate from 0 [mm/s]/[rpm] to the maximum speed of inertia auto-tuning (H09.06) during offline inertia auto-tuning.

H09.08 Interval time after an individual inertia auto-tuning

Address:	2009-09h	Effective mode:	Real time
Min.:	50	Unit:	ms
Max.:	10000	Data Type:	UInt16
Default:	800	Change:	At stop

Value Range:

50 ms–10000 ms

Description

Defines the interval time between two consecutive speed references when H09.05 (Offline inertia auto-tuning mode) is set to 1 (Positive/Negative triangular wave mode).

H09.09 Motor rotating distance per inertia auto-tuning

Address:	2009-0Ah	Effective mode:	Real time
Min.:	0.00	Unit:	[mm]/[Rev]
Max.:	100.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:

0.00[mm]/[Rev]–100.00[mm]/[Rev]

Description

Defines the motor revolutions per inertia auto-tuning when H09.05 (Offline inertia auto-tuning mode) is set to 1 (Positive/Negative triangular wave mode).

Note:

When using the offline inertia auto-tuning function, check that the travel distance of the motor at the stop position is larger than the value of H09.09. If not, decrease the value of H09.06 (Maximum speed for inertia auto-tuning) or H09.07 (Time constant of accelerating to max. speed during inertia auto-tuning) properly until the motor travel distance fulfills the requirement.

H09.11 Vibration threshold

Address:	2009-0Ch	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0% to 100.0%

Description

Defines the alarm threshold for current feedback vibration.

H09.12 Frequency of the 1st notch

Address:	2009-0Dh	Effective mode:	Real time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

50 Hz–8000 Hz

Description

Defines the center frequency of the notch, which is the mechanical resonance frequency.

In the torque control mode, setting the notch frequency to 8000 Hz deactivates the notch function.

H09.13 Width level of the 1st notch

Address:	2009-0Eh	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0–20

Description

Defines the width level of the notch. Use the default setpoint in general cases. Width level is the ratio of the notch width to the notch center frequency.

H09.14 Depth level of the 1st notch

Address:	2009-0Fh	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–99

Description

Defines the depth level of the notch.

The depth level of the notch is the ratio between the input to the output at the notch center frequency.

The higher the setpoint, the lower the notch depth and the weaker the mechanical resonance suppression will be. Note that an excessively high setpoint may cause system instability.

H09.15 Frequency of the 2nd notch

Address:	2009-10h	Effective mode:	Real-time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

50 Hz–8000 Hz

Description

Set the frequency of the 2nd notch.

H09.16 Width level of the 2nd notch

Address:	2009-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0–20

Description

Set the width level of the 2nd notch.

H09.17 **Depth level of the 2nd notch**

Address:	2009-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–99

Description

Set the depth level of the 2nd notch.

H09.18 **Frequency of the 3rd notch**

Address:	2009-13h	Effective mode:	Real time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

50 Hz–8000 Hz

Description

Set the frequency of the 3rd notch.

H09.19 **Width level of the 3rd notch**

Address:	2009-14h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0–20

Description

Set the width level of the 3rd notch.

H09.20 **Depth level of the 3rd notch**

Address:	2009-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–99

Description

Set the depth level of the 3rd notch.

H09.21 **Frequency of the 4th notch**

Address:	2009-16h	Effective mode:	Real time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
50 Hz–8000 Hz
Description
Set the frequency of the 4th notch.

H09.22 **Width level of the 4th notch**

Address:	2009-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0–20
Description
Set the width level of the 4th notch.

H09.23 **Depth level of the 4th notch**

Address:	2009-18h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–99
Description
Set the depth level of the 4th notch.

H09.24 **Auto-tuned resonance frequency**

Address:	2009-19h	Effective mode:	-
Min.:	0	Unit:	Hz
Max.:	5000	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 Hz–5000 Hz

Description

When H09.02 (Adaptive notch mode) is set to 3, the current mechanical resonance frequency is displayed.

H09.32 Gravity compensation value

Address:	2009-21h	Effective mode:	Real time
Min.:	-100.0	Unit:	%
Max.:	100.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:

-100.0% to 100.0%

Description

Defines the gravity compensation value. Setting this parameter properly in vertical axis applications can reduce the falling amplitude upon start.

H09.33 Positive friction compensation value

Address:	2009-22h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0% to 100.0%

Description

Defines the forward friction compensation value.

H09.34 Negative friction compensation value

Address:	2009-23h	Effective mode:	Real time
Min.:	-100.0	Unit:	%
Max.:	0.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:

-100.0% to 0.0%

Description

Defines the reverse direction friction compensation value.

H09.35 Friction compensation speed

Address:	2009-24h	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	20.0	Data Type:	UInt16

Default:	2.0	Change:	Real-time

Value Range:

0.0–20.0

Description

Defines the friction compensation speed.

H09.36 Friction compensation speed

Address:	2009-25h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x13	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0: Slow mode+Speed reference
1: Slow mode+Model speed
2: Slow mode+Speed feedback
3: Slow mode+Observe speed
16: Quick mode +Speed reference
17: Quick mode +Model speed
18: Quick mode +Speed feedback
19: Quick mode+Observe speed

Description

Friction compensation speed
0: Slow mode+Speed reference
1: Slow mode+Model speed
2: Slow mode+Speed feedback
3: Slow mode+Observe speed
16: Quick mode +Speed reference
17: Quick mode +Model speed
18: Quick mode +Speed feedback
19: Quick mode+Observe speed

H09.37 Vibration monitoring time

Address:	2009-26h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	300	Change:	Real-time

Value Range:

0–65535

Description

The resonance detection suppression function is turned off automatically after the time defined by this parameter elapses. To suppress the resonance suppression function, set this parameter to 65536 (in seconds).

H09.38 Frequency of low-frequency resonance suppression 1 at the mechanical end

Address:	2009-27h	Effective mode:	Real time
Min.:	1.0	Unit:	Hz
Max.:	100.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:

1.0 Hz–100.0 Hz

Description

Set this parameter based on the actual jitter frequency.

H09.39 Low-frequency resonance suppression 1 at the mechanical end

Address:	2009-28h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0–3

Description

Defines different low-frequency resonance suppression types at the mechanical load. Type 1 features the shortest delay.

H09.44 Frequency of low-frequency resonance suppression 2 at mechanical load end

Address:	2009-2Dh	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0–200.0

Description

Set this parameter based on the actual jitter frequency.

H09.45 Responsiveness of low-frequency resonance suppression 2 at mechanical load end

Address:	2009-2Eh	Effective mode:	Real time
Min.:	0.01	Unit:	-
Max.:	10.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:

0.01–10.00

Description

Use the default setpoint in general cases. To increase the setpoint, reduce the delay time.

H09.47 Width of low-frequency resonance suppression 2 at mechanical load end

Address:	2009-30h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	2.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:

0.00–2.00

Description

Use the default setpoint in general cases. To increase the setpoint, increase the delay time.

H09.49 Frequency of low-frequency resonance suppression 3 at mechanical load end

Address:	2009-32h	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0–200.0

Description

Set the frequency of low-frequency resonance suppression 3 at mechanical load end.

H09.50 Responsiveness of low-frequency resonance suppression 3 at mechanical load end

Address:	2009-33h	Effective mode:	Real time
Min.:	0.01	Unit:	-
Max.:	10.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:

0.01–10.00

Description

Set the responsiveness of low-frequency resonance suppression 3 at mechanical load end.

H09.52 Width of low-frequency resonance suppression 3 at mechanical load end

Address:	2009-35h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	2.00	Data Type:	UInt16

Default:	1.00	Change:	At stop

Value Range:

0.00–2.00

Description

Set the width of low-frequency resonance suppression 3 at mechanical load end.

H09.54 Resonance detection torque threshold

Address:	2009-37h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	50.0	Change:	Real-time

Value Range:

0.0% to 300.0%

Description

If the torque fluctuation exceeds the setpoint, an error will be reported. Setting this parameter to 0 hides the resonance detection function.

H09.56 Max. overshoot allowed by ETune

Address:	2009-39h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	2936	Change:	Real-time

Value Range:

0–65535

Description

Defines the maximum overshoot value allowed during ETune adjustment.

H09.57 STune resonance suppression switchover frequency

Address:	2009-3Ah	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	4000	Data Type:	UInt16
Default:	650	Change:	Real-time

Value Range:

0 Hz–4000 Hz

Description

If the resonance frequency is lower than the setpoint, use medium-frequency resonance suppression 2 to suppress resonance. Otherwise, use the notch to suppress resonance.

H09.58 STune resonance suppression reset selection

Address:	2009-3Bh	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

Used to enable STune resonance suppression reset to clear parameters related to resonance suppression, medium-frequency resonance suppression 2 and notches 3 and 4.

0: Disabled

1: Enabled

H09.62 Stune stop delay judgment

Address:	2009-3Fh	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	50.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:

0.00 ms–50.00 ms

Description

Set Stune stop delay threshold.

H09.63 STune quick convergence speed

Address:	2009-40h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	50.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:

0.00–50.00

Description

Set STune quick convergence speed.

H09.71 Starting frequency

Address:	2009-48h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	15	Change:	Real-time

Value Range:

0 Hz–8000 Hz

Description

Set the starting frequency for high-performance auto-tuning sweep frequency.

H09.72 End frequency

Address:	2009-49h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

0 Hz–8000 Hz

Description

Set the end frequency for high-performance auto-tuning sweep frequency.

H09.73 Frequency subdivision

Address:	2009-4Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	500	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0–500

Description

Set the frequency resolution for high-performance auto-tuning low frequency band (start frequency–start frequency 2). The larger the setting, the smaller the resolution.

H09.74 Excitation amplitude

Address:	2009-4Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	15.0	Change:	Real-time

Value Range:

0.0% to 400.0%

Description

Set the excitation amplitude for high-performance auto-tuning sweep frequency.

H09.75 Starting frequency 2

Address:	2009-4Ch	Effective mode:	Real time

Min.:	0	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:

0 Hz–8000 Hz

Description

Set the starting frequency for medium and high frequency in high-performance auto-tuning.

H09.76 Frequency subdivision 2

Address:	2009-4Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1000	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:

0–1000

Description

Set the frequency resolution for high-performance auto-tuning low frequency band (start frequency 2–end frequency). The larger the setting, the smaller the resolution.

H09.77 Biquad filter mode

Address:	2009-4Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	6	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled
1: First-order low-pass
2: Second-order low-pass
3: Notch
4: Lead-lag
5: User-defined

Description

Used to select biquad filter mode.

0: Disabled
1: First-order low-pass
2: Second-order low-pass
3: Notch
4: Lead-lag
5: User-defined

H09.78 Biquad filter numerator frequency

Address:	2009-4Fh	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	16000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

0 Hz–16000 Hz

Description

Set the biquad filter numerator frequency.

H09.79 Biquad filter numerator damping coefficient

Address:	2009-50h	Effective mode:	Real time
Min.:	0.001	Unit:	-
Max.:	10.000	Data Type:	UInt16
Default:	1.000	Change:	Real-time

Value Range:

0.001–10.000

Description

Set the biquad filter numerator damping coefficient.

H09.80 Biquad filter denominator frequency

Address:	2009-51h	Effective	Real time
Min.:	0	Unit:	Hz
Max.:	16000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

0 Hz–16000 Hz

Description

Set the biquad filter denominator frequency.

H09.81 Biquad filter denominator damping coefficient

Address:	2009-52h	Effective mode:	Real time
Min.:	0.001	Unit:	-
Max.:	10.000	Data Type:	UInt16
Default:	1.000	Change:	Real-time

Value Range:

0.001–10.000

Description

Set the biquad filter denominator damping coefficient.

H09.82 Vibration frequency 1

Address:	2009-53h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0 Hz–300.0 Hz
Description
Set vibration frequency 1.

H09.83 Resonance frequency 1

Address:	2009-54h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0 Hz–300.0 Hz
Description
Set resonance frequency 1.

H09.84 Vibration damping 1

Address:	2009-55h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	0.50	Data Type:	UInt16
Default:	0.05	Change:	Real-time

Value Range:
0.00–0.50
Description
Set vibration damping 1.

H09.85 Resonance damping 1

Address:	2009-56h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	0.50	Data Type:	UInt16
Default:	0.05	Change:	Real-time

Value Range:
0.00–0.50
Description
Set resonance damping 1.

H09.86 Vibration frequency 2

Address:	2009-57h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0 Hz–300.0 Hz
Description
Set vibration frequency 2.

H09.87 Resonance frequency 2

Address:	2009-58h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0 Hz–300.0 Hz
Description
Set resonance frequency 2.

H09.88 Vibration damping 2

Address:	2009-59h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	0.50	Data Type:	UInt16
Default:	0.05	Change:	Real-time

Value Range:
0.00–0.50
Description
Set vibration damping 2.

H09.89 Resonance damping 2

Address:	2009-5Ah	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	0.50	Data Type:	UInt16
Default:	0.05	Change:	Real-time

Value Range:
0.00–0.50
Description
Set resonance damping 2.

H09.92 Model friction force compensation enable

Address:	2009-5Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

Disable/enable model friction force compensation.

H09.93 Model friction force compensation coefficient

Address:	2009-5Eh	Effective mode:	Real time
Min.:	0.00	Unit:	%/1000 rpm
Max.:	50.00	Data Type:	UInt16
Default:	0.00	Change:	Real-time

Value Range:

0.00%/1000 rpm–50.00%/1000 rpm

Description

Set the model friction compensation coefficient.

H09.98 Vibration suppression auto-tuning

Address:	2009-63h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Fast auto-tuning

2: Slow auto-tuning

Description

0: Disabled

1: Fast auto-tuning

2: Slow auto-tuning

21.11H0A Fault and Protection Parameters

H0A.00 Power input phase loss and failure protection

Address:	200A-01h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Enable

1: Disable

Description

The drive supports single-phase/three-phase 220 V and three-phase 380 V power supplies. When voltage fluctuation or phase loss occurs on the power supply, the drive triggers power input phase loss protection based on H0A.00.

0: Enable

1: Disable

H0A.01 Absolute position limit

Address:	200A-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

2: Enabled after homing

Description

Used to set the activation condition for enabling the software position limit function and the software limit.

0: Disabled

1: Enabled

2: Enabled after homing

H0A.04 Motor overload protection gain

Address:	200A-05h	Effective mode:	Real time
Min.:	50	Unit:	-
Max.:	300	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

50–300

Description

Determines the motor overload duration before E620.0 (Motor overload) is reported.

You can change the setpoint to advance or delay the time when overload protection is triggered based on the motor temperature. The setpoint 50% indicates the time is cut by half; 150% indicates the time is increased by 50%. Set this parameter based on the actual temperature of the motor.

H0A.08 Overspeed threshold

Address:	200A-09h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	20000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–20000[mm/s]/[rpm]

Description

Defines the overspeed threshold of the motor.

Value	Threshold	Condition for Reporting E500.0
0	Maximum motor speed x 1.2	If the speed feedback exceeds the overspeed threshold several times, the drive reports E500.0 (Motor overspeed).
1–20000	If H0A-08 ⩾ (Maximum motor speed x 1.2): Overspeed threshold = Maximum motor speed x 1.2	
	If H0A-08 < (Maximum motor speed x 1.2): Overspeed threshold = H0A.08	

H0A.09 Max. pulse input frequency in position control

Address:	200A-0Ah	Effective mode:	Real time
Min.:	100	Unit:	kHz
Max.:	16000	Data Type:	UInt16
Default:	16000	Change:	At stop

Value Range:

100 kHz–16000 kHz

Description

Defines the maximum frequency of input pulses when the position reference source is pulse reference (H05.00 = 0) in the position control mode.

When the actual pulse input frequency exceeds the value of H0A.09, the drive reports EB01.0 (Position reference input error).

H0A.10 Threshold of excessive local position deviation

Address:	200A-0Bh	Effective	Real time
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	219895614	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the threshold for excessive position deviation in the position control mode.

When the position deviation exceeds this threshold, the drive reports EB00.0 (Position deviation too large).

H0A.12 Runaway protection enable

Address:	200A-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Disabled

1: Runaway protection scheme 1

2: Runaway protection scheme 2

Description

Defines whether to enable runaway protection.

0: Disables E234 detection when the motor drives a vertical axis or is driven by the load

1: Enables runaway protection scheme 1

2: Enable runaway protection scheme 2

H0A.13 Angle auto-tuning mode

Address:	200A-0Eh	Effective	Real time
Min.:	0	mode:	
Max.:	10	Unit:	-
Default:	1	Data Type:	UInt16
Value Range:		Change:	At stop

0: Angle auto-tuning through pre-positioning
1: Angle auto-tuning through inching
2: Angle auto-tuning through voltage injection
6: Angle auto-tuning through static Hall
8: Angle auto-tuning through closed-loop pre-positioning
9: Angle auto-tuning through position lock

Description

Motor angle auto-tuning mode

0: Angle auto-tuning through pre-positioning
1: Angle auto-tuning through inching
2: Angle auto-tuning through voltage injection
6: Angle auto-tuning through static Hall
8: Angle auto-tuning through closed-loop pre-positioning
9: Angle auto-tuning through position lock

Usage limit on mode 2:

1. The setpoint 2 is only applicable to motors with iron core. ROT and DDR can be used, and DDL is not recommended.
2. If other auto-tuning methods fail, perform the following test before using angle auto-tuning through voltage injection. Specifically, with continuous power-on, perform angle auto-tuning through voltage injection at five different positions. Record each auto-tuning result (H00.28). Angle auto-tuning through voltage injection can be used only if the maximum deviation of the auto-tuning results is within 5400.

H0A.17 Reference pulse selection

Address:	200A-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Pulse unit

1: Reference unit

Description

Used to set the threshold unit for large position deviation, positioning completion, and positioning proximity.

0: Pulse unit

1: Reference unit

H0A.18 IGBT over-temperature threshold

Address:	200A-13h	Effective mode:	Real time
Min.:	120	Unit:	°C
Max.:	175	Data Type:	UInt16
Default:	140	Change:	Real-time

Value Range:

120°C–175°C

Description

Defines the threshold for reporting E640.0 (IGBT overtemperature) and E640.1 (Flywheel diode overtemperature).

H0A.19 Filter time constant of touch probe 1

Address:	200A-14h	Effective mode:	Real time

Min.:	0.00	Unit:	μs
Max.:	6.30	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:

0.00μs to 6.30μs

Description

Set the filter time constant of touch probe 1.

H0A.20 Filter time constant of touch probe 2

Address:	200A-15h	Effective mode:	Real time
Min.:	0.00	Unit:	μs
Max.:	6.30	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:

0.00μs to 6.30μs

Description

Set the filter time constant of touch probe 2.

H0A.21 STO function display selection

Address:	200A-16h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–7

Description

Defines whether to display the STO status or report E150.0 after the STO function is triggered.

0: Displays the STO status. The keypad displays "sto_" after the STO function is triggered. In this case, no fault is reported and no output is generated from the fault DO.

1: Displays the STO fault. The keypad displays "E150.0" after the STO function is triggered. In this case, the dive reports the fault and the faulty DO outputs.

H0A.23 TZ signal filter time

Address:	200A-18h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	25ns
Max.:	31	Data Type:	UInt16
Default:	15	Change:	At stop

Value Range:

0 ns–31 ns

Description

Set TZ signal filter time.

H0A.24 Filter time constant of low-speed pulse input terminal

Address:	200A-19h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	25ns
Max.:	255	Data Type:	UInt16
Default:	30	Change:	At stop

Value Range:

0 ns–255 ns

Description

Defines the filter time constant of low-speed pulse input terminal which is enabled (H05.01 = 0) when the position reference source is pulse input (H05.00 = 0) in the position control mode.

When peak interference exists in the low-speed pulse input terminal, set this parameter to suppress peak interference and prevent motor malfunction due to interference signal inputted to the servo drive.

H0A.25 Speed display DO low-pass filter time

Address:	200A-1Ah	Effective	Real time
Min.:	0	Unit:	ms
Max.:	5000	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 ms–5000 ms

Description

Defines the low-pass filter time constant of the speed information for speed feedback and position references.

H0A.26 Motor overload detection

Address:	200A-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Show motor overload alarm (E909.0) and fault (E620.0)

1: Hide motor overload alarm (E909.0) and fault (E620.0)

Description

Defines whether to enable motor overload detection.

0: Show motor overload alarm (E909.0) and fault (E620.0)

1: Hide motor overload alarm (E909.0) and fault (E620.0)

H0A.27 Average filter time for speed display DO

Address:	200A-1Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	50	Change:	At stop

Value Range:
0 ms–100 ms
Description
Defines the average filter time constant of the speed information for speed feedback and position references.

H0A.28 Quadrature encoder filter time

Address:	200A-1Dh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	25ns
Max.:	255	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:
0 ns–255 ns
Description
Defines the quadrature encoder feedback filter time.

H0A.29 Fully closed-loop encoder (ABZ) filter time

Address:	200A-1Eh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	25ns
Max.:	65535	Data Type:	UInt16
Default:	4111	Change:	At stop

Value Range:
bit0–bit7: Fully closed loop encoder (ABZ) pulse signal filtering time
bit8–bit15: Fully closed loop encoder (ABZ) wire breakage filter time
Description
Bit0–bit7: Fully closed-loop encoder (ABZ) pulse signal filter time
Bit8–bit15: Fully closed-loop encoder (ABZ) wire breakage filter time

H0A.30 Filter time constant of high-speed pulse input terminal

Address:	200A-1Fh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ns
Max.:	255	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:
0 ns–255 ns
Description
Set the filter time constant of high-speed pulse input terminal.

H0A.32 Time threshold for locked motor overheat protection

Address:	200A-21h	Effective mode:	Real time

Min.:	10	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

10 ms–65535 ms

Description

Defines the overtemperature duration before E630.0 (Motor stall) is detected by the servo drive.

H0A.32 can be used to adjust the sensitivity of motor stall over-temperature detection.

H0A.33 Locked motor overheat protection

Address:	200A-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

Enables or disables the detection for E630.0 (Motor stall overtemperature protection).

0: Disabled

1: Enabled

H0A.36 Encoder multi-turn overflow fault selection

Address:	200A-25h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Not hide

1: Hide

Description

Defines whether to hide the encoder multi-turn overflow fault in the absolute position linear mode (H02.01 = 1).

0: Not hide

1: Hide

H0A.40 Compensation function selection

Address:	200A-29h	Effective mode:	Real time

Min.:	0x0	Unit:	-
Max.:	0x1F	Data Type:	UInt16
Default:	0x6	Change:	At stop

Value Range:

bit0: Overtravel compensation
0: Enabled
1: Disabled
bit1: Touch probe rising edge compensation
0: Disabled
1: Enabled
bit2: Touch probe falling edge compensation
0: Disabled
1: Enabled
bit3: Touch probe scheme
0: New scheme
1: Old scheme (same as SV660N)
bit4: Probe 2 separate compensation time enable
0: Disabled
1: Enabled

Description

-

H0A.41 Forward position of software position limit

Address:	200A-2Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	2147483647	Change:	At stop

Value Range:

-2147483648 to 2147483647

Description

When the absolute position counter (H0b.07) is larger than H0A.41, the servo drive reports E950.0 (Forward limit switch alarm) and executes stop at forward limit.

H0A.43 Reverse position of software position limit

Address:	200A-2Ch	Effective mode:	Real time
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	-2147483648	Change:	At stop

Value Range:

-2147483648 to 2147483647

Description

When the absolute position counter (H0b.07) is smaller than H0A.43, the drive reports E952.0 (Reverse overtravel) and stops accordingly.

H0A.50 Encoder communication fault tolerance threshold

Address:	200A-33h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	31	Change:	Real-time

Value Range:

0–31

Description

When the communication between the encoder and the drive fails continuously for more than H0A.50 times, it is considered as a communication failure with the encoder. When overspeed point mask is enabled, if the number of consecutive overspeed points exceed H0A.50, it is considered as a communication failure with the encoder.

H0A.51 Phase loss detection filter times

Address:	200A-34h	Effective mode:	Real time
Min.:	3	Unit:	55ms
Max.:	36	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:

3 ms–36 ms

Description

Phase loss fault is reported when phase loss keeps active for a period longer than H0A.51.

H0A.52 Encoder temperature protection threshold

Address:	200A-35h	Effective mode:	Real time
Min.:	0	Unit:	°C
Max.:	175	Data Type:	UInt16
Default:	120	Change:	Real-time

Value Range:

0°C–175°C

Description

Defines the temperature threshold for encoder overtemperature protection.

H0A.53 Probe DI ON compensation time

Address:	200A-36h	Effective mode:	Real time
Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16

Default:	200	Change:	Real-time

Value Range:

-3000 ns–3000 ns

Description

Used to compensate for the action time when the touch probe is switched on.

H0A.54 Probe DI OFF compensation time

Address:	200A-37h	Effective mode:	Real time
Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16
Default:	1512	Change:	Real-time

Value Range:

-3000 ns–3000 ns

Description

Used to compensate for the action time when the touch probe is switched off.

H0A.55 Runaway current threshold

Address:	200A-38h	Effective mode:	Real time
Min.:	100.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	200.0	Change:	Real-time

Value Range:

100.0% to 400.0%

Description

Defines the current threshold for runaway protection detection.

H0A.56 Fault reset delay

Address:	200A-39h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	60000	Data Type:	UInt16
Default:	10000	Change:	Real-time

Value Range:

0 ms–60000 ms

Description

Defines the fault reset delay.

H0A.57 Runaway speed threshold

Address:	200A-3Ah	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16

Default:	50	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–1000[mm/s]/[rpm]

Description

Defines the overspeed threshold for runaway protection detection.

H0A.58 Runaway speed filter time

Address:	200A-3Bh	Effective mode:	Upon the next power-on
Min.:	0.1	Unit:	ms
Max.:	100.0	Data Type:	UInt16
Default:	2.0	Change:	Real-time

Value Range:

0.1 ms–100.0 ms

Description

Defines the speed feedback filter time for runaway protection detection.

H0A.59 Runaway protection detection time

Address:	200A-3Ch	Effective mode:	Real time
Min.:	10	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:

10 ms–1000 ms

Description

The runaway fault (E234.0) will be reported when runaway keeps active for a period longer than H0A.59.

H0A.60 Black box function mode

Address:	200A-3Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Disable

1: Any fault

2: Designated fault

3: Triggered based on designated condition

Description

Defines the condition for triggering black box sampling.
0: Disable
1: Any fault
2: Designated fault
3: Triggered based on designated condition

H0A.61 Designated fault code

Address:	200A-3Eh	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0–6553.5
Description
Defines the fault code for triggering the black box function.

H0A.62 Trigger source

Address:	200A-3Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	25	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–25
Description
Defines the fault code for triggering the black box function through designated channel.

H0A.63 Trigger level

Address:	200A-40h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
Defines the trigger level for triggering the black box function through designated channel.

H0A.65 **Trigger level**

Address:	200A-42h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Rising edge

1: Equal

2: Falling edge

3: Edge-triggered

Description

Defines the trigger mode for triggering the black box function through H0A.63.

0: Rising edge

1: Equal

2: Falling edge

3: Edge-triggered

H0A.66 **Trigger position**

Address:	200A-43h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	100	Data Type:	UInt16
Default:	75	Change:	Real-time

Value Range:

0% to 100%

Description

Defines the pre-trigger position for triggering black box sampling.

H0A.67 **Sampling frequency**

Address:	200A-44h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Current loop

1: Position loop

2: Main cycle

Description

Defines the frequency sampling mode during black box sampling.
0: Current loop
1: Position loop
2: Main cycle

H0A.70 Overspeed threshold 2

Address:	200A-47h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	20000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0[mm/s]/[rpm]–20000[mm/s]/[rpm]
Description
Defines the speed threshold for reporting E500.2 (Position feedback pulse overspeed).

H0A.71 Internal function switch

Address:	200A-48h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	4098	Change:	Real-time

Value Range:
0–65535
Description

bit	Function	Description
0	MS1 overload curve selection	0: New 1: Old
1	Power failure bleeder switch	0: Enabled 1: Disabled
2	Forced brake motor stop	0: Forced stop 1: Not forced stop
3	New external feature switch of multi-speed DI mode	0: Old feature used for multi-speed DI mode 1: New feature used for multi-speed DI mode
4	E120.3 hide switch	0: Enabled 1: Disabled
5	Prohibit software reading function code	0: Disabled 1: Enabled
6	Shield alarm 108.4	0: Disabled 1: Enabled
7	CSV command interpolation mode	0: Sync interrupt interpolation 1: IRQ interrupt interpolation

bit	Function	Description
8	Data type of motor rated current, inertia and back EMF coefficient	0: 16-bit 1: 32-bit
9	Wire breakage detection	0: Enabled 1: Disabled
10	Torque limit source	0: Auto switch acc. to H02.00 1: H07.09 and H07.10
11	Ultra-accurate speed feedback switch	0: Disabled 1: Enabled
12	Power failure retention of homing completion flag	0: Disabled 1: Enabled
13	STO status word fallback switch	0：Switch on disable 1：Fault
14	Encoder adaptive function switch	0: Enabled 1: Disabled
15	Interrupt positioning external characteristics	0: Old external characteristics, follows motor operation direction 1: New external characteristics, direction set by parameter

H0A.72 **Maximum stop time in ramp-to-stop**

Address:	200A-49h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10000	Change:	At stop

Value Range:

0 ms–65535 ms

Description

Defines the time for the motor to decelerate from the maximum speed to 0 [mm/s]/[rpm] during ramp-to-stop.

H0A.73 **STO 24 V disconnection filter time**

Address:	200A-4Ah	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.:	5	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1 ms–5 ms

Description

Defines the delay from the moment when 24V is disconnected to the moment when the STO state applies.

H0A.74 Filter time for two inconsistent STO channels

Address:	200A-4Bh	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

1 ms–1000 ms

Description

Defines the delay from the moment the inconsistent 24V is input to the drive through two channels to the moment when the STO state applies.

H0A.75 Servo OFF delay after STO triggered

Address:	200A-4Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	25	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:

0 ms–25 ms

Description

Defines the delay from the moment the STO state is triggered to the moment the S-ON signal is switched off.

H0A.87 Hall state fault filtering count

Address:	200A-58h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1000	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0–1000

Description

Set Hall state fault filtering count.

H0A.88 Alarm enable

Address:	200A-59h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–3

Description

Bit0: Used to enable original BiSS-C data alarm function, which is only applicable to the encoder that adopts BiSS-C protocol.
bit1: Used to mask the undervoltage alarm for voltage drop protection (971.0)

H0A.89 Correct state of DDL BiSS-C data

Address:	200A-5Ah	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0–31
Description
Defines the fault bit state during normal operation of BiSS-C.

H0A.90 Speed display low-pass filter time

Address:	200A-5Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 ms–100 ms
Description
Defines the low-pass filter time constant for displayed speed values.

H0A.91 Moving average filter time for torque display values

Address:	200A-5Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 ms–100 ms
Description
Defines the moving average filter time constant for torque display values.

H0A.92 Moving average filter time for position display values

Address:	200A-5Dh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 ms–100 ms
Description
Defines the moving average filter time constant for position display values.

H0A.93 Low-pass filter time for voltage display values

Address:	200A-5Eh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	250	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 ms–250 ms
Description
Defines the low-pass filter time constant for voltage display values.

H0A.94 Low-pass filter time for thermal display values

Address:	200A-5Fh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	250	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 ms–250 ms
Description
Defines the filter time constant for thermal display values.

21.12H0B Monitoring Parameters

H0b.00 Motor speed actual value

Address:	200b-01h	Effective mode:	-
Min.:	-32767	Unit:	[mm/s]/[rpm]
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]
Description
Indicates the actual motor speed after round-off, which is accurate to 1 [mm/s]/[rpm].
You can set the filter time constant for H0b.00 through H0A.25 (speed display DO low-pass filter time).

H0b.01 Speed reference

Address:	200b-02h	Effective mode:	-

Min.:	-32767	Unit:	[mm/s]/[rpm]
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]

Description

Indicates the present speed reference (accurate to 1 [mm/s]/[rpm]) of the drive in the position and speed control modes.

H0b.02 Internal torque reference

Address:	200b-03h	Effective mode:	-
Min.:	-3276.7	Unit:	%
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:

-3276.7% to 3276.7%

Description

Displays present torque reference (accurate to 0.1%). The value 100.0% corresponds to the rated torque of the motor.

H0b.03 Input (DI) signal monitoring

Address:	200b-04h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Displays the level status of eight DI terminals without filtering.

Upper LED segments ON: high level (indicated by "1") Lower LED segments ON: low level (indicated by "0")

H0b.05 Output (DO) signal monitoring

Address:	200b-06h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Displays the level status of 5 DO terminals without filtering.
Upper LED segments ON: high level (indicated by "1")
Lower LED segments ON: low level (indicated by "0")

H0b.07 Absolute position counter

Address:	200b-08h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647

Description
Displays current absolute position of the motor (reference unit).
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.09 Mechanical angle

Address:	200b-0Ah	Effective mode:	-
Min.:	0.0	Unit:	°
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0° to 360.0°

Description
Displays present mechanical angle (encoder unit) of the motor. The setpoint 0 indicates the mechanical angle is 0°.
Actual mechanical angle = 360° x H0b.09/(Maximum value of H0b.09 + 1)
Maximum value of H0b.09 for an absolute encoder is 65535.

H0b.10 Electrical angle

Address:	200b-0Bh	Effective mode:	-
Min.:	0.0	Unit:	°
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0° to 360.0°

Description
Indicates the present electrical angle of the motor, which is accurate to 0.1°.
The electrical angle variation range is ±360.0° during rotation. If the motor has four pairs of poles, each revolution generates four rounds of angle change from 0° to 359°. Similarly, if the motor has five pairs of poles, each revolution generates five rounds of angle change from 0° to 359°.

H0b.12 Average load ratio

Address:	200b-0Dh	Effective mode:	-
Min.:	0.0	Unit:	%
Max.:	800.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0% to 800.0%

Description

Displays the percentage of the average load torque to the rated torque of the motor, which is accurate to 0.1%. The value 100.0% corresponds to the rated torque of the motor.

H0b.13 Input reference counter

Address:	200b-0Eh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Used to count and display the number of position references not divided or multiplied by the electronic gear ratio during operation.

This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.15 Position following error (encoder unit)

Address:	200b-10h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Used to count and display the position deviation value after being divided or multiplied by the electronic gear ratio in the position control mode.

This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

Note:

H0b.15 can be clear when the condition defined in H05.16 (Clear action) is met.

H0b.17 Feedback pulse counter

Address:	200b-12h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Used to count the position pulses fed back by the encoder in any control mode.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.19 Total power-on time

Address:	200b-14h	Effective mode:	-
Min.:	0.0	Unit:	s
Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:

0.0s–429496729.5s

Description

Used to record the total operating time of the servo drive.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.
Note:
If the servo drive is switched on and off repeatedly within a short period of time, a deviation within 1h may be present in the total power-on time record.

H0b.21 Displayed AI1 voltage

Address:	200b-16h	Effective mode:	-
Min.:	-327.67	Unit:	V
Max.:	327.67	Data Type:	Int16
Default:	0.00	Change:	Unchangeable

Value Range:

-327.67 V–327.67 V

Description

Displays the actual sampling voltage of AI1.

H0b.22 Displayed AI2 voltage

Address:	200b-17h	Effective mode:	-
Min.:	-327.67	Unit:	V

Max.:	327.67	Data Type:	Int16
Default:	0.00	Change:	Unchangeable

Value Range:

-327.67 V–327.67 V

Description

Displays the actual sampling voltage of AI2.

H0b.24 Phase current RMS value

Address:	200b-19h	Effective mode:	-
Min.:	0.0	Unit:	A
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 A–6553.5 A

Description

Displays the RMS value of the phase current of the motor, accurate to 0.1 A.

H0b.25 Angle obtained upon voltage injection auto-tuning

Address:	200b-1Ah	Effective mode:	-
Min.:	0.0	Unit:	°
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0° to 360.0°

Description

Display the angle obtained upon voltage injection auto-tuning.

H0b.26 Bus voltage

Address:	200b-1Bh	Effective mode:	-
Min.:	0.0	Unit:	V
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 V–6553.5 V

Description

Displays the DC bus voltage of the main circuit input voltage after rectification, which is accurate to 0.01 V.

H0b.27 Module temperature

Address:	200b-1Ch	Effective mode:	-
Min.:	-20	Unit:	℃

Max.:	200	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-20°C–200°C

Description

Indicates the temperature of the module inside the servo drive, which can be used as a reference for estimating the actual temperature of the drive.

H0b.28 Absolute encoder fault information given by FPGA

Address:	200b-1Dh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the absolute encoder fault information given by FPGA.

H0b.29 Axis status information given by FPGA

Address:	200b-1Eh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display axis status information given by FPGA.

H0b.30 Axis fault information given by FPGA

Address:	200b-1Fh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display axis fault information given by FPGA.

H0b.31 Encoder fault information

Address:	200b-20h	Effective mode:	-

Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display encoder internal fault information.

H0b.33

Fault log

Address:	200b-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	19	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Present fault
1: Last fault
2: 2nd to last fault
3: 3rd to last fault
4: 4th to last fault
5: 5th to last fault 6: 6th to last fault
7: 7th to last fault
8: 8th to last fault
9: 9th to last fault
10: 10th to last fault
11: 11th to last fault
12: 12th to last fault
13: 13th to last fault
14: 14th to last fault
15: 15th to last fault
16: 16th to last fault
17: 17th to last fault
18: 18th to last fault
19: 19th to last fault

Description

Used to view the latest 20 faults of the drive.
0: Present fault
1: Last fault
2: 2nd to last fault
3: 3rd to last fault
4: 4th to last fault
5: 5th to last fault 6: 6th to last fault
7: 7th to last fault
8: 8th to last fault
9: 9th to last fault
10: 10th to last fault
11: 11th to last fault
12: 12th to last fault
13: 13th to last fault
14: 14th to last fault
15: 15th to last fault
16: 16th to last fault
17: 17th to last fault
18: 18th to last fault
19: 19th to last fault

H0b.34 Fault code of the selected fault

Address:	200b-23h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the fault code of the selected fault.

H0b.35 Timestamp of the selected fault

Address:	200b-24h	Effective mode:	-
Min.:	0.0	Unit:	s
Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:
0.0s–429496729.5s

Description

Display timestamp of the selected fault.

H0b.37 Motor speed upon occurrence of the selected fault

Address:	200b-26h	Effective mode:	-
Min.:	-32767	Unit:	[mm/s]/[rpm]
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]

Description

Display motor speed upon occurrence of the selected fault.

H0b.38 Motor phase U current upon occurrence of the selected fault

Address:	200b-27h	Effective mode:	-
Min.:	-3276.7	Unit:	A
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:

-3276.7 A–3276.7 A

Description

Display the motor phase U current upon occurrence of the selected fault.

H0b.39 Motor phase V current upon occurrence of the selected fault

Address:	200b-28h	Effective mode:	-
Min.:	-3276.7	Unit:	A
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:

-3276.7 A–3276.7 A

Description

Display the motor phase V current upon occurrence of the selected fault.

H0b.40 Bus voltage upon occurrence of the selected fault

Address:	200b-29h	Effective mode:	-
Min.:	0.0	Unit:	V
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 V–6553.5 V

Description

Display the bus voltage upon occurrence of the selected fault.

H0b.41 Input terminal state on selected fault

Address:	200b-2Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display input terminal state on selected fault.

H0b.43 Output terminal status upon occurrence of the selected fault

Address:	200b-2Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display output terminal status upon occurrence of the selected fault.

H0b.45 Internal fault code

Address:	200b-2Eh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the internal fault code.

H0b.46 Absolute encoder fault information given by FPGA upon occurrence of the selected fault

Address:	200b-2Fh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the absolute encoder fault information given by FPGA upon occurrence of the selected fault.

H0b.47 **System status information given by FPGA upon occurrence of the selected fault**

Address:	200b-30h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the system status information given by FPGA upon occurrence of the selected fault.

H0b.48 **System fault information given by FPGA upon occurrence of the selected fault**

Address:	200b-31h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the system fault information given by FPGA upon occurrence of the selected fault.

H0b.49 **Encoder fault information upon occurrence of the selected fault**

Address:	200b-32h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the encoder fault information upon occurrence of the selected fault.

H0b.51 **Internal fault code upon occurrence of the selected fault**

Address:	200b-34h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16

Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display internal fault code upon occurrence of the selected fault.

H0b.52 FPGA timeout fault standard bit upon occurrence of the selected fault

Address:	200b-35h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the FPGA timeout fault standard bit upon occurrence of the selected fault.

H0b.53 Position following error (reference unit)

Address:	200b-36h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position deviation value which has not been divided or multiplied by the electronic gear ratio in the position control mode.

Position deviation (reference unit) is the value obtained after encoder position deviation calculation. The precision is compromised during division.

This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.55 Actual motor speed 2

Address:	200b-38h	Effective mode:	-
Min.:	-214748364.8	Unit:	[mm/s]/[rpm]
Max.:	214748364.7	Data Type:	Int32
Default:	0.0	Change:	Unchangeable

Value Range:

-214748364.8[mm/s]/[rpm]–214748364.7[mm/s]/[rpm]

Description

Displays the actual motor speed, accurate to 0.1 [mm/s]/[rpm].

This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.
H0A.25 (Filter time constant of speed feedback display) can be used to set the filter time constant of the speed feedback.

H0b.57 Control circuit bus voltage

Address:	200b-3Ah	Effective mode:	-
Min.:	0.0	Unit:	V
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0 V–6553.5 V
Description
Displays the bus voltage of the control circuit.

H0b.58 Mechanical absolute position (low 32 bits)

Address:	200b-3Bh	Effective mode:	-
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0 to 4294967295
Description
Displays the low 32-bit value (encoder unit) of the mechanical position feedback when the absolute encoder is used.

H0b.60 Mechanical absolute position (high 32 bits)

Address:	200b-3Dh	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Displays the high 32-bit value (encoder unit) of the mechanical position feedback when the absolute encoder is used.

H0b.63 NotRdy state

Address:	200b-40h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	9	Data Type:	UInt16

Default:	0	Change:	Unchangeable

Value Range:

0: Normal
1: Control circuit error
2: Main circuit power input error

3: Bus undervoltage
4: Soft start failed
5: Encoder initialization undone
6: Short circuit to ground failed
7: Others
9: Fully closed-loop encoder initialization not completed

Description

Displays the reason for the NRD state.
0: Normal
1: Control circuit error
2: Main circuit power input error

3: Bus undervoltage
4: Soft start failed
5: Encoder initialization undone
6: Short circuit to ground failed
7: Others
9: Fully closed-loop encoder initialization not completed

H0b.64 Real-time input position reference counter

Address:	200b-41h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648~2147483647

Description

Displays the value of the pulse reference counter before being divided or multiplied by the electronic gear ratio. This value is independent of the servo drive status and the control mode.

H0b.66 Encoder temperature

Address:	200b-43h	Effective mode:	-
Min.:	-32768	Unit:	°C
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-32768°C–32767°C
Description
Indicates the encoder temperature value.

H0b.67 Load rate of braking resistor

Address:	200b-44h	Effective mode:	-
Min.:	0.0	Unit:	%
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0% to 200.0%
Description
Display load rate of the braking resistor.

H0b.70 Number of absolute encoder revolutions

Address:	200b-47h	Effective mode:	-
Min.:	-32768	Unit:	Rev
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-32768Rev to 32767Rev
Description
Indicates the number of revolutions of the absolute encoder.

H0b.71 Single-turn position fed back by the absolute encoder

Address:	200b-48h	Effective mode:	-
Min.:	0	Unit:	Encoder unit
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0 to 2147483647
Description
Displays the position feedback of the absolute encoder within one turn.

H0b.74 System fault information given by FPGA

Address:	200b-4Bh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display system fault information given by FPGA.

H0b.77 Encoder position (low 32 bits)

Address:	200b-4Eh	Effective mode:	-
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0 to 4294967295
Description
Displays the low 32-bit value of the position feedback of the absolute encoder.

H0b.79 Encoder position (high 32 bits)

Address:	200b-50h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Displays the high 32-bit value of the position feedback of the absolute encoder.

H0b.81 Single-turn position of the rotary load (low 32 bits)

Address:	200b-52h	Effective mode:	-
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0 to 4294967295
Description
Displays the low 32-bit value of the position feedback of the rotary load when the absolute system works in the rotation mode.

H0b.83 Single-turn position of the rotary load (high 32 bits)

Address:	200b-54h	Effective mode:	-

Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Displays the high 32-bit value of the position feedback of the rotary load when the absolute system works the rotation mode.

H0b.85 Single-turn position of the rotary load (reference unit)

Address:	200b-56h	Effective mode:	-
Min.:	0	Unit:	Reference unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0 to 4294967295

Description

Displays the high 32-bit value of the position feedback of the rotary load when the absolute system works the rotation mode.

H0b.87 IGBT junction temperature

Address:	200b-58h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	200	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–200

Description

Display IGBT junction temperature.

H0b.90 Group No. of the abnormal parameter

Address:	200b-5Bh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Set the group number of the abnormal parameter.

H0b.91 Offset within the group of the abnormal parameter

Address:	200b-5Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display offset within the group of the abnormal parameter.

H0b.92 Hall state

Address:	200b-5Dh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display Hall state.

H0b.93 Closed loop state

Address:	200b-5Eh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0: Half closed loop

1: Fully closed loop

Description

Displays the closed loop state in position control mode.

0: Half closed loop

1: Fully closed loop

H0b.94 Individual power-on time

Address:	200b-5Fh	Effective mode:	-
Min.:	0.0	Unit:	s
Max.:	429496729.5	Data Type:	UInt32

Default:	0.0	Change:	Unchangeable

Value Range:

0.0s–429496729.5s

Description

Display the individual power-on time of the drive.

H0b.96 Individual power-on time upon occurrence of the selected fault

Address:	200b-61h	Effective mode:	-
Min.:	0.0	Unit:	s
Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:

0.0s–429496729.5s

Description

Display the individual power-on time upon occurrence of the selected fault.

H0b.98 Dynamic braking resistor load rate

Address:	200b-63h	Effective mode:	-
Min.:	0.0	Unit:	%
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0% to 200.0%

Description

Display dynamic braking resistor load rate.

21.13H0C Fault and Protection Parameters 2

H0C.53 Probe DI ON compensation time 2

Address:	200C-36h	Effective mode:	Real time
Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16
Default:	200	Change:	Real-time

Value Range:

-3000 ns–3000 ns

Description

Used to compensate for the action time when touch probe 2 is switched on. (Effective when H0A_40 bit4 = 1)

H0C.54 Probe DI OFF compensation time 2

Address:	200C-37h	Effective mode:	Real time

Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16
Default:	1512	Change:	Real-time

Value Range:

-3000 ns–3000 ns

Description

Used to compensate for the action time when touch probe 2 is switched off. (Effective when H0A_40 bit4 = 1)

H0C.71 **Internal function switch 2**

Address:	200C-48h	Effective mode:	Upon the next power-on
Min.:	0		
Max.:	65535		
Default:	512	Unit:	-
Value Range:		Data Type:	Int16
0~65535		Change:	Real-time

Description

bit9: FPGA encoder feedback overspeed point hide switch

21.14H0D Auxiliary Parameters

H0d.00 **Software Reset**

Address:	200d-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enable

Description

0: No operation

1: Enabled

Programs in the drive are reset automatically (similar to the program reset upon power-on) after the software reset function is enabled, without the need for a power cycle.

H0d.01 **Fault Reset**

Address:	200d-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enable

Description

0: No operation

1: Enable

Resettable faults of Level 1 and level 2 can be reset only when the servo drive is not in running state after the fault causes are eliminated. Then, the servo drive do not display the faults and enters the "rdy" state.

When a No. 3 alarm occurs, you can enable the fault reset function directly, regardless of the servo drive status.

H0d.02 Inertia auto-tuning enable

Address:	200d-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65

Description

Used to enable offline inertia auto-tuning through the keypad. In the parameter display mode, switch to H0d.02 and press the SET key to enable offline inertia auto-tuning.

H0d.04 Read/write in encoder ROM

Address:	200d-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Write ROM

2: Read ROM

3: ROM failure

Description

For Inovance encoders, the USB and control circuit need to be disconnected after writing in ROM to activate parameters. Also ensure that the drive is powered on during parameter writing.

0: No operation

1: Write ROM

2: Read ROM

3: ROM failure

H0d.05 Emergency stop

Address:	200d-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:

0: No operation

1: Emergency stop

Description

Trigger emergency stop. 0: No operation; 1: Emergency stop

The emergency stop mode corresponding to H0D.05 is defined by H02.05 or 605C.

H0d.06 Current loop auto-tuning test

Address:	200d-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	6	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enable current loop auto-tuning

2: Enable current loop step test (static)

3: Enable current loop step test

Description

0: No operation

1: Enable current loop auto-tuning

2: Enable current loop step test (static)

3: Enable current loop step test

H0d.10 Analog channel auto adjusting

Address:	200d-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Adjusted through AI1

2: Adjusted through AI2

Description

When automatic adjustment of the analog channel is enabled, the drive automatically corrects the zero drift voltage of the analog channel to improve signal detection accuracy.

0: No operation

1: Adjusted through AI1

2: Adjusted through AI2

H0d.12 Phase U/V current balance correction enable

Address:	200d-0Dh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Enable/disable phase U/V current balance correction.

0: Disabled

1: Enabled

H0d.17 Forced DI/DO enable switch

Address:	200d-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Forced DI enable switch

0: Disabled

1: Enabled

bit1: Forced DO enable switch

0: Disabled

1: Enabled

Description

Forced DI/DO selection.

Bit0: Forced DI enable switch

0: Disabled

1: Enabled

Bit1: Forced DO enable switch

0: Disabled

1: Enabled

H0d.18 Forced DI value

Address:	200d-13h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFF	Data Type:	UInt16
Default:	0xFF	Change:	Real-time

Value Range:

0x0 to 0xFF

Description

Defines whether the DI functions set in group H03 is active when forced DI is activated (H0d.17 = 1 or 3).

The value of H0d.18 is displayed as a hexadecimal on the keypad. When it is converted to a binary value, "bit(n) = 1" indicates the level logic of DI function is high level; "bit(n) = 0" indicates the level logic of the DI function is low level.

H0d.19 Forced DO value

Address:	200d-14h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x1F	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x1F

Description

Defines whether the DO functions assigned in group H04 are active when forced DO is active (H0d.17 = 2 or 3).

The value of H0d.19 is displayed as a hexadecimal on the keypad. When it is converted to a binary value, "bit(n) = 1" indicates the DO function is active; "bit (n) = 0" indicates the DO function is inactive.

H0d.20 Absolute encoder reset

Address:	200d-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Reset fault

2: Reset fault and multi-turn data

3: Reset Inovance 2nd encoder fault

4: Reset Inovance 2nd encoder fault and multi-turn data

Description

You can reset the encoder error or the multi-turn data fed back by the encoder by setting H0d.20.

0: No operation

1: Reset fault

2: Reset fault and multi-turn data

3: Reset Inovance 2nd encoder fault

4: Reset Inovance 2nd encoder fault and multi-turn data

H0d.21 **Read error status bit of Nikon and EnDat2.2 encoders**

Address:	200d-16h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Reading error status bit

Description

Used to read the error status bit of Nikon encoder and EnDat2.2 encoder.

0: No operation

1: Reading error status bit

H0d.29 **Motor parameter auto-tuning**

Address:	200d-1Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enabled

Description

Resistor inductance auto-tuning.

0: No operation

1: Enabled

21.15H0E Communication Function Parameters

H0E.00 **Node address**

Address:	200E-01h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	127	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

1–127

Description

CAN Indicates the slave node address. Ensure this parameter is consistent with the configuration of the host controller.

H0E.01 **Save objects written through communication to EEPROM**

Address:	200E-02h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Not save
1: Save parameters
2: Save object dictionaries
3: Save parameters and object dictionaries
4: Save object dictionaries written before communication (OP)
255: Determine through H0E03 and H0E04

Description

You can use this parameter to select a data saving operation when parameters and object dictionaries are written through a serial port or SDO.
0: Not save
1: Save parameters
2: Save object dictionaries
3: Save parameters and object dictionaries
4: Save object dictionaries written before communication (OP)
255: Determine through H0E03 and H0E04

H0E.03 Save objects written through software (commissioning protocol) to EEPROM

Address:	200E-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Do not save
1: Save

Description

Saves objects written through software (commissioning protocol) to EEPROM, including the parameter and object dictionary.
0: Do not save
1: Save

H0E.04 Save objects written through communication to EEPROM (excluding commissioning protocol)

Address:	200E-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:

0: Do not save

1: Save

Description

You can use this parameter to determine whether to save communication written data in EEPROM (excluding commissioning protocol) (CANopen, CANLink, Ethernet COE, ModBus485). The data include the function code and object dictionary

0: Do not save

1: Save

H0E.07 **Object dictionary unit selection**

Address:	200E-08h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Reference unit system (p/s, p/s^2)

1: User unit system (0.01 [mm/s]/[rpm], ms)

Description

Servo unit system switching:

0: Use reference unit system. The speed type dictionary unit is p/s, and the acceleration type object dictionary is p/s^2

1: User unit system, 0.01 [mm/s]/[rpm] for speed type object dictionaries and ms (time taken for changing from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm]) for acceleration type object dictionaries.

H0E.10 **CAN selection**

Address:	200E-0Bh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Pulse/Axis control command

1: Enhanced axis control command

2: CANopen

Description

CAN function selection

0: Pulse/Axis control command

1: Enhanced axis control command

2: CANopen

H0E.11 **CAN baud rate**

Address:	200E-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	5	Change:	At stop

Value Range:

0: 20 kbps
1: 50 kbps
2: 100 kbps
3: 125 kbps
4: 250 kbps
5: 500 kbps
6: 1 Mbps
7: 1 Mbps - non-standard

Description

It sets the CAN (CANlink or CANopen) communication rate between the servo drive and the host controller.

0: 20 kbps
1: 50 kbps
2: 100 kbps
3: 125 kbps
4: 250 kbps
5: 500 kbps
6: 1 Mbps
7: 1 Mbps - non-standard

Note: To ensure normal communication, the communication speed of the servo drive must match that of the host controller. If H0E.11 is set to 6, the baud rate is 1 Mbps. 80% sampling points are used to match most PLCs with a 1M standard baud rate.
If H0E.11 is set to 7, the baud rate is 1 Mbps. 70% sampling points are used to match most PLCs with a 1M non-standard (deviated) baud rate. Reducing sampling points can also reduce error frames.

H0E.12 **Excessive IP position command increment count**

Address:	200E-0Dh	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	30	Data Type:	UInt16
Default:	20	Change:	At stop

Value Range:

1 to 30

Description

Set the excessive IP position command increment count for triggering EB01.2.

H0E.13 **CANopen sync period error limit**

Address:	200E-0Eh	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	5	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0：1/4
1：1/2
2：3/4
3：1
4：2
5：Disabled

Description

Set CANopen sync period error limit

0：1/4
1：1/2
2：3/4
3：1
4：2
5：Disabled

H0E.14 CANopen communication state

Address:	200E-0Fh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	9	Data Type：	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 9

Description

Display the CANopen communication state.

H0E.17 Get the count of received NMT frames with incorrect length

Address:	200E-12h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display the count of received NMT frames with incorrect length.

H0E.18 **Get the count of received NMT frames with incorrect command**

Address:	200E-13h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Display the count of received NMT frames with incorrect command.

H0E.19 **Get received heartbeat frames of wrong length**

Address:	200E-14h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Get received heartbeat frames of wrong length.

H0E.80 **Modbus baud rate**

Address:	200E-51h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	9	Data Type:	UInt16
Default:	9	Change:	Real time

Value Range:

0：300 bps
1：600 bps
2：1200 bps
3：2400 bps
4：4800 bps
5：9600 bps
6：19200 bps
7：38400 bps
8：57600 bps
9：115200 bps

Description

Defines the communication rate between the servo drive and the host controller. The baud rate set in the servo drive must be the same as that in the host controller. Otherwise, communication will fail.
0：300 bps
1：600 bps
2：1200 bps
3：2400 bps
4：4800 bps
5：9600 bps
6：19200 bps
7：38400 bps
8：57600 bps
9：115200 bps

H0E.81 Modbus data format

Address:	200E-52h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:
0: No parity, 2 stop bits (N-2)
1: Even parity, 1 stop bit (E-1)
2: Odd parity, 1 stop bit (O-1)
3: No parity, 1 stop bit (N-1)

Description
Defines the data check mode between the servo drive and the host controller during communication.
0: No parity, 2 stop bits
1: Even parity, 1 stop bit
2: Odd parity, 1 stop bit
3: No parity, 1 stop bit
The data format of the servo drive must be the same as that of the host controller. Otherwise, communication will fail.

H0E.82 Modbus response delay

Address:	200E-53h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	20	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–20 ms

Description

Defines the delay from the moment when the slave receives a command from the host controller to the moment when the slave returns a response.

H0E.83 Modbus communication timeout

Address:	200E-54h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	600	Data Type:	UInt16
Default:	0	Change:	Real time

Value Range:

0 ms to 600 ms

Description

Set the Modbus communication timeout.

H0E.84 Sequence of Modbus communication data bits

Address:	200E-55h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real time

Value Range:

0: High bits before low bits
1: Low bits before high bits

Description

Defines the 32-bit data transmission format of Modbus communication.
0: High 16 bits before low 16 bits
1: Low 16 bits before high 16 bits

H0E.90 Communication version

Address:	200E-5Bh	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:

0.00–655.35

Description

Display the communication version.

H0E.97 Communication monitoring parameter 1

Address:	200E-62h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

Set communication monitoring parameter 1.

H0E.98 **Communication monitoring parameter 2**

Address:	200E-63h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

Set communication monitoring parameter 2.

21.16H0F Fully Closed-Loop

H0F.00 **Encoder feedback mode**

Address:	200F-01h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real time

Value Range:

0: Internal encoder feedback
1: External encoder feedback
2: Inner/Outer loop switchover

Description

Defines the encoder feedback signal source in fully closed-loop control.
0: Internal encoder feedback. The position feedback signals come from the motor encoder.
1: External encoder feedback The position feedback signals come from the fully closed-loop external encoder
and electronic gear ratio 1 is used.
2: Inner/Outer loop switchover: The DI assigned with FunIN.24 (GEAR_SEL, electronic gear ratio switchover) is switch between inner and outer position closed loops. FunIN.24
: Inactive, internal encoder feedback, with electronic gear ratio 1 used
DI valid: external encoder feedback, using the 2nd electronic gear ratio

H0F.01 Fully closed-loop encoder application mode

Address:	200F-02h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Standard operating direction
1: Reverse operating direction

Description

Defines the feedback pulse counting direction of internal and external encoders when the motor rotates in the fully closed-loop mode.
0: Standard operating direction: The pulse feedback counter of the internal encoder (H0F.18) is in the same direction as that of the external encoder (H0F.20) during rotation of the motor.
1: Reverse operating direction: The pulse feedback counter of the internal encoder (H0F.18) is in the opposite direction as that of the external encoder (H0F.20) during rotation of the motor.

H0F.02 Fully closed-loop encoder absolute value

Address:	200F-03h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Incremental mode
1: Absolute linear mode

Description

Set fully closed-loop encoder absolute value
0: Incremental mode
1: Absolute linear mode

H0F.03 Fully closed-loop encoder feedback type

Address:	200F-04h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Quadrature pulse
1: Inovance
2: BiSS-C
3: EnDat2.2
4: SSI

Description

Set the fully closed-loop encoder feedback type
0: Quadrature pulse
1: Inovance
2: BiSS-C
3: EnDat2.2
4: SSI

H0F.04 Number of fully closed-loop encoder pulses per revolution

Address:	200F-05h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	10000	Change:	At stop

Value Range:
1–2147483647
Description
Defines the pulses fed back by the external encoder per revolution of the motor. It defines the quantity relation between feedback pulses from the external encoder and those from the internal encoder.
Calculate the value of this parameter through analyzing mechanical parameters. When rigid connection is applied between the motor and the external encoder (scale), you can also set this parameter using the following method:
1. Manually rotate the motor and observe H0F.18 (Feedback pulse counter of internal encoder) in the meantime. After ensuring that the motor has rotated for a full turn (H0F.18 = Motor resolution), calculate the change of H0F.20 (Feedback pulse counter of external encoder) and use the absolute value of the change as the value of H0F.04.
2. Assume values of H0F.18 and H0F.20 are X1 and Y1 before the motor rotates and X2 and Y2 after the motor rotates, then the following formula applies:
H0F.04 = Motor resolution x (Y2 - Y1)/(X2 - X1) The calculated result must be positive; if not, perform step 1 again.
For non-rigid connection, an error may exist in the calculation result.
Note:
Ensure H0F.04 is set properly. Otherwise, EB02.0 (Position deviation too large in fully closed loop) may occur after the drive operates.

H0F.06 Fully closed-loop encoder interface

Address:	200F-07h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16

Default:	1	Change:	At stop

Value Range:

0: CN2

1: CN7

Description

Used to set the drive interface used by the fully closed-loop encoder.

0: CN2

1: CN7

H0F.08 Excessive deviation threshold in compound control mode

Address:	200F-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	1000	Change:	Real-time

Value Range:

0–2147483647

Description

Defines the position deviation threshold at which the servo drive reports EB02.0 (Position deviation too large in fully closed-loop mode).

When H0F.08 is set to 0, the drive does not detect EB02.0 and always clears the fully closed-loop position deviation.

H0F.10 Clear deviation in compound control mode

Address:	200F-0Bh	Effective mode:	Real time
Min.:	0	Unit:	Rev
Max.:	100	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0 Rev to 100 Rev

Description

Defines the number of revolutions rotated by the motor per a clear of the fully closed-loop position deviation during operation. The number of revolutions is reflected by H0F.18 (Feedback pulse counter ofinternal encoder). The number of motor revolutions will not be cleared when the drive is not in the operational state.

H0F.13 Compound vibration suppression filter time

Address:	200F-0Eh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	6553.5	Data Type:	UInt16
Default:	1000	Change:	At stop

Value Range:

0.0 ms–6553.5 ms

Description

Defines the time constant for compound vibration suppression in fully closed-loop control when external encoder feedback (H0F.00 = 1 or 2) is used.

Increase the setpoint gradually and check the response change.
When the stiffness of the transmission mechanism between fully closed loop and internal loop is insufficient, set H0F.13 properly to improve system stability, which is to generate the effect ofinternal loop temporarily and form a fully closed loop again after the system is stabilized. When the stiffness is sufficient, there is no need to adjust this parameter.

H0F.16 Pulse deviation display in compound control mode

Address:	200F-11h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Used to count and display the position deviation absolute value in fully closed loop control.
Pulse deviation in compound control = Absolute position feedback of external encoder - Absolute position feedback conversion value ofinternal encoder.
The alignment ofinner and outer loop feedbacks is performed each time the deviation is cleared.

H0F.18 Internal position pulse feedback display

Address:	200F-13h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description:
Used to count and display the number of feedback pulses of the internal encoder (after being divided or multiplied by electronic gear ratio, in internal encoder unit).

H0F.20 Fully closed-loop encoder position pulse feedback display

Address:	200F-15h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Used to count and display the number of feedback pulses of the external encoder (after being divided or multiplied by electronic gear ratio, in external encoder unit).

H0F.22 Quadrature pulse phase Z detection invalid in fully closed-loop mode

Address:	200F-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Detected

1: Not detected

Description

Quadrature pulse phase Z detection in fully closed-loop mode

0: Detected

1: Not detected

H0F.23 BiSS-C/SSI/EDNAT2.2 fully closed-loop encoder absolute homing offset

Address:	200F-18h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

The homing offset is automatically updated after homing is completed, and is automatically aligned with H05.36. It is only necessary to write this value manually when you replace the drive. When the full closed-loop encoder is in absolute linear mode, the power-on initial position = Encoder position feedback original value + Homing offset – Absolute feedback offset

H0F.25 Source of touch probe Z signal in fully closed-loop mode

Address:	200F-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real time

Value Range:

0: Motor Z signal

1: External feedback Z signal

Description

Set the source of touch probe Z signal in fully closed-loop mode.

0: Motor Z signal

1: External feedback Z signal

H0F.26 **BiSS-C/SSI/EDNAT2.2 fully closed-loop encoder absolute feedback offset**

Address:	200F-1Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real time

Value Range:

-2147483648~2147483647

Description

When the full closed-loop encoder is in absolute linear mode, the absolute feedback offset is updated after homing is completed. It is only necessary to write this value manually when you replace the drive.

H0F.28 **Index value of BiSS-C/SSI communication alarm**

Address:	200F-1Dh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Set the index value of BiSS-C/SSI communication alarm.

H0F.29 **CRC of BiSS-C/SSI fully closed-loop encoder feedback**

Address:	200F-1Eh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real time

Value Range:

0: Positive
1: Negative

Description

Set the CRC of BiSS-C/SSI fully closed-loop encoder feedback.
0: Positive
1: Negative

H0F.30 **BiSS-C/SSI/EDNAT2.2 valid bits of encoder communication position feedback in full closed-loop mode**

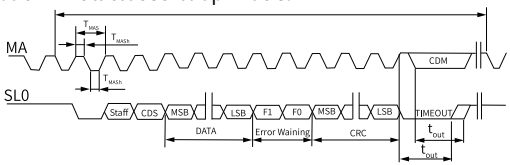
Address:	200F-1Fh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	127	Data Type:	UInt16
Default:	29	Change:	At stop

Value Range:

0~127

Description

Set the BiSS-C/SSI/EDNAT2.2 valid bits of encoder communication position feedback in full closed-loop mode.



- DATA: position data CRC:6-bit CRC code
- 100ns≤T_{MAS}≤2t_{out} 25ns≤T_{MASh}≤t_{out} 25ns≤T_{MASh}≤t_{out}
- t_{out}=1.5MA clock period
- MA : master clock output; SL0: slave data output transmission speed up to 10 Mbps.
- CDM: register communication master transmit bit; CDS: register communication slave return bit
- Error Warning: error and warning bits index (F1 low level indicates an error, F0 low level indicates an alarm)
- Scale input and output complies with RS-422A The differencital line drive and line receiver are required.
- CRC generator polynomial: X6+X1+1, initial value 0, range "DATA", "Error Warning".

In the figure, $\overline{MA}$ $\overline{SL0}$ are not shown.

H0F.30 is the valid bits of position feedback. For details, see the user manual of any third-party BiSS-C encoder.

H0F.31 Valid bit of BiSS-C/SSI encoder communication alarm index in full closedloop mode

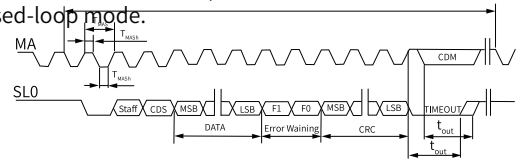
Address:	200F-20h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0 to 31

Description

Set the valid bit of BiSS-C/SSI encoder communication alarm index in full closed-loop mode.



- DATA: position data CRC:6-bit CRC code
- 100ns≤T_{MAS}≤2t_{out} 25ns≤T_{MASh}≤t_{out} 25ns≤T_{MASh}≤t_{out}
- t_{out}=1.5MA clock period
- MA : master clock output; SL0: slave data output transmission speed up to 10 Mbps.
- CDM: register communication master transmit bit; CDS: register communication slave return bit
- Error Warning: error and warning bits index (F1 low level indicates an error, F0 low level indicates an alarm)
- Scale input and output complies with RS-422A The differencital line drive and line receiver are required.
- CRC generator polynomial: X6+X1+1, initial value 0, range "DATA", "Error Warning".

In the figure, $\overline{MA}$ $\overline{SL0}$ are not shown.

H0F.31: Error alarm set bit, error and alarm bit index. Its value is the difference between DATA and CRC

H0F.32 BiSS-C/SSI/ENDAT encoder communication frequency in fully closed-loop mode

Address:	200F-21h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	kHz
Max.:	10000	Data Type:	UInt16
		Change:	Real time

Default:	2000	Change:	Real time

Value Range:

0kHz~10000kHz

Description

Set the BiSS-C/SSI/ENDAT encoder communication frequency in fully closed-loop mode

H0F.33 SSI/ENDAT encoder recovery time in fully closed-loop mode

Address:	200F-22h	Effective mode:	Upon the next power-on
Min.:	0.000	Unit:	μs
Max.:	40.000	Data Type:	UInt16
Default:	0.500	Change:	Real-time

Value Range:

0.000 μs to 40.000 μs

Description

Set the SSI/ENDAT encoder recovery time in fully closed-loop mode.

H0F.35 BiSS-C error detection enable in fully closed-loop mode

Address:	200F-24h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled
1: Enabled

Description

Detection on error bits of BiSS-C protocol by FPGA software.
0: Disabled
1: Enabled

H0F.36 BiSS-C error bit polarity in fully closed-loop mode

Address:	200F-25h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Positive
1: Negative

Description

BiSS-C error bit polarity
0: Positive
1: Negative

H0F.40 Fully closed-loop communication encoder fault info

Address:	200F-29h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display fault information of the fully closed-loop communication encoder.

Table 21–5 Inovance encoder

bit	Name
0	Full closed-loop serial encoder communication timeout (RX side[1])
1	Full closed-loop serial encoder frame stop bit error (RX side)
2	Full closed-loop serial encoder CRC error (RX side)[2]
3	Full closed-loop serial encoder data field error (RX side)
4	Full closed-loop serial encoder position count error (TX side[1])
5	Full closed-loop serial encoder frame overspeed (TX side)
6	Full closed-loop serial encoder over-temperature (TX side)
7	Full closed-loop serial encoder single-turn count error (TX side)
8	Full closed-loop serial encoder multi-turn count error (TX side)
9	Full closed-loop serial encoder battery alarm (TX side)
10	Full closed-loop serial encoder battery failure (TX side)
11–12	Undefined
13[3]	Full closed-loop serial encoder count increment error (algorithm[1])
14–15	Undefined
16–23	Full closed-loop serial encoder expansion data 1
24–31	Full closed-loop serial encoder expansion data 2

Table 21–6 EnDat encoder

bit	Name
0	EnDat encoder communication timeout (RX side)
1	EnDat level 1 fault (RX side)
2	EnDat encoder CRC error (RX side)[2]
3	EnDat level 2 fault (RX side)
4	EnDat fault information 1 (TX side)
5	EnDat fault information 2 (TX side)

bit	Name
6–8	Undefined
9	EnDat additional data 1 CRC error
10	EnDat additional data 2 CRC error
11–12	Undefined
13[3]	Full closed-loop serial encoder count increment error (algorithm)
14	EnDat level 3 fault (RX side)
15	EnDat level 3 fault (RX side)
16–23	Full closed-loop serial encoder expansion data 1
24–31	Full closed-loop serial encoder expansion data 2

Table 21–7 BiSS-C and SSI encoders

bit	Name
0	Full closed-loop serial encoder communication timeout (RX side)
1	Undefined
2	Full closed-loop serial encoder CRC error (RX side)[2]
3–10	Undefined
7	Full closed-loop serial encoder single-turn count error (TX side)
11–12	Undefined
13[3]	Full closed-loop serial encoder count increment error (algorithm)
14–15	Undefined
16 to 23[4]	Full closed-loop serial encoder expansion data 1
24 to 31[4]	Full closed-loop serial encoder expansion data 2

Note

[1]: In the above table, the RX side refers to the drive and the TX side refers to the motor encoder. The algorithm refers to the type of the indirect error caused by a direct error on the RX or TX side.

[2]: When a BiSS-C encoder is used: 1-CRC error; 0-CRC is normal. When an SSI encoder is used: 1-Parity error; 0-Parity is normal.

[3]: When H0A.50 or more data transmission errors occur continuously, bit13 will be set to 1 and the drive must be stopped. For other error types, you can stop the drive as needed.

[4]: Full closed-loop serial encoder extended data 1/2 (when a BiSS-C encoder is used): This part is the status word of BiSS-C and SSI encoders.

H0F.41 Inovance fully closed-loop encoder version

Address:	200F-2Ah	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 to 6553.5

Description

Display the version number of the Inovance fully closed-loop encoder.

H0F.42 Inovance fully closed-loop encoder resolution

Address:	200F-2Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0–4294967295

Description

Display the resolution of the Inovance fully closed-loop encoder.

H0F.45 Positioning completed/Position deviation threshold in fully closed-loop mode

Address:	200F-2Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Threshold scaled to outer loop unit
1: Same threshold used for inner and outer loops

Description

0: Fully closed-loop positioning completed threshold 6067/Excessive position deviation threshold 6065 (scaled to outer loop unit)
1: Same threshold used for inner and outer loops

H0F.51 SSI encoder check bit selection in fully closed-loop mode

Address:	200F-34h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: No check
1: Check applied

Description

SSI encoder check bit selection in fully closed-loop mode
0: No check
1: Check applied

H0F.52 SSI encoder code system in full closed-loop mode

Address:	200F-35h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Binary

1: Gray code

Description

SSI encoder code system in full closed-loop mode

0: Binary

1: Gray code

H0F.53 SSI encoder state word code system in fully closed-loop mode

Address:	200F-36h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Binary
1: Gray code

Description

SSI encoder state word code system in fully closed-loop mode
0: Binary
1: Gray code

H0F.54 SSI encoder parity check in fully closed-loop mode

Address:	200F-37h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

SSI encoder parity check in fully closed-loop mode
0: Disabled
1: Enabled

H0F.55 Fully closed-loop encoder communication timeout error count

Address:	200F-38h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Fully closed-loop encoder communication timeout error count

H0F.56 Encoder CRC error count in fully closed-loop mode

Address:	200F-39h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Encoder CRC error count in fully closed-loop mode

H0F.57 Fully closed-loop encoder communication frame stop bit error count

Address:	200F-3Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Fully closed-loop encoder communication frame stop bit error count.

21.17H11 Multi-position

H11.00 Multi-position running mode

Address:	2011-01h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	5	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Single run (number of displacements selected in H11.01)

1: Cyclic operation (number of displacement selected in H11.01)

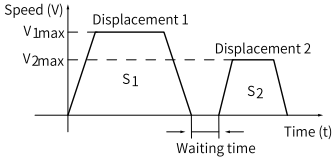
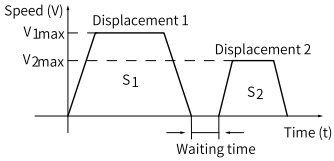
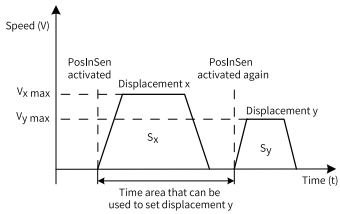
2: DI-based operation (selected by DI)

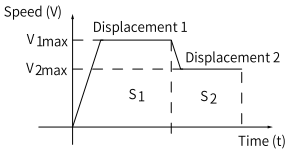
3: Sequential operation

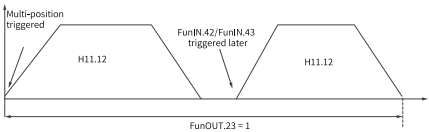
5: Axis-controlled continuous operation

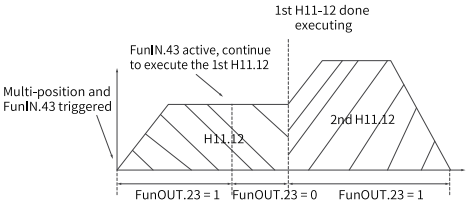
Description

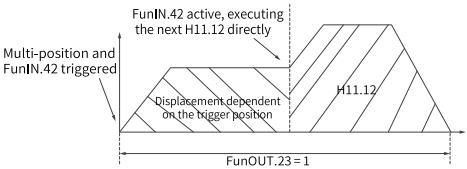
Defines the multi-position operation mode when the main position reference source is multi-position references (H05.00 = 2) in the position control mode.

Value	Operation Mode	Remarks	Operation Curve
0	Individual operation	The drive stops after one cycle of operation. The drive automatically switches to the next speed. You can set the interval time between displacements. The multi-position reference is level-triggered.	 V 1max , V 2max : maximum operating speeds in displacement 1 and displacement 2 S 1 , S 2 : displacement 1 and displacement 2
1	Cyclic operation	The starting displacement after the first cycle is displacement 1. The drive automatically switches to the next speed. You can set the interval time between displacements. The multi-position reference is level-triggered.	 V 1max , V 2max : maximum operating speeds in displacement 1 and displacement 2 S 1 , S 2 : displacement 1 and displacement 2
2	DI-based operation	The drive continues operating when the displacement No. is updated. The speed No. is determined by the DI logic. The interval time between displacements is determined by the command delay of the host controller. The multi-position reference is edge-triggered.	

Value	Operation Mode	Remarks	Operation Curve
			V_{xmax} , V_{ymax} : maximum operating speeds in displacement x and displacement y S_x , S_y : displacement x and displacement y
3	Sequential operation	The drive stops after one cycle of operation. (H11.05 = 0 or H11.05 > H11.01). When H11.05 is greater than H11.01, the software will set H11.05 to 0. The starting displacement after the first cycle is defined by H11.05. The drive automatically switches to the next speed. There is no interval time between displacements. The multi-position reference is level-triggered.	 V_{1max} , V_{2max} : maximum operating speeds in displacement 1 and displacement 2 S_1 , S_2 : displacement 1 and displacement 2

<table>
<tr><th>Value</th><th>Operation Mode</th><th>Remarks</th><th>Operation Curve</th></tr>
<tr><td>5</td><td>Axis-controlled continuous operation</td><td>The drives executes one displacement only.
The individual operation mode, sequential operation mode, and interrupted operation mode are included.
The PosInSen (multi-position reference enable) signal is level-triggered.</td><td>• Individual operation


The PosInSen (multi-position reference enable) signal is triggered only once (FunIN.43/42 triggered later). The drive stops after executing the distance defined by H11.12.
• Sequential operation


The PosInSen (multi-position reference enable) signal is triggered only once. Write H11.12 again and activate FunIN.43 when the distance defined by the first H11.12 is still in progress.After receiving the new distance (or speed), which is the second H11.12, the drive continues executing the first H11.12 until the distance defined by the first H11.12 is done. Then it starts to execute the second H11.12 directly. The travel distance therefore is the sum of the first H11.12 and the second H11.12.
• Interrupted operation


The PosInSen (Multi-position reference enable) signal is triggered only once. Write H11.12 (such as 1000000) again and activate FunIN.42 when the first H11.12 (such as 9000000) is still in progress. After receiving the new distance (or speed), which is the second H11.12, the drive stops executing the first H11.12 and turns to executing the second H11.12.</td></tr>
</table>

To use the multi-position function, assign FunIN.28 (PosInSen, multi-position reference enable) to a DI first. See "Group H03: Terminal input parameters" for the setting mode.

The positioning completed (COIN) signal is activated each time upon completion of a displacement. To determine whether a certain displacement is done executing, use FunOUT.5 (COIN, positioning completed). See "Group H04: Terminal output parameters" for details.

Ensure the S-ON signal is active during operation of each displacement. Otherwise, the drive stops immediately as defined by H02.05 (Stop mode at S-ON OFF) and the positioning completed (COIN) signal in inactive. In modes other than DI-based operation, if the S-ON signal is active but multi-position is disabled during operation of a certain displacement, the drive abandons the unsent displacement reference and stops, with the positioning completed (COIN) signal being active. If the multi-position function is enabled again, the displacement to be executed is defined by H11.02.

H11.01 Number of displacement references in multi-position mode

Address:	2011-02h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	16	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

1–16

Description

Defines the total number of displacement references in the multi-position mode. You can set different displacements, operating speeds, and acceleration/deceleration time for each displacement.

H11.00 ≠ 2: Displacements are switched automatically in a sequence from 1, 2... H11.01.

H11.00 is 2: Assign four DIs (Hardware DI or VDI) with DI functions 6 to 9 (FunIN.6: CMD1 to FunIN.9: CMD4) and control the DI logic through the host controller to switch between different speeds. The segment No. is a 4-bit binary value. Bits 0 to 3 correspond to CMD1 to CMD4.

The displacement No. is a 4-bit binary value. The relationship between the displacement numbers and CMD1...CMD4 is shown in the following table.

FunIN.9	FunIN.8	FunIN.7	FunIN.6	Segment No.
CMD4	CMD3	CMD2	CMD1	
0	0	0	0	1
0	0	0	1	2
...				
1	1	1	1	16

H11.02 Starting displacement No. after pause

Address:	2011-03h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range: 0/1

Description

Defines the starting displacement No. when the multi-position operation recovers from a pause.

Pause:

1. The servo drive switches to another control mode or the interrupt positioning function is enabled during multi-position operation.
2. The internal multi-position enable signal (FunIN.28:PosInSen) changes from "active" to "inactive".

0: Continue to execute the unexecuted displacements: For example, if H11.01 is set to 16 and the drive pauses at displacement 2, after the drive recovers from the pause, it will start from displacement 3.

1: Start from displacement 1: For example, if H11.01 is set to 16 and the drive pauses at displacement 2, after the drive recovers from the pause, it will start from displacement 1.

H11.03 Interval time unit

Address:	2011-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: ms

1: s

Description

Defines the unit of acceleration/deceleration time and the interval time during multi-position operation.

Acceleration/Deceleration time: Indicates the time taken for the motor to change from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed.

Interval time: interval time that starts from the end of the last reference to the beginning of the next reference

H11.04 Displacement reference type

Address:	2011-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Relative displacement reference

1: Absolute displacement reference

Description

Relative displacement: position increment of the target position relative to the current motor position

Absolute displacement: position increment of the target position relative to the motor home.

H11.05 **Starting displacement No. in sequential operation**

Address:	2011-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	16	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 to16

Description

Defines whether to perform cyclic operation and the starting displacement No. after the first cycle of operation in the sequential operation mode (H11.00 = 3).
0: The drive executes the displacements defined by H11.01 only once and then stops. The motor is in the locked state.
1 to 16: The drive operates cyclically, with the starting displacement No. defined by H11.05 after the first cycle of operation. The value of H11.05 should be lower than or equal to H11.01

H11.09 **Deceleration upon axis control OFF**

Address:	2011-0Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	65535	Change:	Real time

Value Range:

0ms to 65535ms

Description

Set deceleration upon axis control OFF.

H11.10 **Starting speed of displacement 1**

Address:	2011-0Bh	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	6000	Data Type:	UInt16
Default:	0	Change:	Real time

Value Range:

0[mm/s]/[rpm]~6000[mm/s]/[rpm]

Description

Set starting speed of displacement 1.

H11.11 **Stop speed of displacement 1**

Address:	2011-0Ch	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	6000	Data Type:	UInt16
Default:	0	Change:	Real time

Value Range:

0[mm/s]/[rpm] to 6000[mm/s]/[rpm]

Description

Set stop speed of displacement 1.

H11.12 Displacement 1

Address:	2011-0Dh	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

Defines displacement 1 (reference unit) in multi-position operation.

H11.14 Max. speed of displacement 1

Address:	2011-0Fh	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the maximum speed of displacement 1 in multi-position operation. The maximum speed is the average operating speed when the motor is not in the acceleration/deceleration process. If H11.12 is set to a too low value, the actual motor speed will be lower than H11.14.

H11.15 Acc/Dec time of displacement 1

Address:	2011-10h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0ms to 65535ms

Description

Defines the time for the motor to change from 0 [mm/s]/[rpm] to 1000 rpm[mm/s]/[rpm] at a constant speed during displacement 1.

H11.16 Interval time after displacement 1

Address:	2011-11h	Effective mode:	Real time

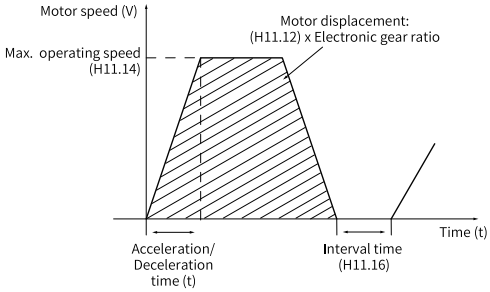
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

Defines the interval time that starts from the end of displacement 1 to the beginning of the next displacement.



H11.17 **Displacement 2**

Address:	2011-12h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.19 **Max. speed of displacement 2**

Address:	2011-14h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real time

Value Range:

1[mm/s]/[rpm]~10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.20 Acc/Dec time of displacement 2

Address:	2011-15h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.21 Interval time after displacement 2

Address:	2011-16h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.22 Displacement 3

Address:	2011-17h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real time

Value Range:

-1073741824 to 1073741824

Description

Same as displacement 1

H11.24 Max. speed of displacement 3

Address:	2011-19h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real time

Value Range:

1[mm/s]/[rpm]~10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.25 **Acc/Dec time of displacement 3**

Address:	2011-1Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0ms~65535ms

Description

See acc/dec time of displacement 1.

H11.26 **Interval time after displacement 3**

Address:	2011-1Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0ms(s)~10000ms(s)

Description

See interval time after displacement 1

H11.27 **Displacement 4**

Address:	2011-1Ch	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.29 **Max. speed of displacement 4**

Address:	2011-1Eh	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real time

Value Range:

1[mm/s]/[rpm]~10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.30 **Acc/Dec time of displacement 4**

Address: 2011-1Fh
Min.: 0
Max.: 65535
Default: 10
Effective mode: Real time
Unit: ms
Data Type: UInt16
Change: Real time

Value Range:
0 ms to 65535 ms

Description
See acc/dec time of displacement 1.

H11.31 **Interval time after displacement 4**

Address: 2011-20h
Min.: 0
Max.: 10000
Default: 10
Effective mode: Real time
Unit: ms(s)
Data Type: UInt16
Change: Real time

Value Range:
0 ms(s) to 10000 ms(s)

Description
See interval time after displacement 1.

H11.32 **Displacement 5**

Address: 2011-21h
Min.: -1073741824
Max.: 1073741824
Default: 10000
Effective mode: Real time
Unit: Reference unit
Data Type: Int32
Change: Real time

Value Range:
-1073741824 to 1073741824

Description
See displacement 1

H11.34 **Max. speed of displacement 5**

Address: 2011-23h
Min.: 1
Max.: 10000
Default: 200
Effective mode: Real time
Unit: [mm/s]/[rpm]
Data Type: UInt16
Change: Real time

Value Range:
1[mm/s]/[rpm]~10000[mm/s]/[rpm]

Description
See max. speed of displacement 1.

H11.35 **Acc/Dec time of displacement 5**

Address: 2011-24h
Effective mode: Real time

Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms to 65535 ms

Description
See acc/dec time of displacement 1.

H11.36 Interval time after displacement 5

Address:	2011-25h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms(s) to 10000 ms(s)

Description
See interval time after displacement 1.

H11.37 Displacement 6

Address:	2011-26h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:
-1073741824 to 1073741824

Description
See displacement 1.

H11.39 Max. speed of displacement 6

Address:	2011-28h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real time

Value Range:
1[mm/s]/[rpm]~10000[mm/s]/[rpm]

Description
See max. speed of displacement 1.

H11.40 Acc/Dec time of displacement 6

Address:	2011-29h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.41 Interval time after displacement 6

Address:	2011-2Ah	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.42 Displacement 7

Address:	2011-2Bh	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1

H11.44 Max. speed of displacement 7

Address:	2011-2Dh	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description
See max. speed of displacement 1.

H11.45 Acc/Dec time of displacement 7

Address:	2011-2Eh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See acc/dec time of displacement 1.

H11.46 Interval time after displacement 7

Address:	2011-2Fh	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms(s) to 10000 ms(s)
Description
See interval time after displacement 1.

H11.47 Displacement 8

Address:	2011-30h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:
-1073741824 to 1073741824
Description
See displacement 1.

H11.49 Max. speed of displacement 8

Address:	2011-32h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16

Default: 200 Change: Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.50 **Acc/Dec time of displacement 8**

Address: 2011-33h Effective mode: Real time
Min.: 0 Unit: ms (s)
Max.: 65535 Data Type: UInt16
Default: 10 Change: Real-time

Value Range:

0 ms to 65535 ms

Description

See acc/dec time of displacement 1.

H11.51 **Interval time after displacement 8**

Address: 2011-34h Effective mode: Real time
Min.: 0 Unit: ms (s)
Max.: 10000 Data Type: UInt16
Default: 10 Change: Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.52 **Displacement 9**

Address: 2011-35h Effective mode: Real time
Min.: -1073741824 Unit: Reference unit
Max.: 1073741824 Data Type: Int32
Default: 10000 Change: Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.54 **Max. speed of displacement 9**

Address: 2011-37h Effective mode: Real time
Min.: 1 Unit: [mm/s]/[rpm]
Max.: 10000 Data Type: UInt16

Default: 200 Change: Real-time

Value Range:

1[mm/s]/[rpm]~10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.55 Acc/Dec time of displacement 9

Address: 2011-38h Effective mode: Real time

Min.: 0 Unit: ms

Max.: 65535 Data Type: UInt16

Default: 10 Change: Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.56 Interval time after displacement 9

Address: 2011-39h Effective mode: Real time

Min.: 0 Unit: ms(s)

Max.: 10000 Data Type: UInt16

Default: 10 Change: Real time

Value Range:

0ms(s)~10000ms(s)

Description

See interval time after displacement 1

H11.57 Displacement 10

Address: 2011-3Ah Effective mode: Real time

Min.: -1073741824 Unit: Reference unit

Max.: 1073741824 Data Type: Int32

Default: 10000 Change: Real time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.59 Max. speed of displacement 10

Address: 2011-3Ch Effective mode: Real time

Min.: 1 Unit: [mm/s]/[rpm]

Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.60 Acc/Dec time of displacement 10

Address:	2011-3Dh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0ms~65535ms

Description

See acc/dec time of displacement 1.

H11.61 Interval time after displacement 10

Address:	2011-3Eh	Effective mode:	Real time
Min.:	0	Unit:	ms(s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.62 Displacement 11

Address:	2011-3Fh	Effective mode:	Real time
Min.:	-1073741824	Unit:	Referece unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.64 Max. speed of displacement 11

Address:	2011-41h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]

Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.65 Acc/Dec time of displacement 11

Address:	2011-42h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.66 Interval time after displacement 11

Address:	2011-43h	Effective mode:	Real time
Min.:	0	Unit:	ms(s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0ms(s)~10000ms(s)

Description

See interval time after displacement 1.

H11.67 Displacement 12

Address:	2011-44h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.69 Max. speed of displacement 12

Address:	2011-46h	Effective mode:	Real time

Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.70 Acc/Dec time of displacement 12

Address:	2011-47h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.71 Interval time after displacement 12

Address:	2011-48h	Effective mode:	Real time
Min.:	0	Unit:	ms(s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0ms(s)~10000ms(s)

Description

See interval time after displacement 1.

H11.72 Displacement 13

Address:	2011-49h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.74 Max. speed of displacement 13

Address:	2011-4Bh	Effective mode:	Real time

Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.75 **Acc/Dec time of displacement 13**

Address:	2011-4Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0 ms to 65535 ms

Description

See acc/dec time of displacement 1

H11.76 **Interval time after displacement 13**

Address:	2011-4Dh	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.77 **Displacement 14**

Address:	2011-4Eh	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.79 **Max. speed of displacement 14**

Address:	2011-50h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real time

Value Range:

1[mm/s]/[rpm] to 10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.80 **Acc/Dec time of displacement 14**

Address:	2011-51h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0 ms to 65535 ms

Description

See acc/dec time of displacement 1.

H11.81 **Interval time after displacement 14**

Address:	2011-52h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.82 **Displacement 15**

Address:	2011-53h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.84 **Max. speed of displacement 15**

Address:	2011-55h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.85 **Acc/Dec time of displacement 15**

Address:	2011-56h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.86 **Interval time after displacement 15**

Address:	2011-57h	Effective mode:	Real time
Min.:	0	Unit:	ms(s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0ms(s)~10000ms(s)

Description

See interval time after displacement 1

H11.87 **Displacement 16**

Address:	2011-58h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.89 **Max. speed of displacement 16**

Address:	2011-5Ah	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real time

Value Range:

1[mm/s]/[rpm]~10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.90 **Acc/Dec time of displacement 16**

Address:	2011-5Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0ms~65535ms

See acc/dec time of displacement 1.

H11.91 **Interval time after displacement 16**

Address:	2011-5Ch	Effective mode:	Real time
Min.:	0	Unit:	ms(s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real time

Value Range:

0ms(s)~10000ms(s)

Description

See interval time after displacement 1.

21.18H12 Multi-Speed

H12.00 **Multi-speed operation mode**

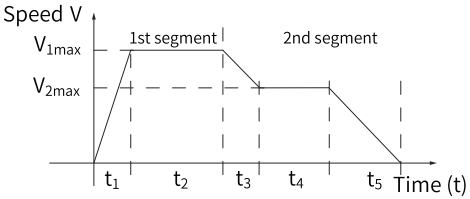
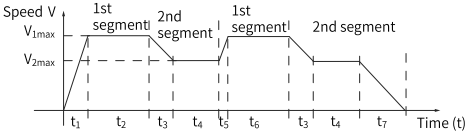
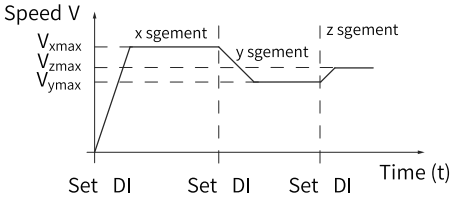
Address:	2012-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Individual operation (number of speeds selected in H12.01)
1: Cyclic operation (number of speeds selected in H12.01)
2: DI-based operation

Description

Defines the multi-speed operation mode when the speed reference source is multi-speed reference (H06.01 = 5, H06.02 = 1/2/3) in the speed control mode. The S-ON signal must be active during operation of each speed. Otherwise, the drive stops immediately as defined by H02.05 (Stop mode at S-ON OFF). The speed reach signal (FunOUT.19: V-Arr) is activated each time when a speed reference value is reached

Value	Operation Mode	Remarks	Operation Curve
0	Individual operation	The drive stops after one cycle of operation. The drive switches to the next displacement automatically.	 V 1max , V 2max : reference values of speed 1 and speed 2 t 1 : actual acceleration/deceleration time of speed 1 t 3 , t 5 : acceleration/deceleration time of speed 2
1	Cyclic operation	The drive starts from speed 1 after each cycle of operation. The drive automatically switches to the next speed. The cyclic operation state remains active as long as the S-ON signal is active.	 V 1max , V 2max : maximum operating speeds in displacement 1 and displacement 2
2	External DI signal	The drive operates continuously as long as the S-ON signal is active. The speed No. is determined by the DI logic. The operating time of each speed is determined only by the interval time of speed switchover. The speed reference direction can be switched through FunIN.5 (DIR-SEL).	 x, y: speed No. (The relationship between the speed No. and the DI logic is described below.) V x , V y: speed references for speeds x and y The speed No. determined by DI does not change, which means the speed reference operates continuously regardless of the reference operating time.

H12.01 Number of speed references in multi-speed mode

Address:	2012-02h	Effective mode:	Real time
Min.:	1	Unit:	-

Max.:	16	Data Type:	UInt16
Default:	16	Change:	At stop

Value Range:

1 to 16

Description

Defines the total number of speed references in the multi-speed mode. Different speed references, operating time, and acceleration/deceleration time (four groups optional) can be set for each speed.

H12.00 ≠ 2: Speeds are switched automatically in a sequence from 1, 2... H12.01.

H12.00 is 2: Assign four DIs (Hardware DI or VDI) with DI functions 6 to 9 (FunIN.6: CMD1 to FunIN.9: CMD4) and control the DI logic through the host controller to switch between different speeds. The segment No. is a 4-bit binary value. Bits 0 to 3 correspond to CMD1 to CMD4.

FunIN.9	FunIN.8	FunIN.7	FunIN.6	Segment No.
CMD4	CMD3	CMD2	CMD1	
0	0	0	0	1
0	0	0	1	2
		...		
1	1	1	1	16

The value of CMD(n) is 1 upon active DI logic and 0 upon inactive DI logic.

H12.02 Operating time unit

Address:	2012-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: s

1: min

Description

Defines the time unit of multi-speed operation.

0: s

1: min

H12.03 Acceleration time 1

Address:	2012-04h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Four groups of acceleration/deceleration time can be set for each speed reference.

Acceleration time: time for the motor to accelerate from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed.

H12.04 Deceleration time 1

Address:	2012-05h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Four groups of acceleration/deceleration time can be set for each speed reference.

Deceleration time: time for the motor to decelerate from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm] at a constant speed.

H12.05 Acceleration time 2

Address:	2012-06h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Real time

Value Range:

0 ms to 65535 ms

Description

Four groups of acceleration/deceleration time can be set for each speed reference.

Acceleration time: time for the motor to accelerate from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed.

H12.06 Deceleration time 2

Address:	2012-07h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Four groups of acceleration/deceleration time can be set for each speed reference.
Deceleration time: time for the motor to decelerate from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm] at a constant speed.

H12.07 **Acceleration time 3**

Address:	2012-08h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
0 ms–65535 ms

Description
Four groups of acceleration/deceleration time can be set for each speed reference.
Acceleration time: time for the motor to accelerate from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed.

H12.08 **Deceleration time 3**

Address:	2012-09h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	Real time

Value Range:
0 ms to 65535 ms

Description
Four groups of acceleration/deceleration time can be set for each speed reference.
Deceleration time: time for the motor to decelerate from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm] at a constant speed.

H12.09 **Acceleration time 4**

Address:	2012-0Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	150	Change:	Real time

Value Range:
0 ms to 65535 ms

Description
Four groups of acceleration/deceleration time can be set for each speed reference.
Acceleration time: time for the motor to accelerate from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed.

H12.10 Deceleration time 4

Address:	2012-0Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	150	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Four groups of acceleration/deceleration time can be set for each speed reference.

Deceleration time: time for the motor to decelerate from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm] at a constant speed.

H12.20 1st speed reference

Address:	2012-15h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	0	Change:	Real time

Value Range:

-10000[mm/s]/[rpm] to 10000[mm/s]/[rpm]

Description

Sets the first speed reference.

H12.21 Operating time of speed 1

Address:	2012-16h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

Defines the operating time of speed 1.

The operating time is the sum of the speed variation time from previous speed reference to present speed reference plus the average operating time of present speed reference.

If the operating time is set to 0, the drive skips this speed reference automatically.
As long as H12.00 (Multi-speed operation mode) is set to 2 (DI-based operation) and the speed No. determined by the external DI does not change, the drive continues operating at the speed defined by this speed reference, without being affected by the reference operating time.

H12.22 1st speed rise/drop and curve smoothing parameter time

Address:	2012-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:
bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description
Bit0–bit7: Acc./dec. time of speed 6
Defines the acceleration/deceleration time of speed 1.
0: Zero acc./dec. time Acceleration time: 0
Deceleration time: 0
1: Acc./dec. Time 1 Acceleration time: H12.03
Deceleration time: H12.04
2: Acc./dec. Time 2 Acceleration time: H12.05
Deceleration time: H12.06
3: Acc./dec. Time 3 Acceleration time: H12.07
Deceleration time: H12.08
4: Acc./dec. Time 4 Acceleration time: H12.09
Deceleration time: H12.10

Bit8–bit15: S curve smoothing parameter
1. Smoothing parameter 1 increasing acceleration time of acceleration segment: H06.51
Decreasing acceleration time of acceleration segment: H06.52
Decreasing deceleration time of deceleration segment: H06.53
Decreasing acceleration time of acceleration segment: H06.54
2. Smoothing parameter 2 increasing acceleration time of acceleration segment: H06.55
Decreasing acceleration time of acceleration segment: H06.56
Decreasing deceleration time of deceleration segment: H06.57
Decreasing acceleration time of acceleration segment: H06.58
3. Smoothing parameter 3 increasing acceleration time of acceleration segment: H06.59
Decreasing acceleration time of acceleration segment: H06.60
Decreasing deceleration time of deceleration segment: H06.61
Decreasing acceleration time of acceleration segment: H06.62
4. Smoothing parameter 4 increasing acceleration time of acceleration segment: H06.63
Decreasing acceleration time of acceleration segment: H06.64
Decreasing deceleration time of deceleration segment: H06.65
Decreasing acceleration time of acceleration segment: H06.66
5. Smoothing parameter 5 increasing acceleration time of acceleration segment: H06.67
Decreasing acceleration time of acceleration segment: H06.68
Decreasing deceleration time of deceleration segment: H06.69
Decreasing acceleration time of acceleration segment: H06.70
6. Smoothing parameter 6 increasing acceleration time of acceleration segment: H06.71
Decreasing acceleration time of acceleration segment: H06.72
Decreasing deceleration time of deceleration segment: H06.73
Decreasing acceleration time of acceleration segment: H06.74
7. Smoothing parameter 7 increasing acceleration time of acceleration segment: H06.75
Decreasing acceleration time of acceleration segment: H06.76
Decreasing deceleration time of deceleration segment: H06.77
Decreasing acceleration time of acceleration segment: H06.78
8. Smoothing parameter 8 increasing acceleration time of acceleration segment: H06.79
Decreasing acceleration time of acceleration segment: H06.80
Decreasing deceleration time of deceleration segment: H06.81
Decreasing acceleration time of acceleration segment: H06.82

H12.23 **Reference 2**

Address:	2012-18h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	100	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.24 **Operating time of speed 2**

Address:	2012-19h	Effective mode:	Real time
Min.:	0.0	Unit:	s(m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real time

Value Range:

0.0 s(m) to 6553.5 s(m)

Description

See operating time of speed 1.

H12.25 **2nd speed rise/drop time and curve smoothing parameter time**

Address:	2012-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.26 Reference 3

Address:	2012-1Bh	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	300	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.27 Operating time of speed 3

Address:	2012-1Ch	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.28 3nd speed rise/drop time and curve smoothing parameter time

Address:	2012-1Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description
See acc./dec. time of speed 1.

H12.29 **Reference 4**

Address:	2012-1Eh	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	500	Change:	Real time

Value Range:

-10000[mm/s]/[rpm] to 10000[mm/s]/[rpm]

Description

See reference 1.

H12.30 **Operating time of speed 4**

Address:	2012-1Fh	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.31 **4th speed rise/drop time and curve smoothing parameter time**

Address:	2012-20h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1

2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.32 **Reference 5**

Address:	2012-21h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	700	Change:	Real time

Value Range:

-10000 [mm/s]/[rpm] to 10000 [mm/s]/[rpm]

Description

See reference 1.

H12.33 **Operating time of speed 5**

Address:	2012-22h	Effective mode:	Real time
Min.:	0.0	Unit:	s(m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real time

Value Range:

0.0 s(m) to 6553.5 s(m)

Description

See operating time of speed 1.

H12.34 **5th speed rise/drop time and curve smoothing parameter time**

Address:	2012-23h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1

H12.35 **Reference 6**

Address:	2012-24h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	900	Change:	Real time

Value Range:

-10000 [mm/s]/[rpm] to 10000 [mm/s]/[rpm]

Description

See reference 1.

H12.36 **Operating time of speed 6**

Address:	2012-25h	Effective mode:	Real time
Min.:	0.0	Unit:	s(m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real time

Value Range:

0.0 s(m) to 6553.5 s(m)

Description

See operating time of speed 1.

H12.37 **6th speed rise/drop time and curve smoothing parameter time**

Address:	2012-26h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2

3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.38 **Reference 7**

Address:	2012-27h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	600	Change:	Real time

Value Range:

-10000 [mm/s]/[rpm] to 10000 [mm/s]/[rpm]

Description

See reference 1.

H12.39 **Operating time of speed 7**

Address:	2012-28h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0 s(m) to 6553.5 s(m)

Description

See operating time of speed 1.

H12.40 **7th speed rise/drop time and curve smoothing parameter time**

Address:	2012-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.41 **Reference 8**

Address:	2012-2Ah	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	300	Change:	Real time

Value Range:

-10000 [mm/s]/[rpm] to 10000 [mm/s]/[rpm]

Description

See reference 1.

H12.42 **Operating time of speed 8**

Address:	2012-2Bh	Effective mode:	Real time
Min.:	0.0	Unit:	s(m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real time

Value Range:

0.0 s(m) to 6553.5 s(m)

Description

See operating time of speed 1.

H12.43 **8th speed rise/drop time and curve smoothing parameter time**

Address:	2012-2Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16

Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.44 **Reference 9**

Address:	2012-2Dh	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	100	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.45 **Operating time of speed 9**

Address:	2012-2Eh	Effective mode:	Real time
Min.:	0.0	Unit:	s(m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real time

Value Range:

0.0 s(m) to 6553.5 s(m)

Description

See operating time of speed 1.

H12.46 **9th speed rise/drop time and curve smoothing parameter time**

Address:	2012-2Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.47 **Reference 10**

Address:	2012-30h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-100	Change:	Real time

Value Range:

-10000[mm/s]/[rpm] to 10000[mm/s]/[rpm]

Description

See reference 1.

H12.48 **Operating time of speed 10**

Address:	2012-31h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.49 10th speed rise/drop time and curve smoothing parameter time

Address:	2012-32h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.50 Reference 11

Address:	2012-33h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-300	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.51 Operating time of speed 11

Address:	2012-34h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16

Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.52 11th speed rise/drop time and curve smoothing parameter time

Address:	2012-35h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time

0: Zero acc and dec time

1: Acc and dec time 1

2: Acc and dec time 2

3: Acc and dec time 3

4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1

2: Smoothing parameter 2

3: Smoothing parameter 3

4: Smoothing parameter 4

5: Smoothing parameter 5

6: Smoothing parameter 6

7: Smoothing parameter 7

8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.53 Reference 12

Address:	2012-36h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-500	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.54 Operating time of speed 12

Address:	2012-37h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.55 12th speed rise/drop time and curve smoothing parameter time

Address:	2012-38h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time

0: Zero acc and dec time

1: Acc and dec time 1

2: Acc and dec time 2

3: Acc and dec time 3

4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1

2: Smoothing parameter 2

3: Smoothing parameter 3

4: Smoothing parameter 4

5: Smoothing parameter 5

6: Smoothing parameter 6

7: Smoothing parameter 7

8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.56 Reference 13

Address:	2012-39h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16

Default:	-700	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm] to 10000[mm/s]/[rpm]

Description

See reference 1.

H12.57 Operating time of speed 13

Address:	2012-3Ah	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.58 13th speed rise/drop time and curve smoothing parameter time

Address:	2012-3Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.59 Reference 14

Address:	2012-3Ch	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]

Max.:	10000	Data Type:	Int16
Default:	-900	Change:	Real time

Value Range:

-10000[mm/s]/[rpm] to 10000[mm/s]/[rpm]

Description

See reference 1.

H12.60 Operating time of speed 14

Address:	2012-3Dh	Effective mode:	Real time
Min.:	0.0	Unit:	s(m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real time

Value Range:

0.0s(m)~6553.5s(m)

Description

See operating time of speed 1.

H12.61 14th speed rise/drop time and curve smoothing parameter time

Address:	2012-3Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.62 **Reference 15**

Address:	2012-3Fh	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-600	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.63 **Operating time of speed 15**

Address:	2012-40h	Effective mode:	Real time
Min.:	0.0	Unit:	s(m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1

H12.64 **15th speed rise/drop time and curve smoothing parameter time**

Address:	2012-41h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.65 **Reference 16**

Address:	2012-42h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-300	Change:	Real time

Value Range:

-10000[mm/s]/[rpm] to 10000[mm/s]/[rpm]

Description

See reference 1.

H12.66 **Operating time of speed 16**

Address:	2012-43h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.67 **16th speed rise/drop time and curve smoothing parameter time**

Address:	2012-44h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5

6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description
See acc./dec. time of speed 1.

21.19H13 Application Safety Parameters

H13.00 Auto-tuned scheme 2 runaway distance threshold

Address:	2013-01h	Effective mode:	-
Min.:	0.00	Unit:	[mm]/[Rev]
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:
0.00[mm]/[Rev]–655.35[mm]/[Rev]
Description
-

H13.01 Scheme 2 runaway distance threshold

Address:	2013-02h	Effective mode:	Real time
Min.:	0.00	Unit:	[mm]/[Rev]
Max.:	15.00	Data Type:	UInt16
Default:	0.50	Change:	At stop

Value Range:
0.00[mm]/[Rev]–15.00[mm]/[Rev]
Description
-

H13.02 Scheme 2 runaway current threshold

Address:	2013-03h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% to 400.0%
Description
-

H13.03 **Runaway speed threshold in scheme 2 speed or position mode**

Address:	2013-04h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	6000	Data Type:	UInt16
Default:	50	Change:	At stop

Value Range:

1[mm/s]/[rpm]~6000[mm/s]/[rpm]

Description

-

H13.04 **Runaway speed threshold in scheme 2 torque mode**

Address:	2013-05h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	6000	Data Type:	UInt16
Default:	500	Change:	At stop

Value Range:

1[mm/s]/[rpm]–6000[mm/s]/[rpm]

Description

-

H13.05 **Scheme 2 runaway inspection window time**

Address:	2013-06h	Effective mode:	Real time
Min.:	10	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	30	Change:	At stop

Value Range:

10 ms to 100 ms

Description

-

21.20H14 Gantry Synchronization

H14.00 **Gantry communication state**

Address:	2014-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–1

Description

Used to judge whether both axes have established communication after the gantry function is enabled.

H14.01 Gantry alignment state

Address:	2014-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 1

Description

After the gantry alignment is completed, the gantry alignment state will be set to 1 to determine whether the gantry alignment is completed.

H14.02 Gantry function selection

Address:	2014-03h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: None

1: Gantry synchronization

Description

Gantry function selection.

0: Disabled

1: Enabled

H14.03 Gantry axis attribute (master-slave)

Address:	2014-04h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Slave axis
1: Master axis

Description

Selects the gantry axis attribute.
0: Slave axis
1: Master axis

H14.04 Gantry mechanical attribute

Address:	2014-05h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Rigid gantry scheme 1-Two-axis position control
1: Flexible gantry scheme 1-Two-axis position control
2: Rigid gantry scheme 2-Master axis position control and slave axis torque

Description

The gantry mechanical attribute is related to the mechanical structure type of the gantry, which can be divided into rigid crossbeam frame connection and flexible crossbeam frame connection.
0: Rigid crossbeam frame, "axis sticking" may occur if both axes deviate too much
1: Flexible crossbeam frame, sync deviation is allowed between both axes
2: Rigid crossbeam frame, suitable for applications do not require high accuracy

H14.05 Current axis position sync direction

Address:	2014-06h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Forward
1: Reverse

Description

The synchronous direction of the two axes is related to the installation direction of the motor and the rotation direction of H02.02.
0: Forward
1: Reverse

H14.07 Gantry sync enable

Address:	2014-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled
1: Enabled
2: DI-enabled

Description

Selects the gantry synchronization enable mode to adjust the gain of gantry slave axis compensation. When it is enabled, H14.08–H14.11 will take effect.
0: Disabled
1: Enabled
2: DI-enabled

H14.08 Gantry sync position loop proportional gain

Address:	2014-09h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0% to 300.0%
Description
It is only effective for the slave axis.

H14.09 Gantry sync position loop integral time constant

Address:	2014-0Ah	Effective mode:	Real time
Min.:	0.5	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	1000.0	Change:	Real-time

Value Range:
0.5 ms–1000.0 ms
Description
It is only effective for the slave axis.

H14.10 Gantry sync speed loop proportional gain

Address:	2014-0Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0% to 300.0%
Description
It is only effective for the slave axis.

H14.11 **Gantry sync speed loop integral time constant**

Address:	2014-0Ch	Effective mode:	Real time
Min.:	0.5	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	1000.0	Change:	Real time

Value Range:
0.5ms to 1000.0ms

Description
It is only effective for the slave axis.

H14.12 **Gantry sync speed limit**

Address:	2014-0Dh	Effective mode:	Real time
Min.:	0.0	Unit:	rpm
Max.:	6000.0	Data Type:	UInt16
Default:	50.0	Change:	Real time

Value Range:
0.0rpm~6000.0rpm

Description
Gantry sync speed limit.

H14.13 **Gantry alignment speed**

Address:	2014-0Eh	Effective mode:	Real time
Min.:	0.0	Unit:	rpm
Max.:	3000.0	Data Type:	UInt16
Default:	10.0	Change:	Real time

Value Range:
0.0rpm to 3000.0rpm

Description
Gantry alignment speed

H14.14 **Gantry alignment acc./dec. time**

Address:	2014-0Fh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
0 ms–1000 ms

Description
Gantry alignment acc./dec. time

H14.18 **Torque pre-alignment before gantry homing**

Address:	2014-13h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real time

Value Range:
0：Disabled

1: Enabled

Description

Enables/disables torque pre-alignment before gantry homing.
0: Disabled
1: Enabled

H14.20 Gantry aligned by default upon power-on

Address:	2014-15h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: No operation
1: Align at first power-on

Description

Sets whether gantry alignment is performed by default upon power-on.
0: No operation
1: Aligned by default upon initial power-on of two axes

H14.21 Gantry alignment mode

Address:	2014-16h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Gantry homing alignment
2: Gantry torque alignment
3: Gantry enable alignment
4: Gantry DI alignment

Description

Gantry axis alignment mode
0: Gantry homing alignment
2: Gantry torque alignment
3: Gantry enable alignment
4: Gantry DI alignment

H14.25 Flexible gantry homing - Master/slave home deviation auto-tuning

Address:	2014-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real time

Value Range:

0: Disabled
1: Torque alignment auto-tuning
2: Position auto-tuning

Description

Sets whether to perform master/slave home deviation auto-tuning when H14.04 is set to flexible gantry.
0: Disabled
1: Torque alignment auto-tuning
2: Position auto-tuning

H14.26 Gantry torque alignment enable

Address:	2014-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled
1: Enabled
2: DI-enabled
3: Enabled at power-on

Description

Selects gantry torque alignment enable mode in gantry alignment mode.
0: Disabled
1: Enabled
2: DI-enabled
3: Enabled at power-on

H14.27 Gantry torque alignment torque

Address:	2014-1Ch	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:

0.0% to 300.0%

Description

Torque value in gantry torque alignment mode.

H14.28 Gantry torque alignment count

Address:	2014-1Dh	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	2	Change:	Real time

Value Range:

1 to 2

Description

The number of alignments in gantry torque alignment mode.

H14.29 Gantry torque alignment speed

Address:	2014-1Eh	Effective mode:	Real time
Min.:	0.0	Unit:	rpm
Max.:	3000.0	Data Type:	UInt16
Default:	10.0	Change:	Real time

Value Range:

0.0rpm to 3000.0rpm

Description

The speed in gantry torque alignment mode.

H14.30 Gantry torque alignment timeout alarm time

Address:	2014-1Fh	Effective mode:	Real time
Min.:	1	Unit:	s
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

1s to 65535s

Description

Gantry torque alignment timeout alarm time

H14.31 Gantry torque alignment acc./dec. time

Address:	2014-20h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	100	Change:	Real time

Value Range:

0ms to 1000ms

Description

Gantry torque alignment acc./dec. time

H14.32 Gantry torque alignment zero speed threshold

Address:	2014-21h	Effective mode:	Real time
Min.:	0.0	Unit:	rpm
Max.:	100.0	Data Type:	UInt16
Default:	2.0	Change:	Real-time

Value Range:

0.0rpm to 100.0rpm

Description

The zero speed threshold for gantry torque alignment.

H14.33 Gantry torque alignment mechanical limit evaluation position loop period count

Address:	2014-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	5	Change:	Real-time

Value Range:

0–65535

Description

Gantry torque alignment mechanical limit evaluation position loop period count

H14.35 2-axis position deviation (encoder unit)

Address:	2014-24h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

The position deviation (encoder unit) between the active axis and the paired axis in gantry mode. It is related to H0B.17 of the two axes.

H14.37 2-axis speed deviation

Address:	2014-26h	Effective mode:	-
Min.:	-32767	Unit:	rpm
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-32767rpm to 32767rpm
Description
It is the speed difference between the active axis and paired axis in gantry mode.

H14.38 Torque reference of active axis

Address:	2014-27h	Effective mode:	-
Min.:	-3276.7	Unit:	%
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:
-3276.7% to 3276.7%
Description
Torque reference of active axis

H14.39 Torque reference of paired axis

Address:	2014-28h	Effective mode:	-
Min.:	-3276.7	Unit:	%
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:
-3276.7% to 3276.7%
Description
Torque reference of paired axis

H14.40 Motor speed of active axis

Address:	2014-29h	Effective mode:	-
Min.:	-32767	Unit:	rpm
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-32767rpm to 32767rpm
Description
Motor speed of active axis

H14.41 Motor speed of paired axis

Address:	2014-2Ah	Effective mode:	-

Min.: -32767
Max.: 32767
Default: 0
Unit: rpm
Data Type: Int16
Change: Unchangeable

Value Range:
-32767rpm to 32767rpm
Description
Motor speed of paired axis

H14.44 Alarm time threshold of large gantry deviation

Address: 2014-2Dh
Min.: 0.5
Max.: 1000.0
Default: 3.0
Effective mode: Real time
Unit: ms
Data Type: UInt16
Change: Real time

Value Range:
0.5ms to 1000.0ms
Description
The alarm time threshold of large gantry deviation.

H14.45 Gantry position alarm threshold

Address: 2014-2Eh
Min.: 0
Max.: 4294967295
Default: 50000
Effective mode: Real time
Unit: Encoder unit
Data Type: UInt32
Change: At stop

Value Range:
0 to 4294967295
Description
Gantry position alarm threshold.

H14.47 Large gantry position deviation alarm enable

Address: 2014-30h
Min.: 0
Max.: 1
Default: 1
Effective mode: Real time
Unit: -
Data Type: UInt16
Change: Real time

Value Range:
0: Disabled
1: Enabled

Description
Large gantry position deviation alarm enable
0: Disabled
1: Enabled

H14.48 Alarm time threshold of large gantry torque deviation

Address:	2014-31h	Effective mode:	Real time
Min.:	0.5	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	3.0	Change:	Real-time

Value Range:

0.5 ms–1000.0 ms

Description

The alarm time threshold of large gantry torque deviation.

H14.49 Gantry torque deviation alarm threshold

Address:	2014-32h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	800.0	Data Type:	UInt16
Default:	300.0	Change:	At stop

Value Range:

0.0% to 800.0%

Description

The alarm threshold for large gantry torque deviation.

H14.50 Large gantry torque deviation alarm enable

Address:	2014-33h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real time

Value Range:

0: Disabled
1: Enabled

Description

Enables/disables large gantry torque deviation alarm.
0: Disabled
1: Enabled

H14.52 Gantry mismatch

Address:	2014-35h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1451	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–1451

Description

If the parameters of the two axes of the gantry do not match, they will be displayed.

H14.71 Flexible gantry homing - Enable aligning slave axis homing position to home offset

Address:	2014-48h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No operation
1: Enabled

Description

Flexible gantry homing - Enable aligning slave axis homing position to home offset
0: No operation
1: Enabled

H14.74 Gantry scheme 2 slave axis enable

Address:	2014-4Bh	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation
1: Enabled

Description

0: Slave axis not respond to position references in gantry scheme 2
1: Slave axis respond to position references in gantry scheme 2

21.21H17 Virtual DI/DO

H17.90 Communication VDI enable

Address:	2017-5Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled
1: Enabled

Description

To use the VDI function:
1. Set H17.90 to enable VDI.
2. Set the default level after power-on through H17.91.
3. Set the DI function of the VDI terminal through parameters in group H17.
4. Set VDI output through H31.00.

H17.91 VDI default value after power-on

Address:	2017-5Ch	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: VDI1
bit1: VDI2
bit2: VDI3
bit3: VDI4
bit4: VDI5
bit5: VDI6
bit6: VDI7
bit7: VDI8
bit8: VDI9
bit9: VDI10
bit10: VDI11
bit11: VDI12
bit12: VDI13
bit13: VDI14
bit14: VDI15
bit15: VDI16

Description

Configures the initial value of VDI upon power-on.
Bit 0 corresponds to VDI1.
Bit 1 corresponds to VDI2.
…
Bit 15 corresponds to VDI16.

H17.00 VDI1 function

Address:	2017-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately

44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Set the function of VDI1.

H17.01 VDI1 logic level selection

Address:	2017-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

Set VDI1 active level

H17.02 VDI2 function

Address:	2017-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction

6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1

52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.03 VDI2 logic level selection

Address:	2017-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.04 VDI3 function

Address:	2017-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited

14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description
See H17.00.

H17.05 **VDI3 logic level selection**

Address:	2017-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Active when the written value is 1
1: Active when the written value changes from 0 to 1
Description
See H17.01.

H17.06 **VDI4 function**

Address:	2017-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable

21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.07 VDI4 logic level selection

Address:	2017-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.08 VDI5 function

Address:	2017-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction

28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.09 VDI5 logic level selection

Address:	2017-0Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.10 **VDI6 function**

Address:	2017-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source

37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.11 VDI6 logic level selection

Address:	2017-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.12 VDI7 function

Address:	2017-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON

2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1

48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.13 VDI7 logic level selection

Address:	2017-0Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.14 VDI8 function

Address:	2017-0Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4

10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause

56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.15 VDI8 logic level selection

Address:	2017-10h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.16 VDI9 function

Address:	2017-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch

16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.17 VDI9 logic level selection

Address:	2017-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.18 VDI10 function

Address:	2017-13h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction

26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.19 VDI10 logic level selection

Address:	2017-14h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description
See H17.01.

H17.20 VDI11 function

Address:	2017-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable

33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.21 VDI11 logic level selection

Address:	2017-16h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.22 VDI12 function

Address:	2017-17h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home

42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.23 VDI12 logic level selection

Address:	2017-18h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.24 VDI13 function

Address:	2017-19h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch

4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3

50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.25 VDI13 logic level selection

Address:	2017-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.26 VDI14 function

Address:	2017-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL

12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable

58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.27 VDI14 logic level selection

Address:	2017-1Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.28 VDI15 function

Address:	2017-1Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog

20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable
29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.29 VDI15 logic level selection

Address:	2017-1Eh	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Active when the written value is 1
1: Active when the written value changes from 0 to 1
Description
See H17.01.

H17.30 VDI16 function

Address:	2017-1Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: No assignment
1: Servo ON
2: Alarm reset signal
3: Gain switchover switch
4: Switchover of main and auxiliary commands
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
10: Mode switchover M1-SEL
11: Mode switchover M2-SEL
12: Zero clamp enable signal
13: Position command inhibited
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
20: Step enable
21: Handwheel override signal 1
22: Handwheel override signal 2
23: Handwheel enable signal
24: Electronic gear
25: Torque reference direction
26: Speed reference direction
27: Position reference direction
28: Multi-position reference enable

29: Interrupt positioning state exit signal
31: Home switch
32: Homing enable
33: Interrupt positioning inhibited
34: Emergency stop
35: Clear position deviation
36: Internal speed limit source
37: Pulse reference inhibited
40: Multi-speed enable
41: Current position as home
42: Axis control command executed immediately
43: Axis control command not executed immediately
44: Positioning and command completed signal clear
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

See H17.00.

H17.31 VDI16 logic level selection

Address:	2017-20h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

See H17.01.

H17.92 Communication VDO enable

Address:	2017-5Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

To use the VDO function:

1. Set H17.92 to enable VDO.
2. Set the default level after power-on through H17.93.
3. Set the DO function of the VDO terminal through parameters in group H17.
4: Read the output level of the VDO in H17.32.

H17.93 VDO default value after power-on

Address:	2017-5Eh	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	At stop

Value Range:

bit0：VDO1
bit1：VDO2
bit2：VDO3
bit3：VDO4
bit4：VDO5
bit5：VDO6
bit6：VDO7
bit7：VDO8
bit8：VDO9
bit9：VDO10
bit10：VDO11
bit11：VDO12
bit12：VDO13
bit13：VDO14
bit14：VDO15
bit15：VDO16

Description

Configures the initial value of VDO upon power-on.
Bit 0 corresponds to VDO1.
Bit 1 corresponds to VDO2.
…
Bit 15 corresponds to VDO16.

H17.32 **VDO virtual level**

Address:	2017-21h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the VDO virtual level.

H17.33 **VDO1 function**

Address:	2017-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output

33: Gantry alignment

Description

Set the function of VDO1.

H17.34 VDO1 logic level selection

Address:	2017-23h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

Set VDO1 active level.

H17.35 VDO2 function

Address:	2017-24h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function

1: Servo ready

2: Motor rotation signal

3: Zero speed signal

4: Speed matching signal

5: Positioning completed

6: Positioning near

7: Torque limited signal

8: Speed limited signal

9: Braking

10: Warning

11: Fault

15: Interrupt positioning completed

16: Homing completed

17: Electrical homing completed

18: Torque reached signal

19: Speed reached signal

21: Enable completed

22: Internal command completed

23: Writing next command allowed

24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description

See H17.33.

H17.36 VDO2 logic level selection

Address:	2017-25h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.37 VDO3 function

Address:	2017-26h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed

17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description

See H17.33.

H17.38 VDO3 logic level selection

Address:	2017-27h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.39 VDO4 function

Address:	2017-28h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal

9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description

See H17.33.

H17.40 VDO4 logic level selection

Address:	2017-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.41 VDO5 function

Address:	2017-2Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal

3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description

See H17.33.

H17.42 VDO5 logic level selection

Address:	2017-2Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.43 VDO6 function

Address:	2017-2Ch	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description

See H17.33.

H17.44 VDO6 logic level selection

Address:	2017-2Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description
See H17.34.

H17.45 VDO7 function

Address:	2017-2Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description
See H17.33.

H17.46 VDO7 logic level selection

Address:	2017-2Fh	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.47 VDO8 function

Address:	2017-30h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function

1: Servo ready

2: Motor rotation signal

3: Zero speed signal

4: Speed matching signal

5: Positioning completed

6: Positioning near

7: Torque limited signal

8: Speed limited signal

9: Braking

10: Warning

11: Fault

15: Interrupt positioning completed

16: Homing completed

17: Electrical homing completed

18: Torque reached signal

19: Speed reached signal

21: Enable completed

22: Internal command completed

23: Writing next command allowed

24: Internal motion completed

26: Closed-loop state

27: Left limit

28: Right limit

30: Warning or fault output

32: EDM output

33: Gantry alignment

Description
See H17.33.

H17.48 **VDO8 logic level selection**

Address:	2017-31h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Output 1 upon active logic
1: Output 0 upon active logic
Description
See H17.34.

H17.49 **VDO9 function**

Address:	2017-32h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed

26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description
See H17.33.

H17.50 VDO9 logic level selection

Address:	2017-33h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Output 1 upon active logic
1: Output 0 upon active logic

Description
See H17.34.

H17.51 VDO10 function

Address:	2017-34h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed

18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description

See H17.33.

H17.52 VDO10 logic level selection

Address:	2017-35h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.53 VDO11 function

Address:	2017-36h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal

9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description

See H17.33.

H17.54 VDO11 logic level selection

Address:	2017-37h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.55 VDO12 function

Address:	2017-38h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal

3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description

See H17.33.

H17.56 VDO12 logic level selection

Address:	2017-39h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.57 VDO13 function

Address:	2017-3Ah	Effective mode:	Real time

0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description

See H17.33.

H17.58 VDO13 logic level selection

Address:	2017-3Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description
See H17.34.

H17.59 VDO14 function

Address:	2017-3Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal
19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description
See H17.33.

H17.60 VDO14 logic level selection

Address:	2017-3Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.61 VDO15 function

Address:	2017-3Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function

1: Servo ready

2: Motor rotation signal

3: Zero speed signal

4: Speed matching signal

5: Positioning completed

6: Positioning near

7: Torque limited signal

8: Speed limited signal

9: Braking

10: Warning

11: Fault

15: Interrupt positioning completed

16: Homing completed

17: Electrical homing completed

18: Torque reached signal

19: Speed reached signal

21: Enable completed

22: Internal command completed

23: Writing next command allowed

24: Internal motion completed

26: Closed-loop state

27: Left limit

28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description

See H17.33.

H17.62 VDO15 logic level selection

Address:	2017-3Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.63 VDO16 function

Address:	2017-40h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function
1: Servo ready
2: Motor rotation signal
3: Zero speed signal
4: Speed matching signal
5: Positioning completed
6: Positioning near
7: Torque limited signal
8: Speed limited signal
9: Braking
10: Warning
11: Fault
15: Interrupt positioning completed
16: Homing completed
17: Electrical homing completed
18: Torque reached signal

19: Speed reached signal
21: Enable completed
22: Internal command completed
23: Writing next command allowed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
30: Warning or fault output
32: EDM output
33: Gantry alignment

Description

See H17.33.

H17.64 VDO16 logic level selection

Address:	2017-41h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

21.22H18 Position Comparison Output

H18.00 Position comparison output selection

Address:	2018-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disable
1: Enable (rising edge-triggered)

Description

0: Disable
1: Enable (rising edge-triggered)

H18.01 Position comparison output feedback source

Address:	2018-02h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Motor encoder feedback

1: Fully closed-loop position feedback

Description

Select position comparison output feedback source.

0: Motor encoder feedback

1: Fully closed-loop position feedback

H18.02 Position comparison resolution

Address:	2018-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0：24bit
1：23bit
2：22bit
3：21bit
4：20bit
5：19bit
6：18bit
7：17bit

Description

Set position comparison resolution

0：24bit
1：23bit
2：22bit
3：21bit
4：20bit
5：19bit
6：18bit
7：17bit

H18.03 Position comparison mode

Address:	2018-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:

0: Individual comparison mode

1: Cyclic comparison mode

2: Fixed cyclic comparison mode

Description

Set position comparison mode

0: Individual comparison mode

1: Cyclic comparison mode

2: Fixed cyclic comparison mode

H18.04 Current position as zero

Address:	2018-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disable

1: Enable (rising edge-triggered)

Description

Current position as zero

H18.05 Position comparison output width

Address:	2018-06h	Effective mode:	Real time
Min.:	0.1	Unit:	ms
Max.:	204.7	Data Type:	UInt16
Default:	0.1	Change:	Real-time

Value Range:

0.1 ms–204.7 ms

Description

Defines the active pulse width of the DO when the comparison point is reached. The value range is 0 to 204.7 (unit: 1 ms).

H18.06 Position comparison output ABZ port polarity

Address:	2018-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit 0: OCZ output logic

0: Positive, output high level upon active logic

1: Negative, output low level upon active logic

Bit 1: Z port output logic
0: Positive, output high level upon active logic
1: Negative, output low level upon active logic
bit2: A/B output logic
0: Positive, output high level upon active logic
1: Negative, output low level upon active logic

Description

0: Positive (output high level upon active logic) 1: Negative (output high level upon active logic)
bit0: OCZ output logic
Bit1: Z output logic
Bit2: A/B output logic

H18.07 Position comparison start point

Address:	2018-08h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1–40

Description

Set position comparison start point.

H18.08 Position comparison end point

Address:	2018-09h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1–40

Description

Set position comparison end point.

H18.09 Current state of position comparison

Address:	2018-0Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1024	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–1024

Description

Display current state of position comparison.

H18.10 Real-time position of position comparison

Address:	2018-0Bh	Effective mode:	-
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648–2147483647

Description

Display the real-time position of position comparison.

H18.12 Zero offset of position comparison

Address:	2018-0Dh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

Set the zero offset of position comparison.

H18.14 Position comparison output delay compensation

Address:	2018-0Fh	Effective mode:	Upon the next power-on
Min.:	-12.00	Unit:	μs
Max.:	12.00	Data Type:	Int16
Default:	0.00	Change:	Real-time

Value Range:

-12.00μs to 12.00μs

Description

Compensates the delay caused by hardware signal output.

H18.15 Fixed cyclic comparison

Address:	2018-10h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1–65535

Description

Set fixed cyclic comparison.

H18.16 ABZ output function setting

Address:	2018-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: OCZ output function
0: Frequency-division output
1: Position comparison
bit1: Z port output function
0: Frequency-division output
1: Position comparison
bit2: A/B port output function
0: Frequency-division output
1: Position comparison

Description

Set ABZ output function.
bit0: OCZ (0: Frequency-division output; 1: Position comparison)
bit1: Z (0: Frequency-division output; 1: Position comparison)
bit2: A/B (0: Frequency-division output; 1: Position comparison)

H18.17 Number of fixed mode cycles

Address:	2018-12h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Set the number of fixed mode cycles.

21.23H19 Target Position Parameters

H19.00 Target value of position comparison 1

Address:	2019-01h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

Set the target value of position comparison 1.

H19.02 Attribute value of position comparison 1

Address:	2019-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" comparison point

bit1: Current position changes from "more than" to "less than" comparison point

bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

Attribute setting of position comparison point 1

Bit0: 1: Current position changes from "less than" to "more than" the comparison point; 0: N/A

Bit0: 1: Current position changes from "more than" to "less than" the comparison point; 0: N/A

Bit2 to bit6: NA

Bit7: 1: DO1 output enabled; 0: N/A

Bit8: 1: DO2 output enabled; 0: N/A

Bit9: 1: DO3 output enabled; 0: N/A

Bit10: 1: DO4 output enabled; 0: N/A

Bit11: 1: DO5 output enabled; 0: N/A

Bit12: 1: Frequency-division A output enabled; 0: N/A

Bit13: 1: Frequency-division B output enabled; 0: N/A

Bit14: 1: Frequency-division C output enabled; 0: N/A

Bit15: 1: Frequency-division OCZ output enabled; 0: N/A

H19.03 Target value of position comparison 2

Address:	2019-04h	Effective mode:	Real time

Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.05 Attribute value of position comparison 2

Address:	2019-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point

bit2: Reserved

bit3: Reserved

bit4: Reserved

bit5: Reserved

bit6: Reserved

bit7: DO1 output

bit8: DO2 output

bit9: DO3 output

bit10: DO4 output

bit11: DO5 output

bit12: Frequency-division A output

bit13: Frequency-division B output

bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

H19.06 Target value of position comparison 3

Address:	2019-07h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See H19.00.

H19.08 Attribute value of position comparison 3

Address:	2019-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output
Description
See H19.02.

H19.09 Target value of position comparison 4

Address:	2019-0Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 –2147483647
Description
See H19.00.

H19.11 Attribute value of position comparison 4

Address:	2019-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.12 Target value of position comparison 5

Address:	2019-0Dh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.14 Attribute value of position comparison 5

Address:	2019-0Fh	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.15 Target value of position comparison 6

Address:	2019-10h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.17 Attribute value of position comparison 6

Address:	2019-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.18 Target value of position comparison 7

Address:	2019-13h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.20 Attribute value of position comparison 7

Address:	2019-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved

bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.21 Target value of position comparison 8

Address:	2019-16h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.23 Attribute value of position comparison 8

Address:	2019-18h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved

bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.24 Target value of position comparison 9

Address:	2019-19h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.26 Attribute value of position comparison 9

Address:	2019-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output

bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.27 Target value of position comparison 10

Address:	2019-1Ch	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.29 Attribute value of position comparison 10

Address:	2019-1Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.30 Target value of position comparison 11

Address:	2019-1Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.32 Attribute value of position comparison 11

Address:	2019-21h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.33 Target value of position comparison 12

Address:	2019-22h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-

Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.35 Attribute value of position comparison 12

Address:	2019-24h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.36 Target value of position comparison 13

Address:	2019-25h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.38 Attribute value of position comparison 13

Address:	2019-27h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.39 Target value of position comparison 14

Address:	2019-28h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.41 Attribute value of position comparison 14

Address:	2019-2Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.42 Target value of position comparison 15

Address:	2019-2Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.44 Attribute value of position comparison 15

Address:	2019-2Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved

bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.45 Target value of position comparison 16

Address:	2019-2Eh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.47 Attribute value of position comparison 16

Address:	2019-30h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output

bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.48 Target value of position comparison 17

Address:	2019-31h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.50 Attribute value of position comparison 17

Address:	2019-33h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

H19.51 Target value of position comparison 18

Address:	2019-34h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.53 Attribute value of position comparison 18

Address:	2019-36h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.54 Target value of position comparison 19

Address:	2019-37h	Effective mode:	Real time

Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.56 Attribute value of position comparison 19

Address:	2019-39h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.57 Attribute value of position comparison 20

Address:	2019-3Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

-2147483648~2147483647

Description

See H19.00.

H19.59 **Attribute value of position comparison 20**

Address:	2019-3Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.60 **Target value of position comparison 21**

Address:	2019-3Dh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.62 **Attribute value of position comparison 21**

Address:	2019-3Fh	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.63 Target value of position comparison 22

Address:	2019-40h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.65 Attribute value of position comparison 22

Address:	2019-42h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.66 Target value of position comparison 23

Address:	2019-43h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.68 Attribute value of position comparison 23

Address:	2019-45h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output

bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.69 Target value of position comparison 24

Address:	2019-46h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.71 Attribute value of position comparison 24

Address:	2019-48h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description
See H19.02.

H19.72 Target value of position comparison 25

Address:	2019-49h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See H19.00.

H19.74 Attribute value of position comparison 25

Address:	2019-4Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output
Description
See H19.02.

H19.75 Target value of position comparison 26

Address:	2019-4Ch	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.77 Attribute value of position comparison 26

Address:	2019-4Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.78 Target value of position comparison 27

Address:	2019-4Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.80 Attribute value of position comparison 27

Address:	2019-51h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.81 Target value of position comparison 28

Address:	2019-52h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.83 Attribute value of position comparison 28

Address:	2019-54h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.84 Target value of position comparison 29

Address:	2019-55h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.86 Attribute value of position comparison 29

Address:	2019-57h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.87 Target value of position comparison 30

Address:	2019-58h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.89 Attribute value of position comparison 30

Address:	2019-5Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved

bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.90 Target value of position comparison 31

Address:	2019-5Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.92 Attribute value of position comparison 31

Address:	2019-5Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output

bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output
Description
See H19.02.

H19.93 Target value of position comparison 32

Address:	2019-5Eh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See H19.00.

H19.95 Attribute value of position comparison 32

Address:	2019-60h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output

bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.96 Target value of position comparison 33

Address:	2019-61h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.98 Attribute value of position comparison 33

Address:	2019-63h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.99 Target value of position comparison 34

Address:	2019-64h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.101 Attribute value of position comparison 34

Address:	2019-66h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.102 Target value of position comparison 35

Address:	2019-67h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-

Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.104 Attribute value of position comparison 35

Address:	2019-69h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.105 Target value of position comparison 36

Address:	2019-6Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.107 Attribute value of position comparison 36

Address:	2019-6Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output
Description
See H19.02.

H19.108 Target value of position comparison 37

Address:	2019-6Dh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See H19.00.

H19.110 Attribute value of position comparison 37

Address:	2019-6Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point

bit2: Reserved

bit3: Reserved

bit4: Reserved

bit5: Reserved

bit6: Reserved

bit7: DO1 output

bit8: DO2 output

bit9: DO3 output

bit10: DO4 output

bit11: DO5 output

bit12: Frequency-division A output

bit13: Frequency-division B output

bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

H19.111 Target value of position comparison 38

Address:	2019-70h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.113 Attribute value of position comparison 38

Address:	2019-72h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.114 Target value of position comparison 39

Address:	2019-73h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.116 Attribute value of position comparison 39

Address:	2019-75h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved

bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.117 Target value of position comparison 40

Address:	2019-76h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.119 Attribute value of position comparison 40

Address:	2019-78h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: DO1 output
bit8: DO2 output
bit9: DO3 output
bit10: DO4 output
bit11: DO5 output
bit12: Frequency-division A output

bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output
Description
See H19.02.

21.24H1F Software Parameters

H1F.90 DI function status 1 read through communication

Address:	201F-5Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Bit 0 corresponds to DI function 1.
Bit 1 corresponds to DI function 2.
Bit 2 corresponds to DI function 3.
…
By analogy

H1F.91 DI function status 2 read through communication

Address:	201F-5Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Bit 0 corresponds to DI function 17.
Bit 1 corresponds to DI function 18.
Bit 2 corresponds to DI function 19.
…
By analogy

H1F.92 DI function status 3 read through communication

Address:	201F-5Dh	Effective mode:	-

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Bit 0 corresponds to DI function 33.

Bit 1 corresponds to DI function 34.

Bit 2 corresponds to DI function 35.

…

By analogy

H1F.93 DI function status 4 read through communication

Address:	201F-5Eh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Bit 0 corresponds to DI function 49.

Bit 1 corresponds to DI function 50.

Bit 2 corresponds to DI function 51.

…

By analogy

H1F.94 DO function status 1 read through communication

Address:	201F-5Fh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Bit 0 corresponds to DO function 1.

Bit 1 corresponds to DO function 2.

Bit 2 corresponds to DO function 3.

…

By analogy

H1F.95 DO function status 2 read through communication

Address:	201F-60h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Bit 0 corresponds to DO function 17.

Bit 1 corresponds to DO function 18.

Bit 2 corresponds to DO function 19.

…

By analogy

21.25H21 Current Loop Gain Switchover Parameters

H21.00 Current loop gain switchover

Address:	2021-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No operation

1: Enabled

Description

Used to enable or disable the current loop gain switchover function.

0: No operation, turned off

1: Enabled, turned on

21.26H22 Technology Segment Parameters

H22.00 Process segment command trigger

Address:	2022-01h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 –1000

Description

Used to trigger the process segment. The process segment can be triggered through the keypad or communication.
The homing function is triggered when 0 is written to H22.00.
Process segments 1 to 15 are triggered when 1 to 15 are written to H22.00.
The process segment pauses when 1000 is written to H22.00.
E126.0 (Process segment number error) will be reported when 16 to 999 are written to H22.00.

H22.01 Process segment triggered by the event rising edge

Address:	2022-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–65535
Description
DI: ProceEvTri (OFF to ON, rising edge-triggered).
0–3bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri1 rising edge. When its value is 1–15, DI is triggered: Process segment 1–15 is executed during ProceEvTri1 rising edge.
4–7bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri2 rising edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri2 rising edge.
8–11bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri3 rising edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri3 rising edge.
12–15bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri4 rising edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri4 rising edge.

H22.02 Process segment triggered by the event falling edge

Address:	2022-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0-65535
Description

DI: ProceEvTri (ON to OFF, falling edge-triggered).
0–3bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri1 falling edge. When its value is 1–15, DI is triggered: Process segment 1–15 is executed during ProceEvTri1 falling edge.
4–7bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri2 falling edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri2 falling edge.
8–11bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri3 falling edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri3 falling edge.
12–15bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri4 falling edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri4 falling edge.

H22.03 Acceleration/Deceleration time upon technology segment pause

Address:	2022-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Acceleration/Deceleration time
1: Acceleration/Deceleration time 1
2: Acceleration/Deceleration time 2
3: Acceleration/Deceleration time 3
4: Acceleration/Deceleration time 4
5: Acceleration/Deceleration time 5
6: Acceleration/Deceleration time 6
7: Acceleration/Deceleration time 7

Description

When the process segment is paused, the motor ramps to stop based on the deceleration time defined by H22.03. Setpoints 0 to 7 correspond to parameters H22.35 to H22.42.
0: Acceleration/Deceleration time
1: Acceleration/Deceleration time 1
2: Acceleration/Deceleration time 2
3: Acceleration/Deceleration time 3
4: Acceleration/Deceleration time 4
5: Acceleration/Deceleration time 5
6: Acceleration/Deceleration time 6
7: Acceleration/Deceleration time 7

H22.04 Positive software position limit

Address:	2022-05h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit

Max.:	2147483647	Data Type:	Int32
Default:	2147483647	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

E956.0 can occur when the motor operates forwardly with position reference exceeding the setpoint of H22.04 during positioning in the process segment mode.

H22.06 Negative software position limit

Address:	2022-07h	Effective mode:	Real time
Min.:	-2147483648		
Max.:	2147483647	Unit:	Reference unit
Default:	-2147483648	Data Type:	Int32
Value Range:		Change:	Real-time

-2147483648 to 2147483647

Description

E958.0 can occur when the motor operates reversely with position reference exceeding the setpoint of H22.06 during positioning in the process segment mode.

H22.08 Process segment number

Address:	2022-09h	Effective mode:	-
Min.:	0		
Max.:	65535	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	At stop

0-65535

Description

Indicates the process segment number in progress in the process segment mode.

H22.09 Process segment function switch

Address:	2022-0Ah	Effective mode:	Real time
Min.:	0		
Max.:	65535	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	At stop

0-65535

Description

bit0：

0: Keep interrupt positioning state
1: Exit interrupt positioning state when triggering technology segment

H22.10 Process segment state

Address:	2022-0Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Used for process segment state feedback.

The process segment number will be read back when commands in the positioning mode are not done executing.

The process segment number + 10000 will be read back when commands in the positioning mode are done executing.

The process segment number + 20000 will be read back when commands in the positioning mode are done executing and positioning has been completed.

H22.19 Target speed

Address:	2022-14h	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	50.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

Eight groups of target speed are available for each process segment command.

Target speed refers to the constant operating speed when the motor is not in the acceleration/deceleration process. If the displacement is too small in the positioning mode, the actual motor speed will be lower than the setpoint of H22.19.

H22.20 Target speed 1

Address:	2022-15h	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	200.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.21 Target speed 2

Address:	2022-16h	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	500.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.22 Target speed 3

Address:	2022-17h	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	1000.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.23 Target speed 4

Address:	2022-18h	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	1500.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.24 Target speed 5

Address:	2022-19h	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	2000.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.25 Target speed 6

Address:	2022-1Ah	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	2500.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.26 Target speed 7

Address:	2022-1Bh	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	3000.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.35 Accel/Decel time

Address:	2022-24h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Eight groups of acceleration/deceleration time are available for each process segment command.

Acceleration/Deceleration time refers to the time for the motor to change from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed.

H22.36 Acceleration/Deceleration time 1

Address:	2022-25h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

0 ms–65535 ms

Description
See H22.35.

H22.37 Acceleration/Deceleration time 2

Address:	2022-26h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.35.

H22.38 Acceleration/Deceleration time 3

Address:	2022-27h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	1000	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.35.

H22.39 Acceleration/Deceleration time 4

Address:	2022-28h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	1500	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.35.

H22.40 Acceleration/Deceleration time 5

Address:	2022-29h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	2000	Change:	Real-time

Value Range:
0 ms–65535 ms

Description
See H22.35.

H22.41 Acceleration/Deceleration time 6

Address:	2022-2Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	2500	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.35.

H22.42 Acceleration/Deceleration time 7

Address:	2022-2Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.35.

H22.51 Delay after completion of the process segment

Address:	2022-34h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Eight groups of delay time are available for each process segment command. The delay time refers to the delay that starts from the end of current command to the operation of the next command in the process segment. See section Process Segment Function.

H22.52 Delay time 1 after completion of the process segment

Address:	2022-35h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16

Default:	50	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.51.

H22.53 Delay time 2 after completion of the process segment

Address:	2022-36h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.51.

H22.54 Delay time 3 after completion of the process segment

Address:	2022-37h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.51.

H22.55 Delay time 4 after completion of the process segment

Address:	2022-38h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	1000	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.51.

H22.56 Delay time 5 after completion of the process segment

Address:	2022-39h	Effective mode:	Real time

Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	1500	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.51.

H22.57 Delay time 6 after completion of the process segment

Address:	2022-3Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	2000	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.51.

H22.58 Delay time 7 after completion of the process segment

Address:	2022-3Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.51.

H22.70 Process segment homing mode

Address:	2022-47h	Effective mode:	Real time
Min.:	-32768	Unit:	-
Max.:	32767	Data Type:	Int16
Default:	-2	Change:	Real-time

Value Range:
-32768–32767
Description
Defines the default motor direction of rotation, deceleration point, and home during homing.
When H22.70 is set to a value from -2 to 35, 402 homing is used (6098h = -2...35). See section "Homing Function" in SV680P Series Servo Drive Function Guide for details.
When H22.70 is set to a value lower than or equal to -200, local homing is used (H22.70 = -200 + H05.31). See section "Homing Function" in SV680P Series Servo Drive Function Guide for details.

H22.71 Speed of high-speed search for home switch signal

Address:	2022-48h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	3000	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–3000[mm/s]/[rpm]

Description

Defines the motor speed for searching for the deceleration point signal during homing.

H22.72 Speed of low-speed search for home switch signal

Address:	2022-49h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–1000[mm/s]/[rpm]

Description

Defines the motor speed for searching for the home signal during homing.

H22.73 Acceleration/Deceleration time during homing

Address:	2022-4Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	1000	Change:	Real-time

Value Range:

0 ms–1000 ms

Description

Defines the time for the motor to accelerate from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed during homing.

H22.74 Home search time limit

Address:	2022-4Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10000	Change:	Real-time

Value Range:

0 ms–65535 ms

Description
Defines the maximum homing time.

H22.75 Mechanical home offset

Address:	2022-4Ch	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
Defines the absolute position of the motor after homing.

H22.79 Relative/Absolute homing

Address:	2022-50h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–65535
Description
Defines the offset relationship between the mechanical home and mechanical zero point, and the action upon overtravel during homing.

H22.83 Jump count threshold

Address:	2022-54h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–65534
Description
Eight jump count thresholds are provided for each process segment command. Jump count threshold: There are two jump process segments for the jump command. When the cumulative number of jumps executed by the jump command is lower than the jump count threshold, you will jump to process segment A, otherwise jump to process segment B. For details, see section 2.2.

H22.84 Jump count threshold 1

Address:	2022-55h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:
0–65534
Description

H22.85 Jump count threshold 2

Address:	2022-56h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	40	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

H22.86 Jump count threshold 3

Address:	2022-57h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	80	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

H22.87 Jump count threshold 4

Address:	2022-58h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	160	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

H22.88 Jump count threshold 5

Address:	2022-59h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	320	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

H22.89 Jump count threshold 6

Address:	2022-5Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	640	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

H22.90 Jump count threshold 7

Address:	2022-5Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	1280	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

21.27H23 Technology Segment

H23.00 Definition of homing

Address:	2023-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295

Description

For details about this parameter, see section 2.2.3 Homing Mode in SV680P Series Servo Drive Function Guide.

H23.02 Homing data

Address:	2023-03h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

Not used.

H23.04 Definition of process segment 1

Address:	2023-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0–4294967295

Description

bit0 to bit3: Mode (process segment operation mode option)

Mode = 1: The fixed speed mode applies.Mode = 2: The positioning mode applies, which stops after positioning is done. Mode = 3: The next segment is executed automatically after positioning is done. Mode = 7: The jump mode applies, which is used to jump to the designated process segment. Mode = 8: The parameter-write mode applies, which allows you to write specific parameters.

For details on each mode, see section 2.2.4 in the SV680P Series Servo Drive Function Guide.

H23.06 Data of process segment 1

Address:	2023-07h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

Different modes selected in process segment 1 correspond to different process segment data. For details on each mode, see section 2.2.4 of the SV680P Series Servo Drive Function Guide.

H23.08 **Definition of process segment 2**

Address:	2023-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.10 **Data of process segment 2**

Address:	2023-0Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.12 **Definition of process segment 3**

Address:	2023-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.14 **Data of process segment 3**

Address:	2023-0Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.16 **Definition of process segment 4**

Address:	2023-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.18 **Data of process segment 4**

Address:	2023-13h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.20 **Definition of process segment 5**

Address:	2023-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.22 **Data of process segment 5**

Address:	2023-17h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.24 Definition of process segment 6

Address:	2023-19h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.26 Data of process segment 6

Address:	2023-1Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.28 Definition of process segment 7

Address:	2023-1Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.30 Data of process segment 7

Address:	2023-1Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.32 **Definition of process segment 8**

Address:	2023-21h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.34 **Data of process segment 8**

Address:	2023-23h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.36 **Definition of process segment 9**

Address:	2023-25h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.38 **Data of process segment 9**

Address:	2023-27h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.40 Definition of process segment 10

Address:	2023-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0–4294967295

Description

See definition of technology segment 1.

H23.42 Data of process segment 10

Address:	2023-2Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See that of technology segment 1.

H23.44 Definition of process segment 11

Address:	2023-2Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0–4294967295

Description

H23.46 Data of process segment 11

Address:	2023-2Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See that of technology segment 1.

H23.48 Definition of process segment 12

Address:	2023-31h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.50 Data of process segment 12

Address:	2023-33h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.52 Definition of process segment 13

Address:	2023-35h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.54 Data of process segment 13

Address:	2023-37h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.56 Definition of process segment 14

Address:	2023-39h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.58 Data of process segment 14

Address:	2023-3Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.60 Definition of process segment 15

Address:	2023-3Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.62 Data of process segment 15

Address:	2023-3Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

21.28H30 Related Variables Read through Communication

H30.00 Servo state read via communication

Address:	2030-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Displays the current running state of the drive to be communicated to the software.

H30.01 DO function status 1 read through communication

Address:	2030-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Bit 0 corresponds to DO function 1.

Bit 1 corresponds to DO function 2.

Bit 2 corresponds to DO function 3.

…

By analogy

H30.02 DO function status 2 read through communication

Address:	2030-03h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Bit 0 corresponds to DO function 17.

Bit 1 corresponds to DO function 18.

Bit 2 corresponds to DO function 19.

…

By analogy

H30.03 Input pulse reference sampling value read through communication

Address:	2030-04h	Effective mode:	-

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display the input pulse reference sampling value.

H30.16 1st encoder communication timeout count

Address:	2030-11h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

It indicates the total number of communication timeout errors of the first encoder after the latest power-on.

H30.17 1st encoder communication CRC error count

Address:	2030-12h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

It indicates the total number of communication CRC errors of the first encoder after the latest power-on.

H30.18 1st encoder communication frame stop bit error count

Address:	2030-13h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

It indicates the total number of communication frame stop bit errors of the encoder after the latest power-on.

21.29H31 Communication Setting

H31.00 VDI virtual level set through communication

Address:	2031-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

When H17.90 is set to 1, the VDI state is defined by this parameter.

The VDI logic is determined by H17.91 (Default VDI virtual level value upon power-on) upon initial power-on. Then, H31.00 is determined by the VDI logic. "bit(n) = 1" of H31.00 indicates the logic of VDI (n+1) is "1". "bit(n)=0" indicates the logic of VDI (n+1) is "0".

H31.01 Frequency-division output frequency set through communication

Address:	2031-02h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	16000000	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 Hz–16000000 Hz

Description

When H05.38 is set to 4, H31.01 sets the frequency of the frequency division output port.

H31.04 DO status set through communication

Address:	2031-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

Sets DO output status.

H31.05 AO status set through communication

Address:	2031-06h	Effective mode:	Real time
Min.:	-10000	Unit:	mV
Max.:	10000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-10000 mV–10000 mV

Description

Set H04.50 to 10 to define AO through H31.05 (in mV).

H31.09 Speed reference set through communication

Address:	2031-0Ah	Effective mode:	Real time
Min.:	-9999.000	Unit:	[mm/s]/[rpm]
Max.:	9999.000	Data Type:	Int32
Default:	0.000	Change:	Real-time

Value Range:

-9999.000[mm/s]/[rpm]–9999.000[mm/s]/[rpm]

Description

Set H06.02 to 4 to define the speed reference in the speed control mode (unit: 0.001 [mm/s]/[rpm]).

H31.11 Torque reference set through communication

Address:	2031-0Ch	Effective mode:	Real time
Min.:	-100.000	Unit:	%
Max.:	100.000	Data Type:	Int32
Default:	0.000	Change:	Real-time

Value Range:

-100.000% to 100.000%

Description

Set H07.02 to 4 to define the torque reference in the torque control mode through this parameter (unit: 0.001%). The setpoint 100.000% corresponds to the rated torque of the motor.

21.30 H32 Direct Drive Parameters

H32.00 Encoder interpolator mismatch alarm (E124)

Address:	2032-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

The T2 interpolator matches the HipeFace encoder. The power-on check switch is turned on by default.

0: Disabled

1: Enabled

H32.01 Encoder interface switchover switch

Address:	2032-02h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Default encoder interface

1: Switching encoder interface

Description

Encoder interface

0: Default encoder interface

1: Switching encoder interface

H32.02 Angle auto-tuning upon power-on

Address:	2032-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Angle auto-tuning starts after the drive switches to the rdy state and the time (in seconds) defined by H32.41 elapses.

0: Disabled

1: Enabled

H32.03 Angle auto-tuning switch controlled by control word

Address:	2032-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Control word 6

2: Control word 7

Description

Used to enable the angle auto-tuning switchover switch through the control word.

0: Disabled

1: Control word 6

2: Control word 7

H32.04 Angle auto-tuning state

Address:	2032-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

bit0: bit7 of 6041

bit1: E602.9

Description

Display an alarm or status bit when the incremental encoder is not angle auto-tuned.

Bit0: bit7 of 6041

Bit1: E602.9

H32.05 Pre-positioning retract selection

Address:	2032-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Used to retract by a certain distance after auto-tuning through pre-positioning is done.

0: Disabled

1: Enabled

H32.06 Position feedback

Address:	2032-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Used to align the position feedback to the position before angle auto-tuning for incremental encoders.

0: Disabled

1: Enabled

H32.07 Incremental homing method

Address:	2032-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	9	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Z Signal short circuit

1: Only first short circuit

Description

Set Z signal of the increment encoder during Z signal homing.

0: Z Signal short circuit

1: Only first short circuit

Note: The width of the Z signal is set based on H32.08.

H32.08 Homing signal width

Address:	2032-09h	Effective mode:	Real time
Min.:	100	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	800	Change:	At stop

Value Range:

100–65535

Description

The setpoint is active after the position is latched by Z signal.

H32.10 Max. reference current in angle auto-tuning through inching

Address:	2032-0Bh	Effective mode:	At stop
Min.:	10.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:

10.0% to 300.0%

Description

Defines the maximum reference current during auto-tuning.

H32.13 Motor operation threshold (ROT/DDR) in angle auto-tuning through inching

Address:	2032-0Eh	Effective mode:	At stop
Min.:	0.001	Unit:	deg
Max.:	20.000	Data Type:	UInt16
Default:	0.200	Change:	At stop

Value Range:

0.001deg to 20.000deg

Description

Sets motor operation threshold for position lock angle auto-tuning.

Usually no change is required. If you have special requirements for the operation range, you can adjust this parameter accordingly. The smaller the value, the smaller the operation range during auto-tuning, but the greater the auto-tuning error.

H32.14 Motor standstill threshold (ROT/DDR) in angle auto-tuning through inching

Address:	2032-0Fh	Effective mode:	At stop
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

The smaller the

Value Range:

0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.15 Motor operation threshold (DDL) in angle auto-tuning through inching

Address:	2032-10h	Effective mode:	At stop
Min.:	0.001	Unit:	mm
Max.:	20.000	Data Type:	UInt16
Default:	0.200	Change:	At stop

Value Range:

0.001 millimeters–20.000 millimeters

Description

Sets motor operation threshold for position lock angle auto-tuning.

Usually no change is required. If you have special requirements for the operation range, you can adjust this parameter accordingly. The smaller the value, the smaller the operation range during auto-tuning, but the greater the auto-tuning error.

H32.16 Motor standstill threshold (DDL) in angle auto-tuning through inching

Address:	2032-11h	Effective mode:	At stop
Min.:	0.1	Unit:	mm/s

Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:

0.1 mm/s–100.0 mm/s

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.18 Motor standstill threshold for inching angle auto-tuning

Address:	2032-13h	Effective mode:	At stop
Min.:	0.1	Unit:	s
Max.:	10.0	Data Type:	UInt16
Default:	0.5	Change:	At stop

Value Range:

0.1s to 10.0s

Description

Sets motor standstill threshold for auto-tuning. Usually no change is required.

H32.20 Max. reference current in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-15h	Effective mode:	At stop
Min.:	10.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:

10.0% to 300.0%

Description

Defines the maximum reference current during auto-tuning.

H32.22 Electrical angle reference in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-17h	Effective mode:	At stop
Min.:	0.0	Unit:	deg
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0deg to 360.0deg

Description

Defines the electrical angle during auto-tuning through pre-positioning.

H32.23 Electrical angle reference change range in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-18h	Effective mode:	At stop
Min.:	10.0	Unit:	deg
Max.:	170.0	Data Type:	UInt16
Default:	90.0	Change:	At stop

Value Range:

10.0deg to 170.0deg

Description

H32.24 Motor stop threshold (ROT/DDR) in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-19h	Effective mode:	At stop
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:

0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.25 Motor stop threshold (DDL) in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-1Ah	Effective mode:	At stop
Min.:	0.1	Unit:	mm/s
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:

0.1 mm/s–100.0 mm/s

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.26 Damping in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-1Bh	Effective mode:	At stop
Min.:	0.00	Unit:	[N/(m/s)]/[N·m/rpm]
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	At stop

Value Range:

0.00[N/(m/s)]/[N·m/rpm]–655.35[N/(m/s)]/[N·m/rpm]

Description

Sets the damping coefficient for motor auto-tuning. The appropriate coefficient ensures a smooth and impact-free operation.

(1) This coefficient is usually related to the load characteristics. Larger load requires a larger coefficient.
(2) When the coefficient is too small, the auto-tuning process may be prone to strong impact, which is normal. When it is too large, motor operation may be sluggish or even stops, which is also normal and a timeout alarm will be raised.

H32.29 Motor standstill threshold for close-loop pre-positioning angle auto-tuning

Address:	2032-1Eh	Effective mode:	At stop
Min.:	0.1	Unit:	s
Max.:	10.0	Data Type:	UInt16
Default:	0.5	Change:	At stop

Value Range:
0.1s to 10.0s
Description
Sets motor standstill threshold for auto-tuning. Usually no change is required.

H32.30 Max. reference current in angle auto-tuning through position lock

Address:	2032-1Fh	Effective mode:	At stop
Min.:	10.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:
10.0% to 300.0%
Description
Defines the maximum reference current during auto-tuning.

H32.33 Motor operation threshold (ROT/DDR) in angle auto-tuning through position lock

Address:	2032-22h	Effective mode:	At stop
Min.:	0.001	Unit:	deg
Max.:	20.000	Data Type:	UInt16
Default:	0.200	Change:	At stop

Value Range:
0.001deg to 20.000deg
Description
Sets motor operation threshold for position lock angle auto-tuning.
Usually no change is required. If you have special requirements for the operation range, you can adjust this parameter accordingly. The smaller the value, the smaller the operation range during auto-tuning, but the greater the auto-tuning error.

H32.34 Motor standstill threshold (ROT/DDR) in angle auto-tuning through position lock

Address:	2032-23h	Effective mode:	At stop
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:

0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.35 Motor operation threshold (DDL) in angle auto-tuning through position lock

Address:	2032-24h	Effective mode:	At stop
Min.:	0.001	Unit:	mm
Max.:	20.000	Data Type:	UInt16
Default:	0.200	Change:	At stop

Value Range:

0.001 millimeters–20.000 millimeters

Description

Sets motor operation threshold for position lock angle auto-tuning.
Usually no change is required. If you have special requirements for the operation range, you can adjust this parameter accordingly. The smaller the value, the smaller the operation range during auto-tuning, but the greater the auto-tuning error.

H32.36 Motor standstill threshold (DDL) in angle auto-tuning through position lock

Address:	2032-25h	Effective mode:	At stop
Min.:	0.1	Unit:	mm/s
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:

0.1 mm/s–100.0 mm/s

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.37 Angle gain in angle auto-tuning through position lock

Address:	2032-26h	Effective mode:	At stop
Min.:	0	Unit:	deg/(p/s)
Max.:	10000	Data Type:	UInt16
Default:	1000	Change:	At stop

Value Range:

0deg/(p/s)–10000deg/(p/s)

Description

Defines the angle gain during auto-tuning. A proper setpoint improves the auto-tuning angle accuracy. The default value applies to most of applications.

H32.38 Inertia ratio in angle auto-tuning through position lock

Address:	2032-27h	Effective mode:	At stop
Min.:	0.00	Unit:	-
Max.:	120.00	Data Type:	UInt16
Default:	0.00	Change:	At stop

Value Range:

0.00–120.00

Description

Sets the inertia ratio gain for auto-tuning. A proper value can ensure smooth and jitter-free operation and reduce the operation range.

(1) This coefficient is usually related to the load characteristics. You can just set it to the actual inertia ratio.

(2) A small value may lead to long movement during auto-tuning, which is a normal phenomenon. A large value may lead to gain mismatch oscillation.

H32.39 Gain class in angle auto-tuning through position lock

Address:	2032-28h	Effective mode:	At stop
Min.:	4	Unit:	level
Max.:	31	Data Type:	UInt16
Default:	16	Change:	At stop

Value Range:

4level to 31level

Description

Defines the loop stiffness level gain for auto-tuning. A proper value can ensure smooth and jitter-free operation and reduce the operation range.

(1) A small value may lead to long movement during auto-tuning, which is a normal phenomenon. A large value may lead to gain mismatch oscillation.

H32.40 Left/Right limit function

Address:	2032-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

1. Left limit being positive
2. Left limit being negative

Description

Enables the left and right limit function for the motor.
1. Left limit being positive
2. Left limit being negative

H32.41 Angle auto-tuning delay after power-on

Address:	2032-2Ah	Effective mode:	Real time
Min.:	0	Unit:	s
Max.:	65535	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:
0s to 65535s
Description
Used to set automatic angle auto-tuning delay upon power-on.

H32.45 Black box channel 21 function

Address:	2032-2Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Real-time target speed (607Ah)
1: Electric angle
Description
Select the black box channel 21 function.
0: Real-time target speed (607Ah)
1: Electric angle

H32.50 32-bit range compatibility

Address:	2032-33h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0–99
Description
32-bit range compatibility.

H32.53 Motor standstill threshold for position lock angle auto-tuning

Address:	2032-36h	Effective mode:	At stop
Min.:	0.1	Unit:	s
Max.:	10.0	Data Type:	UInt16
Default:	0.5	Change:	At stop

Value Range:
0.1s to 10.0s
Description
Sets motor standstill threshold for auto-tuning. Usually no change is required.

H32.54 Hall auto-tuning selection

Address:	2032-37h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
When this parameter is enabled, the Hall auto-tuning will be started automatically after basic angle auto-tuning is done.

H32.55 Hall signal UVW manual adjustment

Address:	2032-38h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–7
Description
Set Hall level state.

H32.56 UVW filter time of Hall signal

Address:	2032-39h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	10	Data Type:	UInt16
Default:	5	Change:	Real-time

Value Range:
0 ms–10 ms
Description
Set UVW filter time of Hall signal.

H32.57 Hall closed-loop locked-rotor speed

Address:	2032-3Ah	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	65535	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0[mm/s]/[rpm]–65535[mm/s]/[rpm]

Description

Set the Hall closed loop angle auto-tuning locked-rotor speed.

H32.58 Hall closed-loop locked-rotor current

Address:	2032-3Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	120.0	Change:	At stop

Value Range:

0.0% to 300.0%

Description

Set the Hall closed loop angle auto-tuning locked-rotor current.

H32.59 Hall closed-loop locked-rotor window time

Address:	2032-3Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	2000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

0 ms–2000 ms

Description

Set the Hall closed loop angle auto-tuning locked-rotor window time.

H32.60 Hall closed-loop inertia ratio

Address:	2032-3Dh	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	120.00	Data Type:	UInt16
Default:	0.00	Change:	At stop

Value Range:

0.00–120.00

Description

Set the Hall closed loop angle auto-tuning Inertia ratio.

H32.61 Hall closed-loop rigidity

Address:	2032-3Eh	Effective mode:	Real time
Min.:	4	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	16	Change:	At stop

Value Range:

4–31

Description

Set the Hall closed loop angle auto-tuning rigidity level.

H32.62 Electrical angle save flag

Address:	2032-3Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

Automatic reset will be performed after the electrical angle is saved when dynamic Hall auto-tuning is done.

H32.63 Hall1 electric angle

Address:	2032-40h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall1 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.64 Hall2 electric angle

Address:	2032-41h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall2 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.65 Hall3 electric angle

Address:	2032-42h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall3 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.66 Hall4 electric angle

Address:	2032-43h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall4 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.67 Hall5 electric angle

Address:	2032-44h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall5 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.68 Hall6 electric angle

Address:	2032-45h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall6 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.70 Motor overload protection mode

Address:	2032-47h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Internal motor overload curve
1: External motor overload curve
2: Current limit overload protection
3: Hide motor overload protection

Description

Set motor overload protection mode
0: Internal motor overload curve
1: External motor overload curve
2: Current limit overload protection
3: Hide motor overload protection

H32.73 Thermal threshold current of overload current limit

Address:	2032-4Ah	Effective mode:	Upon the next power-on
Min.:	10.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	115.0	Change:	At stop

Value Range:

10.0% to 750.0%

Description

Thermal limit current is a percentage of motor rated current defaulted to 100%, above which the motor starts to heat continuously. The motor current will be finally maintained at this value.

H32.74 Peak current of overload current limit

Address:	2032-4Bh	Effective mode:	Upon the next power-on
Min.:	100.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	300.0	Change:	At stop

Value Range:

100.0% to 750.0%

Description
Defines the ratio of the peak current that can be reached by the motor to the rated current of the motor.

H32.75 Max. current duration of overload protection

Address:	2032-4Ch	Effective mode:	Real time
Min.:	0.01	Unit:	s
Max.:	655.35	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:
0.01s to 655.35s
Description
Calculate the maximum heat that can be reached by the motor based on the maximum current continuous time, and take this value as the motor overload alarm threshold.

H32.76 Current limit time constant of overload protection

Address:	2032-4Dh	Effective mode:	Real time
Min.:	0.01	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:
0.01–655.35
Description
It is related to the maximum current continuous time. The higher the setpoint, the longer the maximum current continuous time will be.

H32.77 Current limit alarm threshold of overload protection

Address:	2032-4Eh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:
0.0% to 750.0%
Description
If current limit protection is effective, and the limited current is lower than this value, the drive will raise an alarm.

H32.78 Current limit fault threshold of overload protection

Address:	2032-4Fh	Effective mode:	Real time

Min.:	0.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0% to 750.0%

Description

If current limit protection is effective, and the limited current is lower than this value, the drive will report an error.

H32.79 Thermal threshold current of overload

Address:	2032-50h	Effective mode:	Upon the next power-on
Min.:	10.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	115.0	Change:	At stop

Value Range:

10.0% to 750.0%

Description

Set thermal threshold current of overload.

H32.80 Thermal current interval of overload

Address:	2032-51h	Effective mode:	Upon the next power-on
Min.:	0.1	Unit:	%
Max.:	204.8	Data Type:	UInt16
Default:	6.4	Change:	At stop

Value Range:

0.1% to 204.8%

Description

Set the thermal current interval of overload.

H32.81 Overload heat dissipation current interval

Address:	2032-52h	Effective mode:	Upon the next power-on
Min.:	0.1	Unit:	%
Max.:	204.8	Data Type:	UInt16
Default:	6.4	Change:	At stop

Value Range:

0.1% to 204.8%

Description

Set the overload heat dissipation current interval.

H32.82 **Length of overload heat dissipation curve**

Address:	2032-53h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	-
Max.:	200	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1–200
Description
Set the length of overload heat dissipation curve.

H32.83 **Length of overload heat dissipation curve**

Address:	2032-54h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	-
Max.:	200	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1–200
Description
Set the length of overload heat dissipation curve.

21.31H33 Compensation Parameters

H33.00 **Compensation data BUFFER0**

Address:	2033-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER0.

H33.01 **Compensation data BUFFER1**

Address:	2033-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER1.

H33.02 Compensation data BUFFER2

Address:	2033-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER2.

H33.03 Compensation data BUFFER3

Address:	2033-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER3.

H33.04 Compensation data BUFFER4

Address:	2033-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER4.

H33.05 Compensation data BUFFER5

Address:	2033-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description
Set compensation data BUFFER5.

H33.06 Compensation data BUFFER6

Address:	2033-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER6.

H33.07 Compensation data BUFFER7

Address:	2033-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER7.

H33.08 Compensation data BUFFER8

Address:	2033-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER8.

H33.09 Compensation data BUFFER9

Address:	2033-0Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535

Description
Set compensation data BUFFER9.

H33.10 Compensation data BUFFER10

Address:	2033-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER10.

H33.11 Compensation data BUFFER11

Address:	2033-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER11.

H33.12 Compensation data BUFFER12

Address:	2033-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER12.

H33.13 Compensation data BUFFER13

Address:	2033-0Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER13.

H33.14 Compensation data BUFFER14

Address:	2033-0Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER14.

H33.15 Compensation data BUFFER15

Address:	2033-10h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER15.

H33.16 Compensation data BUFFER16

Address:	2033-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER16.

H33.17 Compensation data BUFFER17

Address:	2033-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description
Set compensation data BUFFER17.

H33.18 Compensation data BUFFER18

Address:	2033-13h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER18.

H33.19 Compensation data BUFFER19

Address:	2033-14h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER19.

H33.20 Compensation data BUFFER20

Address:	2033-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER20.

H33.21 Compensation data BUFFER21

Address:	2033-16h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER21.

H33.22 Compensation data BUFFER22

Address:	2033-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER22.

H33.23 Compensation data BUFFER23

Address:	2033-18h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER23.

H33.24 Compensation data BUFFER24

Address:	2033-19h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER24.

H33.25 Compensation data BUFFER25

Address:	2033-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER25.

H33.26 Compensation data BUFFER26

Address:	2033-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER26.

H33.27 Compensation data BUFFER27

Address:	2033-1Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER27.

H33.28 Compensation data BUFFER28

Address:	2033-1Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER28.

H33.29 Compensation data BUFFER29

Address:	2033-1Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER29.

H33.30 Compensation data BUFFER30

Address:	2033-1Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER30.

H33.31 Compensation data BUFFER31

Address:	2033-20h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER31.

H33.32 Compensation data BUFFER32

Address:	2033-21h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER32.

H33.33 Compensation data BUFFER33

Address:	2033-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER33.

H33.34 Compensation data BUFFER34

Address:	2033-23h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER34.

H33.35 Compensation data BUFFER35

Address:	2033-24h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER35.

H33.36 Compensation data BUFFER36

Address:	2033-25h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER36.

H33.37 Compensation data BUFFER37

Address:	2033-26h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description
Set compensation data BUFFER37.

H33.38 Compensation data BUFFER38

Address:	2033-27h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER38.

H33.39 Compensation data BUFFER39

Address:	2033-28h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER39.

H33.40 Current Compensation BUFFER group number

Address:	2033-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Current Compensation BUFFER group number

H33.41 Compensation data sum

Address:	2033-2Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	32767	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–32767
Description
Set compensation data sum.

H33.44 Data command

Address:	2033-2Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0–1
Description
Data command.

H33.45 Data storage position

Address:	2033-2Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0: Servo RAM
1: Servo FLASH
2: Encoder FLASH
Description
Set data storage position
0: Servo RAM
1: Servo FLASH
2: Encoder FLASH

H33.46 Data clear

Address:	2033-2Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–3
Description
Data clear.

H33.47 Software tool write status

Address:	2033-30h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–2

Description

Display software write status: 0 - Idle; 1 - Writing BUFFER; 2 - Writing BUFFER completed

H33.48 Servo read status

Address:	2033-31h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display servo read status: 0 - Idle; 1 - Reading BUFFER; 2 - Reading BUFFER completed

H33.49 Software tool read status

Address:	2033-32h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–2

Description

Display software read status: 0 - Idle; 1 - Reading BUFFER; 2 - Reading BUFFER completed

H33.50 Servo write status

Address:	2033-33h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display servo write status: 0 - Idle; 1 - Writing BUFFER; 2 - Writing BUFFER completed

H33.51 Data transmission completed flag

Address:	2033-34h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–1

Description

Data transmission completed flag.

H33.52 Servo data transfer completed flag

Address:	2033-35h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Servo data transfer completed flag: 0: Uncompleted; 1: Completed

H33.60 Accuracy compensation function

Address:	2033-3Dh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–1

Description

Used to enable accuracy compensation.

H33.61 Accuracy compensation sum

Address:	2033-3Eh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	count
Max.:	2048	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0count to 2048count

Description

Total accuracy compensation points.

H33.62 Starting offset address of accuracy compensation

Address:	2033-3Fh	Effective mode:	Upon the next power-on
Min.:	-21474836.48	Unit:	[mm]/[deg]
Max.:	21474836.47	Data Type:	Int32
Default:	0.00	Change:	At stop

Value Range:

-21474836.48[mm]/[deg]–21474836.47[mm]/[deg]

Description

The direct-drive motor compensation home of incremental encoder is the home of the mechanical system coordinate.

H33.64 Accuracy compensation data interval

Address:	2033-41h	Effective mode:	Upon the next power-on
Min.:	-327.67	Unit:	[mm]/[deg]
Max.:	327.67	Data Type:	Int16
Default:	0.00	Change:	At stop

Value Range:

-327.67[mm]/[deg]–327.67[mm]/[deg]

Description

Interval of adjacent compensation points of accuracy compensation.

H33.65 Accuracy compensation dial phase sequence

Address:	2033-42h	Effective mode:	Upon the next power-on
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	At stop

Value Range:

0x0 to 0xFFFF

Description

Phase sequence record of accuracy compensation dial stage.

H33.66 Accuracy compensation dial reference direction

Address:	2033-43h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–1

Description

Reference direction record of accuracy compensation dial stage.

H33.67 Servo homing completed

Address:	2033-44h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Accuracy compensation homing completion signal.

H33.68 Current acting index of accuracy compensation

Address:	2033-45h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Current compensation position of accuracy compensation.

H33.69 Forced homing start

Address:	2033-46h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–1

Description

Enables accuracy compensation forced homing.

H33.70 Forced homing mode

Address:	2033-47h	Effective mode:	Upon the next power-on
Min.:	-32768	Unit:	-
Max.:	32767	Data Type:	Int16
Default:	-2	Change:	At stop

Value Range:

-32768 32767

Description

Homing mode record of accuracy compensation dial stage.

H33.71 Forced homing at low speed

Address:	2033-48h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

0[mm/s]/[rpm]–1000[mm/s]/[rpm]

Description

Homing speed record of accuracy compensation dial stage.

H33.72 Single-turn absolute position of accuracy compensation home of absolute encoder

Address:	2033-49h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	At stop

Value Range:

0 to 4294967295

Description

Single-turn absolute value of direct-drive motor compensation home of absolute encoder.

H33.74 Min.pulse width of frequency-division output accuracy compensation

Address:	2033-4Bh	Effective mode:	Upon the next power-on
Min.:	2	Unit:	count
Max.:	7	Data Type:	UInt16
Default:	3	Change:	At stop

Value Range:

2count to 7count

Description

Defines the minimum pulse width of accuracy compensation frequency-division output.

H33.75 Accuracy compensation data unit

Address:	2033-4Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16

Default:	0	Change:	At stop

Value Range:

0: [um]/[arcsec]

1: [mm]/[mrad]

Description

Defines the accuracy compensation data unit.

For DDL: 0-um; 1-mm;

For DDR: 0-arcsec; 2-mrad

H33.81 Motor cogging torque ripple compensation sum

Address:	2033-52h	Effective mode:	Real time
Min.:	0	Unit:	count
Max.:	65535	Data Type:	UInt16
Default:	2000	Change:	At stop

Value Range:

0count to 65535count

Description

Motor cogging torque ripple compensation sum

21.32H34 Servo Motor Parameters 2

H34.12 Error type supported by Endat2.2 encoder

Address:	2034-0Dh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

bit0: Light source; bit1: Signal amplitude; bit2: Position; bit3: Overvoltage; bit4: Undervoltage; bit5: Overcurrent; bit6: Battery

H34.13 Alarm types supported by EnDat2.2 encoders

Address:	2034-0Eh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

bit0: Transmission rate too high, bit1: Overtemperature, bit2: Interior light source approaching limit position, bit3: Battery voltage low, bit4: Reference point not reached, bit5: Reserved, bit6: Approaching limit position, bit7: Probe not at position, bit8: Value change too small

H34.14 Error value output by EnDat2.2 encoder

Address:	2034-0Fh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

bit0: Light source; bit1: Signal amplitude; bit2: Position; bit3: Overvoltage; bit4:

H34.15 Alarm value output by EnDat2.2 encoder

Address:	2034-10h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

bit0: Transmission rate too high, bit1: Overtemperature, bit2: Interior light source approaching limit position, bit3: Battery voltage low, bit4: Reference point not reached, bit5: Reserved, bit6: Approaching limit position, bit7: Probe not at position, bit8: Value change too small

21.331000h Object Dictionary

1005h SYNC message COB-ID

Address:	1005h	Effective mode:	Real time
Min.:	0x80	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x80	Change:	Real-time

Value Range:

0x80 to 0xFFFFFFFF

Description

Only 0x80h and 0x40000080h can be written to the SYNC message.
If 0x80h is written, the sync generator does not work.

If 0x40000080h is written, the sync generator is activated.
To activate the sync generator, you must set 1006h to a non-zero value.

1006h **Synchronization cycle**

Address:	1006h	Effective mode:	Real time
Min.:	0	Unit:	µs
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0µs to 2147483647µs
Description
Applicable to the synchronization generator only (unit: us).

100Ch **Node guarding time**

Address:	100Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Defines the node daemon running time, in ms.

100dh **Life factor**

Address:	100dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–255
Description
This parameter must be used together with the node daemon function and must be set to a value greater than 1.

1014h **Emergency message COB-ID**

Address:	1014h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x80	Change:	Real-time

Value Range:
0x0 to 0xFFFFFFFF
Description
The most significant bit indicates whether to disable the emergency message of the device. Only the data "0x80+Node_ID" can be written for the bit to enable the emergency message of the device.
If the data "0x80000080+Node_ID" is written, the emergency message is disabled.
When the emergency message is enabled, the COB-ID must be the same as that of the object.

1016.01h Consumer heartbeat time 1

Address:	1016-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Parameters include the address of the monitored node and actual consumer time, which must be longer than the heartbeat producer time (unit: ms) of the corresponding node. Two different consumer time cannot be set for one node.
Bits 0 to 15: Monitoring time
Bits 16 to 23: The monitored address
Bits 24 to 31: Reserved (0)

1016.02h Consumer heartbeat time 2

Address:	1016-02h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Same as 1016.01h.

1016.03h Consumer heartbeat time 3

Address:	1016-03h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1016.01h.

1016.04h Consumer heartbeat time 4

Address:	1016-04h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1016.01h.

1016.05h Consumer heartbeat time 5

Address:	1016-05h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1016.01h.

1017h Producer heartbeat time

Address:	1017h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Defines the heartbeat production time of the slave, in ms.

1400.01h COB-ID of RPDO1

Address:	1400-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x200	Change:	Real-time

Value Range:

0x0 to 0xFFFFFFFF

Description

Only the most significant bit can be modified. When the most significant bit is 0, the PDO is active. When the most significant bit is 1, the PDO is inactive.

The factory settings are as follows:

1400h: 0x00000200 + Node_ID

1401h: 0x80000300 + Node_ID

1402h: 0x80000400 + Node_ID

1403h: 0x80000500 + Node_ID

1400.02h Transmission type of RPDO1

Address:	1400-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	255	Change:	Real-time

Value Range:

0–255

Description

This parameter can be modified only when PDO is inactive.

Different values correspond to different PDO transmission types, as follows:

0: Not circle synchronous data

1 to 240: Circle synchronous data

254 and 255: Not circle asynchronous data

1401.01h COB-ID of RPDO2

Address:	1401-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x300	Change:	Real-time

Value Range:

0x0 to 0xFFFFFFFF

Description

1401.02h Transmission type of RPDO2

Address:	1401-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	255	Change:	Real-time

Value Range:

0–255

Description

Same as 1400.02h.

1402.01h COB-ID of RPDO3

Address:	1402-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x80000400	Change:	Real-time

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1400.01h.

1402.02h Transmission type of RPDO3

Address:	1402-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	255	Change:	Real-time

Value Range:
0–255
Description
Same as 1400.02h.

1403.01h COB-ID of RPDO4

Address:	1403-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x80000500	Change:	Real-time

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1400.01h.

1403.02h Transmission type of RPDO4

Address:	1403-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	255	Change:	Real-time

Value Range:
0–255
Description
Same as 1400.02h.

1600.00h Number of valid mapped objects in RPDO1

Address:	1600-00h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:

0–4

Description

This object can be modified only when PDO is inactive. When 0 is written, the mapping objects of other sub-indexes are cleared.

1600.01h Mapped object 1 in RPDO1

Address:	1600-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x60400010	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

The total length of a mapping object cannot exceed 64 bits. Mapping based on bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.

Sub-indexes are written in the following format:

Bit 16 to bit 31: Index
Bit 8 to bit 15: Sub-index
Bit 0 to bit 7: Object length

1600.02h Mapped object 2 in RPDO1

Address:	1600-02h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x60FF0020	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1600.01h.

1600.03h Mapped object 3 in RPDO1

Address:	1600-03h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x60600008	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1600.01h.

1600.04h Mapped object 4 in RPDO1

Address:	1600-04h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1600.01h.

1601.00h Number of valid mapped objects in RPDO2

Address:	1601-00h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0–4

Description

This object can be modified only when PDO is inactive. When 0 is written, the mapping objects of other sub-indexes are cleared.

1601.01h Mapped object 1 in RPDO2

Address:	1601-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x607A0020	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

The total length of a mapping object cannot exceed 64 bits. Mapping based on bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.

Sub-indexes are written in the following format:

Bit 16 to bit 31: Index

Bit 8 to bit 15: Sub-index

Bit 0 to bit 7: Object length

1601.02h Mapped object 2 in RPDO2

Address:	1601-02h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x60810020	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Same as 1601.01h.

1601.03h Mapped object 3 in RPDO2

Address:	1601-03h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Same as 1601.01h.

1601.04h Mapped object 4 in RPDO2

Address:	1601-04h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Same as 1601.01h.

1602.00h Number of valid mapped objects in RPDO3

Address:	1602-00h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–4
Description
This object can be modified only when PDO is inactive. When 0 is written, the mapping objects of other sub-indexes are cleared.

1602.01h Mapped object 1 in RPDO3

Address:	1602-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

The total length of a mapping object cannot exceed 64 bits. Mapping based bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.

Sub-indexes are written in the following format:

Bit 16 to bit 31: Index
Bit 8 to bit 15: Sub-index
Bit 0 to bit 7: Object length

1602.02h Mapped object 2 in RPDO3

Address:	1602-02h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1602.01h.

1602.03h Mapped object 3 in RPDO3

Address:	1602-03h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1602.01h.

1602.04h Mapped object 4 in RPDO3

Address:	1602-04h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1602.01h.

1603.00h Number of valid mapped objects in RPDO4

Address:	1603-00h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–4

Description

This object can be modified only when PDO is inactive. When 0 is written, the mapping objects of other sub-indexes are cleared.

1603.01h Mapped object 1 in RPDO4

Address:	1603-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

The total length of a mapping object cannot exceed 64 bits. Mapping based on bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.

Sub-indexes are written in the following format:

Bit 16 to bit 31: Index
Bit 8 to bit 15: Sub-index
Bit 0 to bit 7: Object length

1603.02h Mapped object 2 in RPDO4

Address:	1603-02h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description
Same as 1603.01h.

1603.03h Mapped object 3 in RPDO4

Address:	1603-03h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Same as 1603.01h.

1603.04h Mapped object 4 in RPDO4

Address:	1603-04h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Same as 1603.01h.

1800.01h COB-ID of TPDO1

Address:	1800-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x40000180	Change:	Real-time

Value Range:
0x0 to 0xFFFFFFFF
Description
Only the MSB and the second MSB can be modified.
When the most significant bit is 0, the PDO is active. When the most significant bit is 1, the PDO is inactive.
The second most significant bit defines whether the PDO can be triggered by a remote frame. You are recommended to set this bit to 1 to disable the remote frame to trigger the PDO.

The factory settings are as follows:
1800h: 0x40000180 + Node_ID
1801h: 0xC0000280 + Node_ID
1802h: 0xC0000380 + Node_ID
1803h: 0xC0000480 + Node_ID

1800.02h Transmission type of TPDO1

Address:	1800-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	255	Change:	Real-time

Value Range:
0–255
Description
This parameter can be modified only when PDO is inactive. Different values correspond to different PDO transmission types, as follows:
0: Not circle synchronous data
1 to 240: Circle synchronous data
254 and 255: Not circle asynchronous data

1800.03h Inhibit time of TPDO1

Address:	1800-03h	Effective mode:	Real time
Min.:	0	Unit:	100μs
Max.:	65535	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
0μs to 65535μs
Description
This parameter can be modified only when PDO is inactive.
The unit is 100 μs. The value 0 indicates that the inhibit time is invalid.

1800.05h Event counter of TPDO1

Address:	1800-05h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
This parameter can be modified only when PDO is inactive.
When the unit is ms, the value 0 indicates that the event counter is inactive.

1801.01h COB-ID of TPDO2

Address:	1801-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x40000280	Change:	Real-time

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1800.01h.

1801.02h Transmission type of TPDO2

Address:	1801-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	255	Change:	Real-time

Value Range:
0–255
Description
Same as 1800.02h.

1801.03h Inhibit time of TPDO2

Address:	1801-03h	Effective mode:	Real time
Min.:	0	Unit:	100μs
Max.:	65535	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
0μs to 65535μs
Description
Same as 1800.03h.

1801.05h Event counter of TPDO2

Address:	1801-05h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Same as 1800.05h.

1802.01h COB-ID of TPDO3

Address:	1802-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0xC0000380	Change:	Real-time

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1800.01h.

1802.02h Transmission type of TPDO3

Address:	1802-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	255	Change:	Real-time

Value Range:
0–255
Description
Same as 1800.02h.

1802.03h Inhibit time of TPDO3

Address:	1802-03h	Effective mode:	Real time
Min.:	0	Unit:	100μs
Max.:	65535	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
0μs to 65535μs
Description
Same as 1800.03h.

1802.05h Event counter of TPDO3

Address:	1802-05h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Same as 1800.05h.

1803.01h COB-ID of TPDO4

Address:	1803-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0xC0000480	Change:	Real-time

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1800.01h.

1803.02h Transmission type of TPDO4

Address:	1803-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	255	Change:	Real-time

Value Range:
0–255
Description
Same as 1800.02h.

1803.03h Inhibit time of TPDO4

Address:	1803-03h	Effective mode:	Real time
Min.:	0	Unit:	100μs
Max.:	65535	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
0μs to 65535μs
Description
Same as 1800.03h.

1803.05h Event counter of TPDO4

Address:	1803-05h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Same as 1800.05h.

1A00.00h Number of valid mapped objects in TPDO1

Address:	1A00-00h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:

0–4

Description

This object can be modified only when PDO is inactive. When 0 is written, the mapping objects of other sub-indexes are cleared.

1A00.01h Mapped object 1 in TPDO1

Address:	1A00-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x60410010	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

The total length of a mapping object cannot exceed 64 bits. Mapping based on bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.

Sub-indexes are written in the following format:

Bit 16 to bit 31: Index
Bit 8 to bit 15: Sub-index
Bit 0 to bit 7: Object length

1A00.02h Mapped object 2 in TPDO1

Address:	1A00-02h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x60FD0020	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1A00.01h.

1A00.03h Mapped object 3 in TPDO1

Address:	1A00-03h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32

Default:	0x60610008	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Same as 1A00.01h.

1A00.04h Mapped object 4 in TPDO1

Address:	1A00-04h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Same as 1A00.01h.

1A01.00h Number of valid mapped objects in TPDO2

Address:	1A01-00h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0–4
Description
This object can be modified only when PDO is inactive. When 0 is written, the mapping objects of other sub-indexes are cleared.

1A01.01h Mapped object 1 in TPDO2

Address:	1A01-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x60640020	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
The total length of a mapping object cannot exceed 64 bits. Mapping based on bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.
Sub-indexes are written in the following format:
Bit 16 to bit 31: Index

Bit 8 to bit 15: Sub-index
Bit 0 to bit 7: Object length

1A01.02h Mapped object 2 in TPDO2

Address:	1A01-02h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x606C0020	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Same as 1A01.01h.

1A01.03h Mapped object 3 in TPDO2

Address:	1A01-03h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Same as 1A01.01h.

1A01.04h Mapped object 4 in TPDO2

Address:	1A01-04h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0x7FFFFFFF
Description
Same as 1A01.01h.

1A02.00h Number of valid mapped objects in TPDO3

Address:	1A02-00h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–4

Description

This object can be modified only when PDO is inactive. When 0 is written, mapping objects of other sub-indexes are cleared.

1A02.01h Mapped object 1 in TPDO3

Address:	1A02-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

The total length of a mapping object cannot exceed 64 bits. Mapping based on bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.

Sub-indexes are written in the following format:

Bit 16 to bit 31: Index
Bit 8 to bit 15: Sub-index
Bit 0 to bit 7: Object length

1A02.02h Mapped object 2 in TPDO3

Address:	1A02-02h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1A02.01h.

1A02.03h Mapped object 3 in TPDO3

Address:	1A02-03h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1A02.01h.

1A02.04h Mapped object 4 in TPDO3

Address:	1A02-04h	Effective mode:	Real time

Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1A02.01h.

1A03.00h Number of valid mapped objects in TPDO4

Address:	1A03-00h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–4

Description

This object can be modified only when PDO is inactive. When 0 is written, the mapping objects of other sub-indexes are cleared.

1A03.01h Mapped object 1 in TPDO4

Address:	1A03-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

The total length of a mapping object cannot exceed 64 bits. Mapping based on bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.

Sub-indexes are written in the following format:

Bit 16 to bit 31: Index

Bit 8 to bit 15: Sub-index

Bit 0 to bit 7: Object length

1A03.02h Mapped object 2 in TPDO4

Address:	1A03-02h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1A03.01h.

1A03.03h Mapped object 3 in TPDO4

Address:	1A03-03h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1A03.01h.

1A03.04h Mapped object 4 in TPDO4

Address:	1A03-04h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x7FFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x7FFFFFFF

Description

Same as 1A03.01h.

21.346000h Object Dictionary

603Fh Error code

Address:	603Fh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

When an error described in the DSP402 profile occurs on the servo drive, 603Fh is as described in DSP402.

When an error specified by the user occurs on the servo drive, 603Fh is 0xFF00.

The value of 603Fh is in hexadecimal.

In addition, the object dictionary 203Fh displays auxiliary bytes of fault codes in hexadecimal.

203Fh is a Uint 32 value, in which the high 16 bits indicate the manufacturer internal fault code, and the low 16 bits indicate the manufacturer external fault code.

6040h **Control word**

Address:	6040h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0xFFFF

Description

For details on the control word, see the Communication Guide.

6041h **Status word**

Address:	6041h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

For details on the control word, see the Communication Guide.

605Ah **Quick stop mode**

Address:	605Ah	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	7	Data Type:	Int16
Default:	2	Change:	Real-time

Value Range:

0: Coast to stop, keeping de-energized state

1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state

2: Ramp to stop as defined by 6085h, keeping de-energized state

3: Stop at emergency stop torque, keeping de-energized state

5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state

6: Ramp to stop as defined by 6085h, keeping position lock state

7: Stop at emergency stop torque, keeping position lock state

Description

Defines the deceleration mode of the motor for stopping rotating upon quick stop and the motor status after stop.
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state

2: Ramp to stop as defined by 6085h, keeping de-energized state
3: Stop at emergency stop torque, keeping de-energized state
5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state
6: Ramp to stop as defined by 6085h, keeping position lock state
7: Stop at emergency stop torque, keeping position lock state
Note: When the brake function is enabled and the value of 605Ah is lower than 4, the stop mode is forcibly set to "2: Ramp to stop as defined by 6085h, keeping

605Ch **Stop mode at S-OFF**

Address:	605Ch	Effective mode:	At stop
Min.:	-4	Unit:	-
Max.:	2	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:
–4: Ramp to stop as defined by 6085h, keeping dynamic braking state
–3: Stop at zero speed, keeping dynamic braking state
–2: Ramp to stop as defined by 6084h/ 609Ah, keeping dynamic braking state
–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/ 609Ah, keeping de-energized state
2: Dynamic braking stop, keeping de-energized state

Description
Defines the deceleration mode of the motor for stopping rotating upon S-ON OFF and the motor status after stop.
–4: Ramp to stop as defined by 6085h, keeping dynamic braking state
–3: Stop at zero speed, keeping dynamic braking state
–2: Ramp to stop as defined by 6084h/609Ah, keeping dynamic braking state
–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah, keeping de-energized status
2: Dynamic braking stop, keeping de-energized state
Note: After the brake is enabled, 605Ch is forced to "4: Ramp to stop as defined by 6085h, keeping dynamic braking state".

605Dh **Halt mode**

Address:	605Dh	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	3	Data Type:	Int16
Default:	1	Change:	Real-time

Value Range:

1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping position lock state
2: Ramp to stop as defined by 6085h, keeping position lock state
3: Stop at emergency stop torque, keeping position lock state

Description

Defines the deceleration mode of the motor for stopping rotating upon S-ON pause and the motor status after stop.

PP/PV/HM mode:

Value	Stop Mode
1	Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock status
2	Ramp to stop as defined by 6085h, keeping position lock status
3	Stop at emergency-stop torque, keeping position lock status

PT mode:

Value	Stop Mode
1/2/3	Ramp to stop as defined by 6087h, keeping position lock status

605Eh Stop mode at No. 2 fault

Address:	605Eh	Effective mode:	At stop
Min.:	-5	Unit:	-
Max.:	4	Data Type:	Int16
Default:	2	Change:	Real-time

Value Range:

–5: Stop at zero speed, keeping dynamic braking state
–4: Stop at emergency stop torque, keeping dynamic braking state
–3: Ramp to stop as defined by 6085h, keeping dynamic braking state
–2: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping dynamic braking state
–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping de-energized state
2: Ramp to stop as defined by 6085h, keeping de-energized state
3: Stop at emergency stop torque, keeping de-energized state
4: Dynamic braking stop, keeping de-energized state

Description

Defines the deceleration mode of the servo motor for stopping rotating and the servo motor status when a No. 2 fault occurs.

–5: Stop at zero speed, keeping dynamic braking state
–4: Stop at emergency stop torque, keeping dynamic braking state
–3: Ramp to stop as defined by 6085h, keeping dynamic braking state
–2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state

–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state
2: Ramp to stop as defined by 6085h, keeping de-energized stat
3: Stop at emergency stop torque, keeping de-energized state
4: Dynamic braking stop, keeping de-energized state
Note: If the brake is enabled, 605Eh is forced to "3: Ramp to stop as defined by 6085h, keeping dynamic braking state".

6060h Servo drive mode

Address:	6060h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
1: Profile position mode (pp)
3: Profile velocity mode (pv)
4: Profile torque mode (pt)
6: Homing mode (hm)
7: Interpolation mode (ip)

Description
It defines the operation mode of the servo drive.
0: N/A (internally forced to pp)
1: Profile position mode (pp)
3: Profile velocity mode (pv)
4: Profile torque mode (pt)
6: Homing mode (hm)
7: Interpolation mode (ip)
Other: N/A
If an unsupported operation mode is selected through an SDO, an SDO error will be returned.
If an unsupported operation mode is selected through a PDO, the change of the operation mode will be invalid.

6061h Operation mode display

Address:	6061h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
1: Profile position mode (pp)
3: Profile velocity mode (pv)

4: Profile torque mode (pt)
6: Homing mode (hm)
7: Interpolation mode (ip)

Description

Indicates the actual operation mode.
0: Profile position mode (pp)
1: Profile position mode (pp)
3: Profile velocity mode (pv)
4: Profile torque mode (pt)
6: Homing mode (hm)
7: Interpolation mode (ip)

6062h **Position reference**

Address:	6062h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the real-time position reference (reference unit).

6063h **Position actual value**

Address:	6063h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the absolute position feedback (encoder unit) of the motor in real time.

6064h **Position actual value**

Address:	6064h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the absolute position feedback (reference unit) in real time.
Position actual value in user-defined unit (6064h) x Gear ratio (6091h) = Position actual value in encoder unit (6063h)

6065h Following error window

Address:	6065h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit
Max.:	4294967295	Data Type:	UInt32
Default:	219895614	Change:	Real-time

Value Range:
0 to 4294967295
Description
Defines the threshold of excessive position deviation (reference unit).
When the difference value between position demand value (6062h) and position actual value (6064h) keeps exceeding ±6065h after the time defined by 6066h elapses, B00.0 (Position deviation too large) occurs.

6066h Defines the time lapse to trigger excessive position deviation (EB00.0).

Address:	6066h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Defines the time lapse to trigger excessive position deviation (EB00.0), which must be used together with 6065h.

6067h Position window

Address:	6067h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit
Max.:	4294967295	Data Type:	UInt32
Default:	46976	Change:	Real-time

Value Range:
0 to 4294967295
Description
Defines the threshold for position reach.

If the difference between 6062h and 6064h is within ±6067h and the time reaches 6068h, the position is reached. In this case, bit 10 of 6041h is set to 1 in the profile position mode.
This flag bit is valid only when the S-ON signal is valid in profile position control mode.

6068h Position window time

Address:	6068h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Defines the window time for position reach, which must be used together with 6067h.

606Ch Actual speed

Address:	606Ch	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit/s
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
–2147483648 to +2147483647
Description
It indicates the velocity actual value.

606Dh Velocity window

Address:	606Dh	Effective mode:	Real time
Min.:	0	Unit:	rpm
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 RPM to 65535 RPM
Description
Defines the threshold for speed reach.
If the difference value between the target speed 60FFh and the actual speed 606Ch is within ±606Dh and the time reaches 606Eh, the speed is reached and bit 10 of the status word 6041h is set to 1 in the profile velocity (PV) mode.
This flag bit is meaningful only when the servo drive is enabled in PV mode.

606Eh **Velocity window time**

Address:	606Eh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

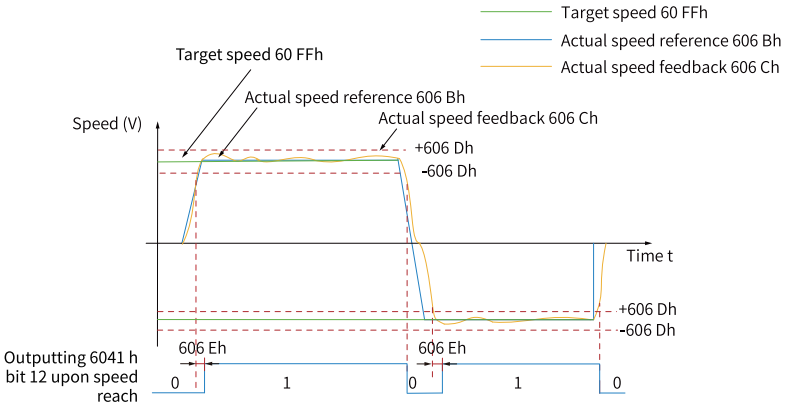
0 ms–65535 ms

Description

Defines the time window for speed reach, which must be used together with 606Dh.

Defines the time window for speed arrival. If the difference value between the target speed 60FFh and the actual speed 606Ch is within ±606Dh and the time reaches 606Eh, the speed is reached and bit 10 of the status word 6041h is set to 1 in the profile velocity (PV) mode.

This flag bit is meaningful only when the servo drive is enabled in PV mode.



606Fh **Zero speed signal threshold**

Address:	606Fh	Effective mode:	Real time
Min.:	0	Unit:	rpm
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 RPM to 65535 RPM

Description

Defines the threshold for determining whether the user velocity is 0.

When 606Ch is within ±606Fh and the time reaches the value set by 6070h, the user velocity is 0. When either condition is not met, the user velocity is not 0.

This flag bit is valid only in PV mode.

This flag bit is unrelated to the enable/disable state of the servo drive.

6070h **Velocity threshold time**

Address:	6070h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–65535 ms

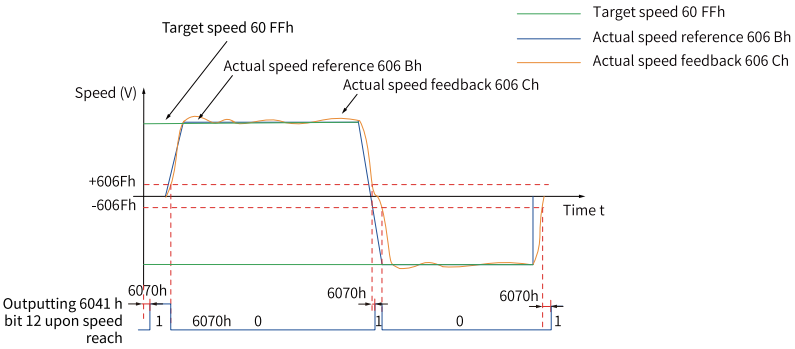
Description

Defines the time window for determining whether the user velocity is 0, which must be used together with 606Fh.

When 606Ch is within ±606Fh and the time reaches the value set by 6070h, the user velocity is 0. When either condition is not met, the user velocity is not 0.

This flag bit is valid only in PV mode.

This flag bit is unrelated to the enable/disable state of the servo drive.



6071h **Target torque**

Address:	6071h	Effective mode:	Real time
Min.:	-4000	Unit:	0.10%
Max.:	4000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-4000.%–4000.%

Description

Defines the target torque of the servo drive in the profile torque mode.

The value 1000 corresponds to the rated torque of the motor.

6072h **Max. torque reference**

Address:	6072h	Effective mode:	Real time
Min.:	0	Unit:	0.10%

Max.:	4000	Data Type:	UInt16
Default:	3500	Change:	Real-time

Value Range:

0.%–4000.%

Description

Defines the maximum torque reference limit.

The value 1000 corresponds to the rated torque of the motor.

6074h Torque reference

Address:	6074h	Effective mode:	-
Min.:	-4000	Unit:	0.10%
Max.:	4000	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-4000.%–4000.%

Description

Defines the target torque value.

The value 1000 corresponds to the rated torque of the motor.

6077h Actual torque

Address:	6077h	Effective mode:	-
Min.:	-4000	Unit:	0.10%
Max.:	4000	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-4000.%–4000.%

Description

It displays the internal actual torque of the servo drive.

The value 1000 corresponds to the rated torque of the motor.

607Ah Target position

Address:	607Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the target position of the servo drive in the profile position mode.
When bit 6 of 6040h is set to 0, 607Ah indicates the absolute target position of current segment.
After positioning of current segment is done, the value of 6064h will be the same as the value of 607Ah.
When bit 6 of 6040h is set to 1, 607Ah indicates the target increment displacement of current segment.
After positioning of current segment is done, user displacement increment will be the same as the value of 607Ah.

607Ch **Home offset**

Address:	607Ch	Effective mode:	At stop
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647

Description
Defines the physical location of mechanical zero that deviates from the home of the motor in position control modes (profile position mode, interpolation mode, and homing mode).
The home offset takes effect in the following conditions: The device is powered on, the homing operation is complete, and bit15 of 6041h is set to 1.
After homing is done, the position actual value (6064h) will be the same as the value of 607Ch.
If 607Ch is outside the value of 607Dh (Software position limit), E09.1 (Home setting error) will occur.

607D.01h **Min. position limit**

Address:	607D-01h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	-2147483648	Change:	Real-time

Value Range:
-2147483648 to 2147483647

Description
Defines the minimum software position limit relative to the mechanical zero point.
Minimum software position limit = (607D.01h)
The software position limit is used to judge the absolute position. When homing is not performed, the internal software position limit is invalid.
The condition for activating the software position limit is set in H0A.01 (object dictionary 0x200A.02h).

607D.02h **Max. position limit**

Address:	607D-02h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit

Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	2147483647	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the maximum software position limit relative to the mechanical zero.

Maximum software position limit = (607D.02h)

607Eh **Reference polarity**

Address:	607Eh	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0xFF

Description

Defines the polarity of position or speed references.

When bit 7 is 1, it indicates the position reference is multiplied by "–1" and the motor direction is reversed in the standard position mode or interpolation mode.

When bit 6 is 1, it indicates the speed reference (60FFh) is multiplied by "–1" and the motor direction is reversed in the speed mode.

When bit 5 is 1, it indicates the torque demand value (6071h) is multiplied by "–1" and the motor direction is reversed in the torque mode.

Other bits are meaningless.

607Fh **Max. speed**

Address:	607Fh	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the maximum user running speed.

Set a proper gear ratio (8:1 recommended) when using a 26-bit encoder. Otherwise, the motor speed will be limited to 3840 RPM.

6081h **Profile velocity**

Address:	6081h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	111848106	Change:	Real-time

Value Range:

0 to 4294967295

Description

It sets the average velocity normally attained at the end of the acceleration ramp during a profiled motion.

The setpoint takes effect after the slave receives the displacement reference.

6083h Profile acceleration

Address:	6083h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s²
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the acceleration rate in the acceleration stage of the displacement reference in the profile position mode.

The following formula applies if a motor equipped with 23-bit encoder needs to run at 400 RPM (6081h: 400 x 8388608/60) with acceleration rate being 400 RPM/s (6083h: 400 x 8388608/60) and deceleration rate being 200 RPM/s (6084h: 200 x 8388608/60) under a gear ratio of 1:1:

Acceleration time tup = Δ6081h/ Δ6083h = 1 (s); Deceleration time tdown = Δ6081h/ Δ6084h = 2 (s).

6084h Profile deceleration

Address:	6084h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s²
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the deceleration rate in the deceleration stage of the displacement reference in the profile position mode.

The following formula applies if a motor equipped with 23-bit encoder needs to run at 400 RPM (6081h: 400 x 8388608/60) with acceleration rate being 400 RPM/s (6083h: 400 x 8388608/60) and deceleration rate being 200 RPM/s (6084h: 200 x 8388608/60) under a gear ratio of 1:1:

Acceleration time tup = Δ6081h/ Δ6083h = 1 (s); Deceleration time tdown = Δ6081h/ Δ6084h = 2 (s).

6085h Quick stop deceleration

Address:	6085h	Effective mode:	Real time

Min.:	0	Unit:	Reference unit/s²
Max.:	4294967295	Data Type:	UInt32
Default:	2147483647	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the deceleration rate when the quick stop command (6040h = 0x0002) is active and 605Ah (Quick stop option code) is set to 2 or 5.

6087h Torque slope

Address:	6087h	Effective mode:	Real time
Min.:	0	Unit:	0.1%/s
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:

0.%/s–4294967295.%/s

Description

It sets the rate of change of torque in profile torque mode, in unit of torque increment per second.

In the profile torque mode, if 605Ah is set to 1, 2, 5, or 6, or 605Dh is set to 1 or 2, the servo drive decelerates to stop as defined by 6087h.

If the value exceeds the torque reference limit, the servo drive runs at the limit.

6091.01h Motor resolution

Address:	6091-01h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1	Change:	At stop

Value Range:

1–4294967295

Description

Defines the numerator of the gear ratio.

Defines the proportional relation between the load shaft displacement designated by the user and the motor shaft displacement.

The relation between motor position feedback (encoder unit) and load shaft position feedback (reference unit) is as follows.

Motor position feedback = Load shaft position feedback x Gear ratio

The relation between the motor speed (RPM) and the load shaft speed (reference unit/s) is as follows:

Motor speed (RPM) = Load shaft speed * 6091h * 60/Encoder resolution
The motor acceleration (RPM/ms) and the load shaft acceleration (reference unit/s2) is in the following relationship:
Motor acceleration (RPM/ms) = Load shaft acceleration * 6091h * 1000 / Encoder resolution / 60

6091.02h **Shaft resolution**

Address:	6091-02h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1	Change:	At stop

Value Range:
1–4294967295
Description
Defines the denominator of the gear ratio.

6098h **Homing method**

Address:	6098h	Effective mode:	Real time
Min.:	-3	Unit:	-
Max.:	35	Data Type:	Int8
Default:	1	Change:	Real-time

Value Range:
-3–35
Description
It selects the homing method.
-3 Nearby, Z signal as home.
-2 Forward, positive mechanical limit as deceleration point and Z signal as home.
-1 Reverse, negative mechanical limit as deceleration point and Z signal as home.
1 Reverse, negative limit switch as deceleration point and Z signal as home, falling edge of the negative limit switch signal must be reached before Z signal.
2 Forward, positive limit switch as deceleration point and Z signal as home, falling edge of positive limit switch signal must be reached before Z signal.
3 Forward, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.
4 Reverse, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.
5 Reverse, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.

6 Forward, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.
7 Forward, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.
8 Forward, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.
9 Forward, home switch as deceleration point and Z signal as home, rising edge on the other side of the home switch signal must be reached before Z signal.
10 Forward, home switch as deceleration point and Z signal as home, falling edge on the other side of the home switch signal must be reached before Z signal.
11 Reverse, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.
12 Reverse, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.
13 Reverse, home switch as deceleration point and Z signal on the other side of the home switch signal as home, rising edge on the other side of the home switch signal must be reached before Z signal.
14 Reverse, home switch as deceleration point and Z signal on the other side of the home switch signal as home, falling edge on the other side of the home switch signal must be reached before Z signal.
17–32 are similar to 1–14 except that the deceleration point coincides with the home.
33 Reverse, Z signal as home.
34 Forward, Z signal as home.
Current position as the home
When 6098h is set to 15, 16, 31 or 32, it is meaningless and the servo drive does not perform the homing operation.

6099.01h Speed during search for switch

Address:	6099-01h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	111848106	Change:	At stop

Value Range:
0 to 4294967295
Description
Defines the speed during search for the deceleration point signal. A large setpoint helps prevent E601.0 (Homing timeout).

6099.02h Speed during search for zero

Address:	6099-02h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	11184810	Change:	At stop

Value Range:

0 to 4294967295

Description

Defines the speed in searching for the home signal. Set this sub-index to a low value to avoid overshoot during stop at high speed, preventing excessive deviation between the stop position and the preset mechanical home.

609Ah Homing acceleration

Address:	609Ah	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s^2
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:

0 to 4294967295

Description

It sets the acceleration during the homing operation.

60B8h Touch probe function

Address:	60B8h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0xFFFF

Description

bit	Name	Description
0	Touch probe 1 function selection 0: Probe 1 disabled 1: Probe 1 enabled	Bit0 to bit5: settings related to probe 1 When a DI is used to trigger the touch probe function, the DI source cannot be changed once the touch probe function is enabled. For absolute encoders, Z signal refers to the zero point of the single-turn position feedback.
1	Touch probe 1 trigger mode 0: Single trigger mode (Latches the position at the first trigger event.) 1: Continuous trigger mode	
2	Touch probe 1 trigger signal selection	

bit	Name	Description
	0: DI signal 1: Z signal	
3	NA	
4	Touch probe 1 positive edge 0: Latching at positive edge disabled 1: Latching at positive edge enabled	
5	Touch probe 1 negative edge 0: Latching at negative edge disabled 1: Latching at negative edge enabled	
6-7	NA	-
8	Touch probe 2 function selection 0: Probe 2 disabled 1: Probe 2 enabled	bit8 to bit13: settings related to probe 2
9	Touch probe 2 trigger mode 0: Single trigger mode (Latches the position at the first trigger event.) 1: Continuous trigger mode	
10	Touch probe 2 trigger signal selection 0: DI signal 1: Z signal	
11	NA	
12	Touch probe 2 positive edge 0: Latching at positive edge disabled 1: Latching at positive edge enabled	
13	Touch probe 2 negative edge 0: Latching at negative edge disabled 1: Latching at negative edge enabled	
14-15	NA	-

60B9h Touch probe status

Address:	60B9h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Defines the functions of touch probe 1 and touch probe 2.

See the following table for descriptions of each bit of 60B9h.

bit	Name	Description
0	Touch probe 1 function selection 0: Probe 1 disabled 1: Probe 1 enabled	bit0 to bit2: Status of probe 1

bit	Name	Description
1	Touch probe 1 positive edge value 0: No positive edge value latched 1: Edge value latched	
2	Touch probe 1 negative edge value 0: No negative edge value latched 1: Negative edge value latched	
3-5	NA	-
6-7	When the function of probe 1 is selected as continuous sampling, the total number of times the probe is triggered	When the function of probe 1 is selected as continuous sampling, the total number of times (0–3) the probe is triggered
8	Probe 2 enable: 0: Probe 2 disabled 1: Probe 2 enabled	bit8 to bit10: Status of probe 2
9	Touch probe 2 positive edge value 0: No positive edge value latched 1: Edge value latched	
10	Touch probe 2 negative edge value 0: No negative edge value latched 1: Negative edge value latched	
11-13	NA	-
14-15	When the function of probe 2 is selected as continuous sampling, the total number of times the probe is triggered	When the function of probe 2 is selected as continuous sampling, the total number of times (0–3) the probe is triggered

60BAh Touch probe 1 positive edge position value

Address:	60BAh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647

Description

Indicates the position feedback value (reference unit) latched at positive edge of touch probe 1 signal.

60BBh Touch probe 1 negative edge position value

Address:	60BBh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647

Description

Indicates the position feedback value (reference unit) latched at negative edge of touch probe 1 signal.

60BCh **Touch probe 2 positive edge position value**

Address:	60BCh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position feedback value (reference unit) latched at positive edge of touch probe 2 signal.

60BDh **Touch probe 2 negative edge position value**

Address:	60BDh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position feedback value (reference unit) latched at negative edge of touch probe 2 signal.

60C1.01h **Interpolation displacement**

Address:	60C1-01h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the displacement reference in the interpolation mode.

In interpolation mode, 60C1.01h must be set to synchronize PDO and the transmission type must be set to 1.

The host controller will send a displacement reference to the slave upon every synchronization cycle.

60C2.01h **Interpolation time period**

Address:	60C2-01h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1–20

Description

Defines the interpolation time units.
The synchronization cycle must be set after the servo drive stops running.

60C2.02h **Interpolation time units**

Address:	60C2-02h	Effective mode:	Real time
Min.:	-3	Unit:	-
Max.:	-3	Data Type:	Int8
Default:	-3	Change:	Real-time

Value Range:
-3–-3
Description
Defines the interpolation period time unit.
The value "–3" indicates the unit ms. Therefore, the actual interpolation period (ms) is the value of 60C2.01h.

60C5h **Max. acceleration**

Address:	60C5h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s²
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:
0 to 4294967295
Description
Defines the maximum permissible acceleration rate of the acceleration segment in the profile position mode, profile velocity mode, and homing mode.
The setpoint 0 will be forcibly changed to 1.

60C6h **Max. deceleration**

Address:	60C6h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s²
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:
0 to 4294967295
Description
Defines the maximum permissible deceleration in the profile position mode, profile velocity mode, and homing mode.
The setpoint 0 will be forcibly changed to 1.

60D5h **Touch probe 1 positive edge counter**

Address:	60D5h	Effective mode:	-
Min.:	0x0	Unit:	-

Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
The counting value is added by "1" each time this object is triggered.

60D6h Touch probe 1 negative edge counter

Address:	60D6h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
The counting value is added by "1" each time this object is triggered.

60D7h Touch probe 2 positive edge counter

Address:	60D7h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
The counting value is added by "2" each time this object is triggered.

60D8h Touch probe 2 negative edge counter

Address:	60D8h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
The counting value is added by "2" each time this object is triggered.

60E0h Positive torque limit

Address:	60E0h	Effective mode:	Real time

Min.:	0	Unit:	0.10%
Max.:	4000	Data Type:	UInt16
Default:	3500	Change:	Real-time

Value Range:

0.%–4000.%

Description

It sets the maximum positive torque in the motor.

60E1h Negative torque limit

Address:	60E1h	Effective mode:	Real time
Min.:	0	Unit:	0.10%
Max.:	4000	Data Type:	UInt16
Default:	3500	Change:	Real-time

Value Range:

0.%–4000.%

Description

It sets the maximum negative torque in the motor.

60F4h Position deviation

Address:	60F4h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position deviation (reference unit).

60FCh Position reference

Address:	60FCh	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position reference (encoder unit).

If no alarm is detected when the S-ON signal is active, the relation between the position reference in reference unit and that in encoder unit is as follows:

60FCh (in encoder unit) = 6062h (in reference unit) x 6091h

60FDh DI state

Address:	60FDh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFFFFFF

Description

Indicates current DI logic of the drive.

0: Inactive

1: Active

The signal indicated by each bit is described as follows:

Bit signal

0: Reverse overtravel signal active

1: Forward overtravel signal active

2: Home signal active

3–15: N/A

16: DI1 input active

17: DI2 input active

18: DI3 input active

19: DI4 input active

20: DI5 input active

21: DI6 input active

22: DI7 input active

23: DI8 input active

24–26: N/A

27: STO1 signal input

28: STO2 signal input

29: EDM output active

30: Z signal active

31: N/A

60FFh PV target velocity

Address:	60FFh	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit/s
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

–2147483648 to +2147483647

Description

Defines the target speed in the profile velocity mode.

60FE.01h Physical output

Address:	60FE-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0xFFFFFFFF

Description

Indicates the DO logic.

The signal indicated by each bit is described as follows:

Description of bits

0–15: N/A

16: DO1 forced output (0: off, 1: on), outputs only when DO output function 31 configured and bit 16 of 60FE.02 is set to 1

17: DO2 forced output (0: off, 1: on), outputs only when DO output function 31 configured and bit 17 of 60FE.02 is set to 1

18: DO3 forced output (0: off, 1: on), outputs only when DO output function 31 configured and bit 18 of 60FE.02 is set to 1

19: DO4 forced output (0: off, 1: on), outputs only when the DO output function 31 is configured and bit 19 of 60FE.02 is set to 1

20: DO5 forced output (0: off, 1: on), outputs only when the DO output function 31 is configured and bit 20 of 60FE.02 is set to 1

21–25: N/A

26: P/PI switchover, only when bit 26 of 60FE.02 is set to 1

27–31: N/A

60FE.02h Bitmask

Address:	60FE-02h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0xFFFFFFFF

Description

0 to 15: N/A

16: Forced DO1 output enable

17: Forced DO2 output enable

18: Forced DO3 output enable

19: Forced DO4 output enable

20: Forced DO5 output enable

19 to 25: N/A

26: P/PI switchover enable

27 to 31: N/A

22 Parameter List [Standard N]

The mapping relation between the parameter displayed on the keypad (in decimal) and the object dictionary operated by the host controller (in hexadecimal, "Index" and "Sub-index") is as follows.

Object dictionary index = 0x2000 + Parameter group number

Object dictionary sub-index = Hexadecimal offset within the parameter group + 1 For example:

Panel Display	Object dictionary operated by the host controller
H02.15	2002.10h

Note

The following section only describes the display and parameter settings on the keypad side (in decimal), which are different from those displayed in the software tool (in hexadecimal). Make necessary value conversions during use.

22.1 H00 Servo Motor Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H00.00	2000-01h	Motor SN	20000: linear motor-pulse encoder 14203: linear motor-BiSS-C encoder 14206: linear motor-SSI encoder 14207: linear motor-EnDat2.2 encoder 14202: linear motor-Inovance communication 23-bit encoder 14205: linear motor-Inovance interpolator 23-bit encoder 20001: DDR motor-pulse encoder 14210: DDR motor-Inovance interpolator 23-bit encoder 14201: DDR motor-Inovance communication 23-bit encoder 14211: DDR motor-BiSS-C encoder 14212: DDR motor-EnDat2.2 encoder 14213: DDR motor-SSI encoder 20002: rotary motor-pulse encoder 14000: rotary motor-Inovance communication 20-bit encoder 14101: rotary motor-Inovance communication 23-bit encoder 14102: rotary motor-Inovance communication 26-bit encoder 14020: rotary motor-Harmonic 20-bit encoder-2.5M baud rate 14021: rotary motor-Harmonic 17-bit encoder-2.5M baud rate 14022: rotary motor-Harmonic 17-bit encoder-4M baud rate 14120: rotary motor-Nikon 20-bit encoder-2.5M baud rate	14102	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			14121: rotary motor-Nikon 17-bit encoder-2.5M baud rate 14122: rotary motor-Nikon 17-bit encoder-4M baud rate 14130: rotary motor-TAMAGAWA 17-bit encoder 14131: rotary motor-TAMAGAWA 23-bit encoder 14140: rotary motor-EnDat2.2 encoder 14150: rotary motor-SSI encoder 14160: rotary motor-BiSS-C encoder				
H00.02	2000-03h	Customized No.	0.00–42949672.95	0.00	-	Unchangeable	
H00.04	2000-05h	Encoder version	0.0–6553.5	0.0	-	Unchangeable	
H00.05	2000-06h	Encoder version	0–65535	0	-	Unchangeable	
H00.06	2000-07h	FPGA customized SN	0.00–655.35	0.00	-	Unchangeable	
H00.07	2000-08h	STO version	0.0–6553.5	0.0	-	Unchangeable	
H00.08	2000-09h	Bus encoder type	0–65535	0	-	At stop	
H00.14	2000-0Fh	Rated speed	50[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	At stop	
H00.15	2000-10h	Maximum speed	50[mm/s]/[rpm]–10000[mm/s]/[rpm]	6000	[mm/s]/[rpm]	At stop	
H00.18	2000-13h	Stator resistance	0.001Ω to 65.535Ω	0.500	Ω	At stop	
H00.19	2000-14h	Stator inductance Lq	0.01mH to 655.35mH	3.27	mH	At stop	
H00.20	2000-15h	Stator inductance Ld	0.01mH to 655.35mH	3.87	mH	At stop	
H00.22	2000-17h	Torque coefficient Kt	0.01[N/Arms]/[N·m/Arms]–655.35[N/Arms]/[N·m/Arms]	0.51	[N/Arms]/	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
					[N·m/Arms]		
H00.40	2000-29h	Motor control type	0: General-purpose rotary motor (ROT) 1: Direct drive rotary motor (DDR) 2: Direct drive linear motor (DDL) 3: Voice coil motor (VOL)	2	-	At stop	
H00.41	2000-2Ah	Master encoder configuration	0: CN2 1: CN7	1	-	Un changeable	
H00.43	2000-2Ch	Number of BiSS-C/SSI/ EnDat2.2 data bits	0–40	32	-	At stop	
H00.44	2000-2Dh	Number of BiSS-C/SSI fault bits	0–31	2	-	At stop	
H00.45	2000-2Eh	Encoder pitch 1	0.00[mm]/[deg]–655.35[mm]/[deg]	2.00	[mm]/[deg]	At stop	
H00.46	2000-2Fh	Encoder pitch 2	0.00[mm]/[deg]–655.35[mm]/[deg]	0.50	[mm]/[deg]	At stop	
H00.47	2000-30h	Encoder Type	0: Optical scale 1: Magnetic scale	0	-	At stop	
H00.48	2000-31h	Linear motor pole pitch (N-S)	0.00 millimeters–655.35 millimeters	16.00	mm	At stop	
H00.49	2000-32h	Direct drive motor encoder resolution	0.000um/p–65.535um/p	1.000	um/p	At stop	
H00.54	2000-37h	BiSS-C/SSI CRC	0–1	1	-	At stop	
H00.55	2000-38h	Rated torque (Uint32)	0.00[N]/[N·m]–42949672.95[N]/[N·m]	2.00	[N]/[N·m]	At stop	
H00.57	2000-3Ah	Max. torque (Uint32)	0.00[N]/[N·m]–42949672.95[N]/[N·m]	7.00	[N]/[N·m]	At stop	
H00.59	2000-3Ch	Encoder counting direction	0: Forward 1: Reverse	0	-	At stop	
H00.63	2000-40h	Max. current (Uint32)	0.00A–42949672.95A	3.00	A	At stop	
H00.65	2000-42h	Rated current (Uint32)	0.00A–42949672.95A	1.00	A	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H00.67	2000-44h	Moment of inertia (Uint32)	0.00000[g]/[0.00001kg·cm²]–42949.67295[g]/[0.00001kg·cm²]	0.00001	[g]/[0.00001kg·cm²]	At stop	
H00.69	2000-46h	Linear back EMF coefficient (Uint32)	0.00[V/(m/s)]/[100mV/rpm]–42949672.95[V/(m/s)]/[100mV/rpm]	33.00	[V/(m/s)]/[100mV/rpm]	At stop	

22.2 H01 Servo Drive Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H01.00	2001-01h	MCU software version	0.0–6553.5	0.0	-	Unchangeable	
H01.01	2001-02h	FPGA software version	0.0–6553.5	0.0	-	Unchangeable	
H01.02	2001-03h	Servo drive series No.	0–65535	0	-	Unchangeable	
H01.06	2001-07h	Board software version	0.0–6553.5	0.0	-	Unchangeable	
H01.10	2001-0Bh	Drive series No.	2: S1R6 3: S2R8 5: S5R5 6: S7R6 7: S012 8: S018 9: S022 10: S027 10001: T3R5 10002: T5R4 10003: T8R4 10004: T012 10005: T017 10006: T021 10007: T026	3	-	At stop	
H01.11	2001-0Ch	DC-AC voltage class	0 V–65535 V	220	V	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H01.12	2001-0Dh	Drive rated power	0.00 kW–42949672.95kW	0.40	kW	Unchangeable	
H01.14	2001-0Fh	Max. output power of the drive	0.00 kW–42949672.95kW	0.40	kW	Unchangeable	
H01.16	2001-11h	Rated output current of the drive	0.00 A–42949672.95 A	2.80	A	Unchangeable	
H01.18	2001-13h	Max. output current of the drive	0.00 A–42949672.95 A	10.10	A	Unchangeable	
H01.40	2001-29h	DC bus overvoltage protection threshold	0 V–2000 V	420	V	Real-time	
H01.75	2001-4Ch	Current loop amplification factor	0.00–655.35	1.00	-	Real-time	
H01.88	2001-59h	Junction temperature parameter version 1	0.0–6553.5	0.0	-	Unchangeable	
H01.89	2001-5Ah	Junction temperature parameter version 2	0–65535	0	-	Unchangeable	
H01.90	2001-5Bh	Motor property mask	0–65535	0	-	At stop	

22.3 H02 Basic Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.00	2002-01h	Control mode	0: Velocity mode 1: Position mode 2: Torque mode 7: Technology segment 9: EtherCAT mode	9	-	At stop	
H02.01	2002-02h	Absolute system selection	0: Incremental mode 1: Absolute position linear mode 2: Absolute position rotation mode	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			3: Absolute position linear mode (without encoder overflow alarm) 4: Absolute position single-turn mode				
H02.02	2002-03h	Rotation direction selection	0: Counterclockwise (CCW) as forward direction 1: Clockwise (CW) as forward direction	0	-	At stop	
H02.03	2002-04h	Output pulse phase	0: Phase A leads phase B 1: Phase A lags behind phase B	0	-	At stop	
H02.05	2002-06h	Stop mode at S-ON OFF	–4: Ramp to stop as defined by 6085h, keeping dynamic braking state –3: at zero speed, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Dynamic braking stop, keeping de-energized state	0	-	Real-time	
H02.06	2002-07h	Stop mode at No. 2 fault	–5: Stop at zero speed, keeping dynamic braking state –4: Stop at emergency stop torque, keeping dynamic braking state –3: Ramp to stop as defined by 6085h, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping de-energized state	2	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state				
H02.07	2002-08h	Stop mode at overtravel	0: Coast to stop, keeping de-energized state 1: Stop at zero speed, keeping position lock state 2: Stop at zero speed, keeping de-energized state 3: Stop based on ramp, keeping de-energized state 4: Stop based on ramp, keeping position lock state 5: Dynamic braking stop, keeping de-energized state 6: Dynamic braking stop, keeping dynamic braking state 7: Not responding to overtravel	1	-	At stop	
H02.08	2002-09h	Stop mode at No.1 fault	0: Coast to stop, keeping de-energized state 1: Dynamic braking stop, keeping de-energized state 2: Dynamic braking stop, keeping dynamic braking state	2	-	At stop	
H02.09	2002-0Ah	Delay from brake output ON to command received	0 ms–500 ms	250	ms	Real-time	
H02.10	2002-0Bh	Delay from brake output OFF to motor de-energized	50 ms–1000 ms	150	ms	Real-time	
H02.11	2002-0Ch	Motor speed threshold at brake output OFF in rotation state	20[mm/s]/[rpm]–3000[mm/s]/[rpm]	30	[mm/s]/[rpm]	Real-time	
H02.12	2002-0Dh	Delay from S-ON OFF to brake output	1 ms–65535 ms	500	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		OFF in rotation state					
H02.15	2002-10h	LED Alarm Display	0: Output alarm information immediately 1: Not output alarm information	0	-	Real-time	
H02.16	2002-11h	Brake enable switch	0: OFF 1: ON	0	-	Real-time	
H02.17	2002-12h	Stop mode upon main circuit power failure	0: Keep current action 1: Stop upon fault as defined by H02.06 2: Stop at S-ON OFF as defined by H02.05 3: Stop quickly as defined by H02.18	2	-	Real-time	
H02.18	2002-13h	Quick stop mode	0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state 6: Ramp to stop as defined by 6085h, keeping position lock state 7: Stop at emergency stop torque, keeping position lock state	2	-	Real-time	
H02.21	2002-16h	Permissible minimum resistance of braking resistor	1Ω to 1000Ω	40	Ω	Unchangeable	
H02.22	2002-17h	Power of built-in braking resistor	0W–65535W	50	W	Unchangeable	
H02.23	2002-18h	Resistance of built-in braking resistor	0Ω to 65535Ω	50	Ω	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.24	2002-19h	Resistor heat dissipation coefficient	10% to 100%	30	%	Real-time	
H02.25	2002-1Ah	Braking resistor type	0: Built-in 1: External, natural cooling 2: External, forced air cooling 3: No resistor needed	3	-	Real-time	
H02.26	2002-1Bh	Power of external braking resistor	1 W–65535W	40	W	Real-time	
H02.27	2002-1Ch	Resistance of external braking resistor	15Ω to 1000Ω	50	Ω	Real-time	
H02.28	2002-1Dh	Parameters Initialization	0: Parameters in group H02 and above initialized 1: Parameters in group H00, H02 and above initialized 2: All parameters initialized (default values used for model-related parameters)	0	-	At stop	
H02.30	2002-1Fh	User password	0–65535	0	-	Real-time	
H02.31	2002-20h	System parameter initialization	0: No operation 1: Restore default settings 2: Clear fault records	0	-	At stop	
H02.32	2002-21h	Selection of parameters in group H0b	0–99	50	-	Real-time	
H02.35	2002-24h	Keypad data update frequency	0 Hz–20 Hz	0	Hz	Real-time	
H02.38	2002-27h	Overload time of external resistor	0s to 200s	40	s	Real-time	
H02.41	2002-2Ah	Manufacturer password	0–65535	0	-	Real-time	
H02.47	2002-30h	Delay time from power cable breakage to brake OFF	0 ms–1000 ms	10	ms	Real-time	

22.4 H03 Terminal Input Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H03.02	2003-03h	DI1 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 38: Touch probe 1 39: Touch probe 2 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3	14	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H03.03	2003-04h	DI1 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.04	2003-05h	DI2 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 38: Touch probe 1 39: Touch probe 2 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4	15	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H03.05	2003-06h	DI2 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.06	2003-07h	DI3 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 38: Touch probe 1 39: Touch probe 2 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1	31	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H03.07	2003-08h	DI3 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.08	2003-09h	DI4 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop	34	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			36: Internal speed limit source 38: Touch probe 1 39: Touch probe 2 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H03.09	2003-0Ah	DI4 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.10	2003-0Bh	DI5 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit	38	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 38: Touch probe 1 39: Touch probe 2 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H03.11	2003-0Ch	DI5 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H03.50	2003-33h	Voltage-type AI1 offset	-5000 mV to 5000 mV	0	mV	Real-time	
H03.51	2003-34h	Voltage-type AI1 input filter time constant	0.00 ms–655.35 ms	2.00	ms	Real-time	
H03.53	2003-36h	Voltage-type AI1 dead zone	0.0 mV to 1000.0 mV	10.0	mV	Real-time	
H03.54	2003-37h	Voltage-type AI1 zero drift	-500.0 mV–500.0 mV	0.0	mV	Real-time	
H03.55	2003-38h	Voltage-type AI2 offset	-5000 mV to 5000 mV	0	mV	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H03.56	2003-39h	Voltage-type AI2 input filter time constant	0.00 ms–655.35 ms	2.00	ms	Real-time	
H03.58	2003-3Bh	Voltage-type AI2 dead zone	0.0 mV to 1000.0 mV	10.0	mV	Real-time	
H03.59	2003-3Ch	Voltage-type AI2 zero drift	-500.0 mV–500.0 mV	0.0	mV	Real-time	
H03.60	2003-3Dh	DI1 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.61	2003-3Eh	DI2 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.62	2003-3Fh	DI3 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.63	2003-40h	DI4 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.64	2003-41h	DI5 fitter time	0.00 ms–500.00 ms	3.00	ms	Real-time	
H03.80	2003-51h	Speed corresponding to analog 10 V	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	At stop	
H03.81	2003-52h	Torque corresponding to analog 10 V	0.00 to 8.00	1.00	Multiplier	At stop	

22.5 H04 Terminal Output Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H04.00	2004-01h	DO1 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 25: Comparison output DO 26: Closed-loop state 27: Left limit 28: Right limit 31: Forced communication DO 32: EDM output 33: Gantry alignment	1	-	Real-time	
H04.01	2004-02h	DO1 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H04.02	2004-03h	DO2 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 25: Comparison output DO 26: Closed-loop state 27: Left limit 28: Right limit 31: Forced communication DO 32: EDM output 33: Gantry alignment	11	-	Real-time	
H04.03	2004-04h	DO2 logic selection	0: Normally open 1: Closed	0	-	Real-time	
H04.22	2004-17h	DO source selection	Bit0: DO1 output source 0: DO1 function output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			1: Bit0 of H31.04 Bit1: DO2 output source 0: DO2 function output 1: Bit1 of H31.04				
H04.23	2004-18h	EtherCAT communication-forced DO logic in non-OP status	Bit0: DO1 0: Maintain output 1: No output Bit1: DO2 0: Maintain output 1: No output	0	-	Real-time	
H04.24	2004-19h	DO brake enable	0: Disabled 1: Enabled	0	-	At stop	
H04.50	2004-33h	AO1 signal selection	0: Motor speed (1 V/1000 [mm/s]/[rpm]) 1: Speed reference (1 V/1000 [mm/s]/[rpm]) 2: Torque reference (1 V/100 x rated torque) 3: Position deviation (0.5 mV/1 reference unit) 4: Position deviation (0.5 mV/1 encoder unit) 5: Position reference speed (1 V/1000 [mm/s]/[rpm]) 6: Positioning completed 8: AI1 voltage 9: AI2 voltage 10: Defined by H31.05	0	-	Real-time	
H04.51	2004-34h	AO1 offset voltage	-10000 mV–10000 mV	0	mV	Real-time	
H04.52	2004-35h	AO1 ratio	-99.99–99.99	1.00	-	Real-time	

22.6 H05 Position Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.00	2005-01h	Primary position reference source	2: Multi-position reference	2	-	Real-time	
H05.02	2005-03h	Pulses per revolution	0–4294967295	0	[P/N-N]/[P/Rev]	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.04	2005-05h	First-order low-pass filter time constant	0.0 ms–6553.5 ms	0.0	ms	At stop	
H05.06	2005-07h	Moving average filter time constant 1	0.0 ms–128.0 ms	0.0	ms	At stop	
H05.07	2005-08h	Electronic gear ratio 1 (numerator)	1–1073741824	1	-	Real-time	
H05.09	2005-0Ah	Electronic gear ratio 1 (denominator)	1–1073741824	1	-	Real-time	
H05.11	2005-0Ch	Electronic gear ratio 2 (numerator)	1–1073741824	1	-	Real-time	
H05.13	2005-0Eh	Electronic gear ratio 2 (denominator)	1–1073741824	1	-	Real-time	
H05.17	2005-12h	Number of encoder frequency-division pulses	0–4194303	2500	[P/N-N]/[P/Rev]	At stop	
H05.19	2005-14h	Speed feedforward control	0: No speed feedforward 1: Internal speed feedforward 2: H05.72 3: Zero phase	1	-	At stop	
H05.20	2005-15h	Condition for positioning completed signal output	0: When absolute value of position deviation is smaller than the value of H05.21, a positioning completion ON signal is output. 1: When filtered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 2: When unfiltered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 3: When the unfiltered position command is 0 and the absolute value of the position	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the unfiltered position command and the absolute value of the position deviation. 4: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the filtered position command and the absolute value of the position deviation. 5: When the unfiltered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 6: When the filtered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.				

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			7: When the unfiltered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 8: When the filtered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.				
H05.20	2005-15h	Condition for positioning completed signal output	9: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. 10: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			positioning completion ON signal is output.				
H05.21	2005-16h	Threshold of positioning completed	1 to 65535	46976	Encoder unit	Real-time	
H05.22	2005-17h	Proximity threshold	1 to 65535	65535	Encoder unit	Real-time	
H05.30	2005-1Fh	Homing enable selection	0: Disabled 6: Current position as home	0	-	Real-time	
H05.35	2005-24h	Home search time limit	0 ms–65535 ms	10000	ms	Real-time	
H05.36	2005-25h	Mechanical home offset	-2147483648 to 2147483647	0	Reference unit	Real-time	
H05.38	2005-27h	Frequency-division output source	0: Encoder frequency-division output 2: Frequency-division output inhibited 3: Second encoder frequency-division output 4: H31-01 reference frequency output	0	-	Real-time	
H05.39	2005-28h	Electronic gear ratio switchover condition	0: Switchover after position reference is kept 0 for 2.5 ms 1: Switched in real time	0	-	At stop	
H05.40	2005-29h	Mechanical home offset and action upon overtravel	0: H05.36 as the coordinate after homing, reverse homing applied after homing triggered again on overtravel 1: H05.36 as the relative offset after homing, reverse homing applied after homing triggered again on overtravel 2: H05.36 as the coordinate after homing, reverse homing auto-applied on overtravel 3: H05.36 as the relative offset after homing, reverse homing auto-applied on overtravel	0	-	Real-time	
H05.41	2005-2Ah	Z pulse output polarity	bit0: Frequency-division Z output polarity 0: Positive (high level upon active Z pulse) 1: Negative (low level upon active Z pulse)	0x1	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit1: OCZ output polarity 0: Positive (high level upon active Z pulse) 1: Negative (low level upon active Z pulse) bit2: Inner loop probe Z signal source 0: Motor Z signal 1: Frequency-division output Z signal				
H05.44	2005-2Dh	Numerator of frequency-division output reduction ratio	1–16383	1	-	At stop	
H05.45	2005-2Eh	Denominator of frequency-division output reduction ratio	1–8191	1	-	At stop	
H05.46	2005-2Fh	DI selection of multi-turn frequency-division Z starting point	0: No operation 1: DI1 2: DI2 3: DI3 4: DI4 5: DI5	0	-	Real-time	
H05.47	2005-30h	Frequency-division Z pulse width	0μs to 400μs	0	μs	Real-time	
H05.48	2005-31h	Frequency-division output dead zone setting threshold	0 to 255	0	Encoder unit	Real-time	
H05.50	2005-33h	Mechanical gear ratio in absolute position rotation mode (numerator)	1–65535	1	-	At stop	
H05.51	2005-34h	Mechanical gear ratio in absolute position rotation mode (denominator)	1–65535	1	-	At stop	
H05.52	2005-35h	Pulses per revolution of the load in	0 to 4294967295	0	Encoder unit	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		absolute position rotation mode (low 32 bits)					
H05.54	2005-37h	Pulses per revolution of the load in absolute position rotation mode (high 32 bits)	0 to 4294967295	0	Encoder unit	At stop	
H05.58	2005-3Bh	Torque threshold in homing upon hit-and-stop	0.0% to 400.0%	100.0	%	Real-time	
H05.59	2005-3Ch	Positioning window time	0 ms–30000 ms	0	ms	Real-time	
H05.60	2005-3Dh	Hold time of positioning completed	0 ms–30000 ms	0	ms	Real-time	
H05.66	2005-43h	Homing time unit	0: 1 ms 1: 10 ms 2: 100 ms	2	-	At stop	
H05.67	2005-44h	Offset between zero point and single-turn absolute position	-2147483648 to 2147483647	0	Encoder unit	At stop	
H05.71	2005-48h	Motor Z signal width	1 ms–100 ms	4	ms	Real-time	
H05.72	2005-49h	External speed feedforward source selection	0: 60B1 1: AI1 2: AI2	0	-	Real-time	

22.7 H06 Speed Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H06.00	2006-01h	Source of main speed reference A	0: Digital setting (H06.03) 1: AI1 2: AI2	0	-	At stop	
H06.01	2006-02h	Source of auxiliary speed reference B	0: Digital setting (H06.03) 1: AI1 2: AI2 5: Multi-speed reference	1	-	At stop	
H06.02	2006-03h	Speed reference source	0: Source of main speed reference A 1: Source of auxiliary speed reference B 2: A+B 3: Switched between A and B 4: Communication	0	-	At stop	
H06.03	2006-04h	Speed reference set through keypad	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H06.04	2006-05h	DI jog speed reference	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	150	[mm/s]/[rpm]	Real-time	
H06.05	2006-06h	Acc. ramp time of speed reference	0 ms–65535 ms	0	ms	Real-time	
H06.06	2006-07h	Dec. ramp time of speed reference	0 ms–65535 ms	0	ms	Real-time	
H06.07	2006-08h	Maximum speed limit	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	7000	[mm/s]/[rpm]	Real-time	
H06.08	2006-09h	Forward speed threshold	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	7000	[mm/s]/[rpm]	Real-time	
H06.09	2006-0Ah	Reverse speed threshold	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	7000	[mm/s]/[rpm]	Real-time	
H06.10	2006-0Bh	Deceleration unit in emergency stop	0: Multiplied by 1 1: Multiplied by 10 2: Multiplied by 100	0	-	At stop	
H06.11	2006-0Ch	Torque feedforward control	0: No torque feedforward 1: Internal torque feedforward 2: 60B2h as external torque feedforward	1	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			3: STune mode 5				
H06.12	2006-0Dh	Acc./dec. ramp time of speed jog	0 ms–65535 ms	10	ms	Real-time	
H06.13	2006-0Eh	Speed feedforward smoothing filter	0μs to 65535μs	0	μs	Real-time	
H06.15	2006-10h	Zero clamp speed threshold	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	
H06.16	2006-11h	Threshold of TGON (motor rotation) signal	0[mm/s]/[rpm]–1000[mm/s]/[rpm]	20	[mm/s]/[rpm]	Real-time	
H06.17	2006-12h	Threshold of V-Cmp (speed matching) signal	0[mm/s]/[rpm]–100[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	
H06.18	2006-13h	Threshold of speed reach signal	20[mm/s]/[rpm]–10000[mm/s]/[rpm]	1000	[mm/s]/[rpm]	Real-time	
H06.19	2006-14h	Threshold of zero speed output signal	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	
H06.50	2006-33h	Speed S-curve enable switch	0: Disabled 1: Enabled	1	-	At stop	
H06.51	2006-34h	Increasing acceleration 1 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.52	2006-35h	Decreasing acceleration 1 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.53	2006-36h	Decreasing deceleration 1 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.54	2006-37h	Decreasing acceleration 1	0.0% to 100.0%	50.0	%	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		of speed S-curve deceleration segment					
H06.55	2006-38h	Increasing acceleration 2 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.56	2006-39h	Decreasing acceleration 2 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.57	2006-3Ah	Decreasing deceleration 2 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.58	2006-3Bh	Decreasing acceleration 2 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.59	2006-3Ch	Increasing acceleration 3 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.60	2006-3Dh	Decreasing acceleration 3 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.61	2006-3Eh	Decreasing deceleration 3 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H06.62	2006-3Fh	Decreasing acceleration 3 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.63	2006-40h	Increasing acceleration 4 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.64	2006-41h	Decreasing acceleration 4 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.65	2006-42h	Decreasing deceleration 4 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.66	2006-43h	Decreasing acceleration 4 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.67	2006-44h	Increasing acceleration 5 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.68	2006-45h	Decreasing acceleration 5 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.69	2006-46h	Decreasing deceleration 5 of speed S-curve	0.0% to 100.0%	50.0	%	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		deceleration segment					
H06.70	2006-47h	Decreasing acceleration 5 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.71	2006-48h	Increasing acceleration 6 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.72	2006-49h	Decreasing acceleration 6 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.73	2006-4Ah	Decreasing deceleration 6 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.74	2006-4Bh	Decreasing acceleration 6 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.75	2006-4Ch	Increasing acceleration 7 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.76	2006-4Dh	Decreasing acceleration 7 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.77	2006-4Eh	Decreasing deceleration 7	0.0% to 100.0%	50.0	%	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		of speed S-curve deceleration segment					
H06.78	2006-4Fh	Decreasing acceleration 7 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.79	2006-50h	Increasing acceleration 8 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.80	2006-51h	Decreasing acceleration 8 of speed S-curve acceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.81	2006-52h	Decreasing deceleration 8 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	
H06.82	2006-53h	Decreasing acceleration 8 of speed S-curve deceleration segment	0.0% to 100.0%	50.0	%	At stop	

22.8 H07 Torque Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H07.00	2007-01h	Source of main torque reference A	0: Keypad (H07.03) 1: AI1 2: AI2	0	-	At stop	
H07.01	2007-02h	Source of auxiliary torque reference B	0: Keypad (H07.03) 1: AI1 2: AI2	1	-	At stop	
H07.02	2007-03h	Torque reference source	0: Source of main torque reference A 1: Source of auxiliary torque reference B 2: Source of A+B 3: Switched between A and B 4: Communication	0	-	At stop	
H07.03	2007-04h	Torque reference set through keypad	-400.0% to 400.0%	0.0	%	Real-time	
H07.05	2007-06h	Torque reference filter time constant 1	0.00 ms–30.00 ms	0.50	ms	Real-time	
H07.06	2007-07h	Torque reference filter time constant 2	0.00 ms–30.00 ms	0.27	ms	Real-time	
H07.07	2007-08h	Torque Limit source	0: Positive/Negative internal torque limit 1: Internal or external limit as defined by DI 2: T_LMT 3: T_LMT or external limit as defined by DI (FunIN.16 or FunIN.17) 4: T_LMT or internal limit (FunIN.16 or FunIN.17) as defined by DI	0	-	Real-time	
H07.08	2007-09h	T-LMT selection	1: AI1 2: AI2	1	-	Real-time	
H07.09	2007-0Ah	Positive internal torque limit	0.0% to 400.0%	350.0	%	Real-time	
H07.10	2007-0Bh	Negative internal torque limit	0.0% to 400.0%	350.0	%	Real-time	
H07.11	2007-0Ch	Positive external torque limit	0.0% to 400.0%	350.0	%	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H07.12	2007-0Dh	Negative external torque limit	0.0% to 400.0%	350.0	%	Real-time	
H07.15	2007-10h	Emergency-stop torque	0.0% to 400.0%	100.0	%	Real-time	
H07.17	2007-12h	Speed limit source	0: Internal speed limit 1: V-LMT 2: H07.19 or H07.20 as defined by DI	0	-	Real-time	
H07.18	2007-13h	V-LMT selection	1: AI1 2: AI2	1	-	Real-time	
H07.19	2007-14h	Positive speed limit/Speed limit 1 in torque control	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	Real-time	
H07.20	2007-15h	Negative speed limit/Speed limit 2 in torque control	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	Real-time	
H07.21	2007-16h	Torque reach base value	0.0% to 400.0%	0.0	%	Real-time	
H07.22	2007-17h	Torque reach valid value	0.0% to 400.0%	20.0	%	Real-time	
H07.23	2007-18h	Torque reach invalid value	0.0% to 400.0%	10.0	%	Real-time	
H07.24	2007-19h	Field weakening depth	60% to 115%	115	%	Real-time	
H07.25	2007-1Ah	Max. permissible demagnetizing current	0% to 300%	100	%	Real-time	
H07.26	2007-1Bh	Field weakening selection	0: Disabled 1: Enabled	0	-	At stop	
H07.27	2007-1Ch	Flux weakening gain	0.001 kHz–1.000 kHz	0.030	kHz	Real-time	
H07.28	2007-1Dh	Speed of flux weakening point	0–65535	0	-	Unchangeable	
H07.35	2007-24h	Torque non-standard feature enable	bit0: Motor output correction enable bit1: Shield compensation data enable	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H07.36	2007-25h	Time constant of low-pass filter 2	0.00 ms–10.00 ms	0.00	ms	Real-time	
H07.37	2007-26h	Torque reference filter selection	0: First-order filter 1: Biquad filter	0	-	Real-time	
H07.38	2007-27h	Biquad filter attenuation ratio	0–50	16	-	Real-time	
H07.40	2007-29h	Speed limit threshold in torque control mode	0 ms–300 ms	10	ms	Real-time	
H07.42	2007-2Bh	Biquad low pass filter damping coefficient	0.001–10.000	1.000	-	Real-time	

22.9 H08 Gain Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.00	2008-01h	Speed loop gain	0.0 Hz–2000.0 Hz	40.0	Hz	Real-time	
H08.01	2008-02h	Speed loop integral time constant	0.15 ms–512.00 ms	19.89	ms	Real-time	
H08.02	2008-03h	Position loop gain	0.0 Hz–2000.0 Hz	64.0	Hz	Real-time	
H08.03	2008-04h	2nd speed loop gain	0.1 Hz–2000.0 Hz	75.0	Hz	Real-time	
H08.04	2008-05h	2nd speed loop integral time constant	0.15 ms–512.00 ms	10.61	ms	Real-time	
H08.05	2008-06h	2nd position loop gain	0.1 Hz–2000.0 Hz	120.0	Hz	Real-time	
H08.08	2008-09h	2nd gain mode setting	0: Fixed to the 1st gain, switched between P and PI as defined by bit26 of external 60FEh 1: Switched between the 1st and 2nd gain sets as defined by H08.09	1	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.09	2008-0Ah	Gain switchover condition	0: Fixed to the 1st gain set (PS) 1: Switched as defined by bit26 of 60FEh 2: Torque reference too large (PS) 3: Speed reference too large (PS) 4: Speed reference change rate too large (PS) 5: Speed reference low/high speed threshold (PS) 6: Position deviation too large (P) 7: Position reference available (P) 8: Positioning unfinished (P) 9: Actual speed (P) 10: Position reference + Actual speed (P)	0	-	Real-time	
H08.10	2008-0Bh	Gain switchover delay	0.0 ms–1000.0 ms	5.0	ms	Real-time	
H08.11	2008-0Ch	Gain switchover level	0–20000	50	-	Real-time	
H08.12	2008-0Dh	Gain switchover hysteresis	0–20000	30	-	Real-time	
H08.13	2008-0Eh	Position gain switchover time	0.0 ms–1000.0 ms	3.0	ms	Real-time	
H08.15	2008-10h	Load moment of inertia ratio	0.00–120.00	1.00	-	Real-time	
H08.17	2008-12h	Zero phase delay	0.0 ms–4.0 ms	0.0	ms	Real-time	
H08.18	2008-13h	Time constant of speed feedforward filter	0.00 ms–64.00 ms	0.50	ms	Real-time	
H08.19	2008-14h	Speed feedforward gain	0.0% to 100.0%	0.0	%	Real-time	
H08.20	2008-15h	Torque feedforward filter time constant	0.00 ms–64.00 ms	0.50	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.21	2008-16h	Torque feedforward gain	0.0% to 300.0%	0.0	%	Real-time	
H08.22	2008-17h	Speed feedback filtering option	0: Inhibited 1: 2 times 2: 4 times 3: 8 times 4: 16 times	0	-	At stop	
H08.23	2008-18h	Cutoff frequency of speed feedback low-pass filter	100 Hz–8000 Hz	8000	Hz	Real-time	
H08.24	2008-19h	PDFF control coefficient	0.0% to 200.0%	100.0	%	Real-time	
H08.25	2008-1Ah	Speed measurement method	0: M-method 1: MT-method	0	-	At stop	
H08.27	2008-1Ch	Speed observer cutoff frequency	50 Hz–600 Hz	170	Hz	Real-time	
H08.28	2008-1Dh	Speed observer inertia correction coefficient	1% to 1600%	100	%	Real-time	
H08.29	2008-1Eh	Speed observer filter time	0.00 ms–10.00 ms	0.80	ms	Real-time	
H08.31	2008-20h	Disturbance cutoff frequency	1 Hz–4000 Hz	600	Hz	Real-time	
H08.32	2008-21h	Disturbance compensation gain	0% to 100%	0	%	Real-time	
H08.33	2008-22h	Disturbance observer inertia correction coefficient	1% to 1600%	100	%	Real-time	
H08.37	2008-26h	Phase modulation for medium-frequency jitter suppression 2	-90° to 90°	0	°	Real-time	
H08.38	2008-27h	Medium-frequency suppression 2 frequency	0 Hz–1000 Hz	0	Hz	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.39	2008-28h	Compensation gain of medium-frequency jitter suppression 2	0% to 300%	0	%	Real-time	
H08.40	2008-29h	Speed observer selection	0: Disabled 1: Enabled	0	-	Real-time	
H08.42	2008-2Bh	Model control selection	0: Disabled 1: Enabled 2: Reserved 4: Model tracking B	0	-	Real-time	
H08.43	2008-2Ch	Model gain	0.1–2000.0	40.0	-	Real-time	
H08.46	2008-2Fh	Feedforward value	0.0–102.4	95.0	-	Real-time	
H08.48	2008-31h	Model torque feedforward forward compensation coefficient	0.0–204.8	102.4	-	Real-time	
H08.49	2008-32h	Model torque feedforward reverse compensation coefficient	0.0–204.8	102.4	-	Real-time	
H08.53	2008-36h	Medium- and low-frequency jitter suppression frequency 3	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	
H08.54	2008-37h	Medium- and low-frequency jitter suppression compensation 3	0% to 200%	0	%	Real-time	
H08.56	2008-39h	Medium- and low-frequency jitter suppression phase modulation 3	0% to 600%	100	%	Real-time	
H08.59	2008-3Ch	Medium- and low-frequency jitter suppression frequency 4	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.60	2008-3Dh	Medium- and low-frequency jitter suppression compensation 4	0% to 200%	0	%	Real-time	
H08.61	2008-3Eh	Medium- and low-frequency jitter suppression phase modulation 4	0% to 600%	100	%	Real-time	
H08.62	2008-3Fh	Position loop integral time constant	0.15–512.00	512.00	-	Real-time	
H08.63	2008-40h	2nd position loop integral time constant	0.15–512.00	512.00	-	Real-time	
H08.64	2008-41h	Speed observer feedback source	0: Observer output speed 1: Observer observed speed	0	-	Real-time	
H08.65	2008-42h	Zero deviation control selection	0: Disabled 1: Enabled	0	-	Real-time	
H08.66	2008-43h	Zero deviation control position average filter	0.0 ms–320.0 ms	5.0	ms	At stop	
H08.68	2008-45h	Speed feedforward of zero deviation control	0.0% to 100.0%	100.0	%	Real-time	
H08.69	2008-46h	Torque feedforward of zero deviation control	0.0% to 100.0%	100.0	%	Real-time	
H08.90	2008-5Bh	Encoder scale spacing ripple suppressor enable	0: Disabled 1: 1st group activated only-adaptive mode 2: 1st group activated only-hysteresis mode 3: Two groups activated-adaptive mode 4: Two groups activated-hysteresis mode	0	-	Real-time	

22.10H09 Auto-tuning Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.00	2009-01h	Auto-adjustment mode	0: Disabled, manual gain tuning required 1: Enabled, gain parameters generated automatically based on the stiffness level 2: Positioning mode, gain parameters generated automatically based on the stiffness level 3: Interpolation mode+Inertia auto-tuning 4: Normal mode+Inertia auto-tuning 5: Stune mode 5 6: Quick positioning mode+Inertia auto-tuning 9: Model tracking + Inertia auto-tuning + Friction force compensation	4	-	Real-time	
H09.01	2009-02h	Stiffness level selection	0–41	15	-	Real-time	
H09.02	2009-03h	Mode selection of adaptive notch	0: Adaptive notch no longer updated 1: One adaptive notch activated (3rd notch) 2: Two adaptive notches activated (3rd and 4th notches) 3: Resonance point tested only (displayed in H09.24) 4: Adaptive notch cleared, values of 3rd and 4th notches restored to default	0	-	Real-time	
H09.03	2009-04h	Online inertia auto-tuning mode	0: Disabled 1: Enabled, changing slowly 2: Enabled, changing normally 3: Enabled, changing quickly	0	-	Real-time	
H09.05	2009-06h	Offline inertia auto-tuning mode	0: Bi-directional 1: Unidirectional	0	-	At stop	
H09.06	2009-07h	Max. speed of inertia auto-tuning	100[mm/s]/[rpm]–1000[mm/s]/[rpm]	500	[mm/s]/[rpm]	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.07	2009-08h	Time constant for accelerating to max. speed during inertia auto-tuning	10 ms–5000 ms	125	ms	At stop	
H09.08	2009-09h	Interval time after an individual inertia auto-tuning	50 ms–10000 ms	800	ms	At stop	
H09.09	2009-0Ah	Motor rotating distance per inertia auto-tuning	0.00[mm]/[Rev]–100.00[mm]/[Rev]	1.00	[mm]/[Rev]	Real-time	
H09.11	2009-0Ch	Vibration threshold	0.0% to 100.0%	5.0	%	Real-time	
H09.12	2009-0Dh	Frequency of the 1st notch	50 Hz–8000 Hz	8000	Hz	Real-time	
H09.13	2009-0Eh	Width level of the 1st notch	0–20	2	-	Real-time	
H09.14	2009-0Fh	Depth level of the 1st notch	0–99	0	-	Real-time	
H09.15	2009-10h	Frequency of the 2nd notch	50 Hz–8000 Hz	8000	Hz	Real-time	
H09.16	2009-11h	Width level of the 2nd notch	0–20	2	-	Real-time	
H09.17	2009-12h	Depth level of the 2nd notch	0–99	0	-	Real-time	
H09.18	2009-13h	Frequency of the 3rd notch	50 Hz–8000 Hz	8000	Hz	Real-time	
H09.19	2009-14h	Width level of the 3rd notch	0–20	2	-	Real-time	
H09.20	2009-15h	Depth level of the 3rd notch	0–99	0	-	Real-time	
H09.21	2009-16h	Frequency of the 4th notch	50 Hz–8000 Hz	8000	Hz	Real-time	
H09.22	2009-17h	Width level of the 4th notch	0–20	2	-	Real-time	
H09.23	2009-18h	Depth level of the 4th notch	0–99	0	-	Real-time	
H09.24	2009-19h	Auto-tuned resonance frequency	0 Hz–5000 Hz	0	Hz	Unchangeable	
H09.32	2009-21h	Gravity compensation value	-100.0% to 100.0%	0.0	%	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.33	2009-22h	Positive friction compensation value	0.0% to 100.0%	0.0	%	Real-time	
H09.34	2009-23h	Negative friction compensation value	-100.0% to 0.0%	0.0	%	Real-time	
H09.35	2009-24h	Friction compensation speed	0.0–20.0	2.0	-	Real-time	
H09.36	2009-25h	Friction compensation speed	0: Slow mode+Speed reference 1: Slow mode+Model speed 2: Slow mode+Speed feedback 3: Slow mode+Observe speed 16: Quick mode +Speed reference 17: Quick mode +Model speed 18: Quick mode +Speed feedback 19: Quick mode+Observe speed	0x0	-	Real-time	
H09.37	2009-26h	Vibration monitoring time	0–65535	300	-	Real-time	
H09.38	2009-27h	Frequency of low-frequency resonance suppression 1 at the mechanical end	1.0 Hz–100.0 Hz	100.0	Hz	At stop	
H09.39	2009-28h	Low-frequency resonance suppression 1 at the mechanical end	0–3	2	-	At stop	
H09.44	2009-2Dh	Frequency of low-frequency resonance suppression 2 at the mechanical end	0.0 Hz–200.0 Hz	0.0	Hz	At stop	
H09.45	2009-2Eh	Responsiveness of low-frequency resonance suppression 2	0.01–10.00	1.00	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		at mechanical load end					
H09.47	2009-30h	Width of low-frequency resonance suppression 2 at mechanical load end	0.00–2.00	1.00	-	At stop	
H09.49	2009-32h	Frequency of low-frequency resonance suppression 3 at the mechanical end	0.0 Hz–200.0 Hz	0.0	Hz	At stop	
H09.50	2009-33h	Responsiveness of low-frequency resonance suppression 3 at mechanical load end	0.01–10.00	1.00	-	At stop	
H09.52	2009-35h	Width of low-frequency resonance suppression 3 at mechanical load end	0.00–2.00	1.00	-	At stop	
H09.54	2009-37h	Resonance detection torque threshold	0.0% to 300.0%	50.0	%	Real-time	
H09.56	2009-39h	Max. overshoot allowed by ETune	0–65535	2936	-	Real-time	
H09.57	2009-3Ah	STune resonance suppression switchover frequency	0 Hz–4000 Hz	650	Hz	Real-time	
H09.58	2009-3Bh	STune resonance suppression reset selection	0: Disabled 1: Enabled	0	-	Real-time	
H09.62	2009-3Fh	Stune stop delay judgment	0.00 ms–50.00 ms	1.00	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.63	2009-40h	STune quick convergence speed	0.00–50.00	1.00	-	Real-time	
H09.71	2009-48h	Starting frequency	0 Hz–8000 Hz	15	Hz	Real-time	
H09.72	2009-49h	End frequency	0 Hz–8000 Hz	8000	Hz	Real-time	
H09.73	2009-4Ah	Frequency subdivision	0–500	50	-	Real-time	
H09.74	2009-4Bh	Excitation amplitude	0.0% to 400.0%	15.0	%	Real-time	
H09.75	2009-4Ch	Starting frequency 2	0 Hz–8000 Hz	500	Hz	Real-time	
H09.76	2009-4Dh	Frequency subdivision 2	0–1000	500	-	Real-time	
H09.77	2009-4Eh	Biquad filter mode	0: Disabled 1: First-order low-pass 2: Second-order low-pass 3: Notch 4: Lead-lag 5: User-defined	0	-	Real-time	
H09.78	2009-4Fh	Biquad filter numerator frequency	0 Hz–16000 Hz	8000	Hz	Real-time	
H09.79	2009-50h	Biquad filter numerator damping coefficient	0.001–10.000	1.000	-	Real-time	
H09.80	2009-51h	Biquad filter denominator frequency	0 Hz–16000 Hz	8000	Hz	Real-time	
H09.81	2009-52h	Biquad filter denominator damping coefficient	0.001–10.000	1.000	-	Real-time	
H09.82	2009-53h	Vibration frequency 1	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	
H09.83	2009-54h	Resonance frequency 1	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	
H09.84	2009-55h	Vibration damping 1	0.00–0.50	0.05	-	Real-time	
H09.85	2009-56h	Resonance damping 1	0.00–0.50	0.05	-	Real-time	
H09.86	2009-57h	Vibration frequency 2	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.87	2009-58h	Resonance frequency 2	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	
H09.88	2009-59h	Vibration damping 2	0.00–0.50	0.05	-	Real-time	
H09.89	2009-5Ah	Resonance damping 2	0.00–0.50	0.05	-	Real-time	
H09.92	2009-5Dh	Model friction force compensation enable	0: Disabled 1: Enabled	1	-	Real-time	
H09.93	2009-5Eh	Model friction force compensation coefficient	0.00%/1000 rpm–50.00%/1000 rpm	0.00	%/1000 rpm	Real-time	
H09.98	2009-63h	Vibration suppression auto-tuning	0: Disabled 1: Fast auto-tuning 2: Slow auto-tuning	0	-	Real-time	

22.11H0A Fault and Protection Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.00	200A-01h	Power input phase loss and failure protection	0: Enable 1: Disable	0	-	Real-time	
H0A.01	200A-02h	Absolute position limit	0: Disabled 1: Enabled 2: Enabled after homing	0	-	Real-time	
H0A.04	200A-05h	Motor overload protection gain	50 to 300	100	-	Real-time	
H0A.08	200A-09h	Overspeed threshold	0[mm/s]/[rpm]–20000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	
H0A.10	200A-0Bh	Threshold of excessive local position deviation	0 to 4294967295	219895614	encoder unit	Real-time	
H0A.12	200A-0Dh	Runaway protection enable	0: Disabled 1: Runaway protection scheme 1 2: Runaway protection scheme 2	1	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.13	200A-0Eh	Angle auto-tuning mode	0: pre-positioning 1: Inching 2: Voltage injection 6: Static hall 8: Closed-loop pre-positioning 9: Position locking	0	-	At stop	
H0A.17	200A-12h	Reference pulse selection	0: Pulse unit 1: Reference unit	1	-	At stop	
H0A.18	200A-13h	IGBT over-temperature threshold	120°C–175°C	140	°C	Real-time	
H0A.19	200A-14h	Filter time constant of touch probe 1	0.00μs to 6.30μs	2.00	μs	Real-time	
H0A.20	200A-15h	Filter time constant of touch probe 2	0.00μs to 6.30μs	2.00	μs	Real-time	
H0A.21	200A-16h	STO function display selection	0 to 7	0	-	Real-time	
H0A.23	200A-18h	TZ signal filter time	0 ns–31 ns	15	25ns	At stop	
H0A.25	200A-1Ah	Speed display DO low-pass filter time	0 ms–5000 ms	0	ms	At stop	
H0A.26	200A-1Bh	Motor overload detection	0: Show motor overload alarm (E909.0) and fault (E620.0) 1: Hide motor overload alarm (E909.0) and fault (E620.0)	0	-	Real-time	
H0A.27	200A-1Ch	Average filter time for speed display DO	0 ms–100 ms	50	ms	At stop	
H0A.28	200A-1Dh	Quadrature encoder filter time	0 ns–255 ns	2	25ns	At stop	
H0A.29	200A-1Eh	Fully closed-loop encoder (ABZ) filter time	bit0–bit7: Fully closed loop encoder (ABZ) pulse signal filtering time bit8–bit15: Fully closed loop encoder (ABZ) wire breakage filter time	4111	25ns	At stop	
H0A.32	200A-21h	Time threshold for locked motor overheat protection	10 ms–65535 ms	200	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.33	200A-22h	Locked motor overheat protection	0: Disabled 1: Enabled	1	-	Real-time	
H0A.36	200A-25h	Encoder multi-turn overflow fault selection	0: Not hide 1: Hide	0	-	Real-time	
H0A.40	200A-29h	Compensation function selection	bit0: Overtravel compensation 0: Enabled 1: Disabled bit1: Touch probe rising edge compensation 0: Disabled 1: Enabled bit2: Touch probe falling edge compensation 0: Disabled 1: Enabled bit3: Touch probe scheme 0: New scheme 1: Old scheme (same as SV660N) bit4: Probe 2 separate compensation time enable 0: Disabled 1: Enabled	0x6	-	At stop	
H0A.41	200A-2Ah	Forward position of software position limit	-2147483648 to 2147483647	2147483647	encoder unit	At stop	
H0A.43	200A-2Ch	Reverse position of software position limit	-2147483648 to 2147483647	-2147483648	encoder unit	At stop	
H0A.50	200A-33h	Encoder communication fault tolerance threshold	0 to 31	31	-	Real-time	
H0A.51	200A-34h	Phase loss detection filter times	3 ms–36 ms	20	55ms	Real-time	
H0A.52	200A-35h	Encoder temperature protection threshold	0°C–175°C	120	°C	Real-time	
H0A.53	200A-36h	Probe DI ON compensation time	-3000 ns–3000 ns	200	25ns	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.54	200A-37h	Probe DI OFF compensation time	-3000 ns–3000 ns	1512	25ns	Real-time	
H0A.55	200A-38h	Runaway current threshold	100.0% to 400.0%	200.0	%	Real-time	
H0A.56	200A-39h	Fault reset delay	0 ms–60000 ms	10000	ms	Real-time	
H0A.57	200A-3Ah	Runaway speed threshold	1[mm/s]/[rpm]–1000[mm/s]/[rpm]	50	[mm/s]/[rpm]	Real-time	
H0A.58	200A-3Bh	Runaway speed filter time	0.1 ms–100.0 ms	2.0	ms	Real-time	
H0A.59	200A-3Ch	Runaway protection detection time	10 ms–1000 ms	30	ms	Real-time	
H0A.60	200A-3Dh	Black box function mode	0: Disable 1: Any fault 2: Designated fault 3: Triggered based on designated condition	1	-	Real-time	
H0A.61	200A-3Eh	Designated fault code	0.0 to 6553.5	0.0	-	Real-time	
H0A.62	200A-3Fh	Trigger source	0 to 27	0	-	Real-time	
H0A.63	200A-40h	Trigger level	-2147483648 to 2147483647	0	-	Real-time	
H0A.65	200A-42h	Trigger level	0: Rising edge 1: Equal 2: Falling edge 3: Edge-triggered	0	-	Real-time	
H0A.66	200A-43h	Trigger position	0% to 100%	75	%	Real-time	
H0A.67	200A-44h	Sampling frequency	0: Current loop 1: Position loop 2: Main cycle	0	-	Real-time	
H0A.70	200A-47h	Overspeed threshold 2	0[mm/s]/[rpm]–20000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	
H0A.71	200A-48h	Internal function switch	0 to 65535	4098	-	Real-time	
H0A.72	200A-49h	Maximum stop time in ramp-to-stop	0 ms–65535 ms	10000	ms	At stop	
H0A.73	200A-4Ah	STO 24 V disconnection filter time	1 ms–5 ms	1	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.74	200A-4Bh	Filter time for two inconsistent STO channels	1 ms–1000 ms	100	ms	Real-time	
H0A.75	200A-4Ch	Servo OFF delay after STO triggered	0 ms–25 ms	20	ms	Real-time	
H0A.87	200A-58h	Hall state fault filtering count	0 to 1000	1	-	Real-time	
H0A.88	200A-59h	Alarm enable	0 to 3	0	-	At stop	
H0A.89	200A-5Ah	Correct state of DDL BiSS-C data	0 to 31	1	-	At stop	
H0A.90	200A-5Bh	Speed display low-pass filter time	0 ms–100 ms	0	ms	At stop	
H0A.91	200A-5Ch	Moving average filter time for torque display values	0 ms–100 ms	0	ms	At stop	
H0A.92	200A-5Dh	Moving average filter time for position display values	0 ms–100 ms	0	ms	At stop	
H0A.93	200A-5Eh	Low-pass filter time for voltage display values	0 ms–250 ms	0	ms	At stop	
H0A.94	200A-5Fh	Low-pass filter time for thermal display values	0 ms–250 ms	0	ms	At stop	

22.12H0b Monitoring Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.00	200b-01h	Motor speed actual value	-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]	0	[mm/s]/[rpm]	Unchangeable	
H0b.01	200b-02h	Speed reference	-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]	0	[mm/s]/[rpm]	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.02	200b-03h	Internal torque reference	-3276.7% to 3276.7%	0.0	%	Unchangeable	
H0b.03	200b-04h	Input (DI) signal monitoring	0–65535	0	-	Unchangeable	
H0b.05	200b-06h	Output (DO) signal monitoring	0–65535	0	-	Unchangeable	
H0b.07	200b-08h	Absolute position counter	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
H0b.09	200b-0Ah	Mechanical angle	0.0° to 360.0°	0.0	°	Unchangeable	
H0b.10	200b-0Bh	Electrical angle	0.0° to 360.0°	0.0	°	Unchangeable	
H0b.12	200b-0Dh	Average load ratio	0.0% to 800.0%	0.0	%	Unchangeable	
H0b.15	200b-10h	Position following error (encoder unit)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0b.17	200b-12h	Feedback pulse counter	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0b.19	200b-14h	Total power-on time	0.0s–429496729.5s	0.0	s	Unchangeable	
H0b.21	200b-16h	Displayed AI1 voltage	-327.67 V–327.67 V	0.00	V	Unchangeable	
H0b.22	200b-17h	Displayed AI2 voltage	-327.67 V–327.67 V	0.00	V	Unchangeable	
H0b.24	200b-19h	Phase current RMS value	0.0 A–6553.5 A	0.0	A	Unchangeable	
H0b.25	200b-1Ah	Angle obtained upon voltage injection auto-tuning	0.0° to 360.0°	0.0	°	Unchangeable	
H0b.26	200b-1Bh	Bus voltage	0.0 V–6553.5 V	0.0	V	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.27	200b-1Ch	Module temperature	-20°C–200°C	0	°C	Unchangeable	
H0b.28	200b-1Dh	Absolute encoder fault information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.29	200b-1Eh	Axis status information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.30	200b-1Fh	Axis fault information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.31	200b-20h	Encoder fault information	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.33	200b-22h	Fault log	0: Present fault 1: Last fault 2: 2nd to last fault 3: 3rd to last fault 4: 4th to last fault 5: 5th to last fault 6: 6th to last fault 7: 7th to last fault 8: 8th to last fault 9: 9th to last fault 10: 10th to last fault 11: 11th to last fault 12: 12th to last fault 13: 13th to last fault 14: 14th to last fault 15: 15th to last fault 16: 16th to last fault 17: 17th to last fault 18: 18th to last fault 19: 19th to last fault	0	-	Real-time	
H0b.34	200b-23h	Fault code of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.35	200b-24h	Timestamp of the selected fault	0.0s–429496729.5s	0.0	s	Unchangeable	
H0b.37	200b-26h	Motor speed upon occurrence of the selected fault	-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]	0	[mm/s]/[rpm]	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.38	200b-27h	Motor phase U current upon occurrence of the selected fault	-3276.7 A–3276.7 A	0.0	A	Unchangeable	
H0b.39	200b-28h	Motor phase V current upon occurrence of the selected fault	-3276.7 A–3276.7 A	0.0	A	Unchangeable	
H0b.40	200b-29h	Bus voltage upon occurrence of the selected fault	0.0 V–6553.5 V	0.0	V	Unchangeable	
H0b.41	200b-2Ah	Input terminal state on selected fault	0–65535	0	-	Unchangeable	
H0b.43	200b-2Ch	Output terminal status upon occurrence of the selected fault	0–65535	0	-	Unchangeable	
H0b.45	200b-2Eh	Internal fault code	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.46	200b-2Fh	Absolute encoder fault information given by FPGA upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.47	200b-30h	System status information given by FPGA upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.48	200b-31h	System fault information given by FPGA upon occurrence of	0x0 to 0xFFFF	0x0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		the selected fault					
H0b.49	200b-32h	Encoder fault information upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.51	200b-34h	Internal fault code upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.52	200b-35h	FPGA timeout fault standard bit upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.53	200b-36h	Position following error (reference unit)	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
H0b.55	200b-38h	Actual motor speed 2	-214748364.8[mm/s]/[rpm]–214748364.7[mm/s]/[rpm]	0.0	[mm/s]/[rpm]	Unchangeable	
H0b.57	200b-3Ah	Control circuit bus voltage	0.0 V–6553.5 V	0.0	V	Unchangeable	
H0b.58	200b-3Bh	Mechanical absolute position (low 32 bits)	0 to 4294967295	0	Encoder unit	Unchangeable	
H0b.60	200b-3Dh	Mechanical absolute position (high 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0b.63	200b-40h	NotRdy state	0: Normal 1: Control circuit error 2: Main circuit power input error 3: Bus undervoltage 4: Soft start failed 5: Encoder initialization undone	0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			6: Short circuit to ground failed 7: Others 9: Fully closed-loop encoder initialization not completed				
H0b.66	200b-43h	Encoder temperature	-32768°C–32767°C	0	°C	Unchangeable	
H0b.67	200b-44h	Load rate of braking resistor	0.0% to 200.0%	0.0	%	Unchangeable	
H0b.70	200b-47h	Number of absolute encoder revolutions	-32768Rev to 32767Rev	0	Rev	Unchangeable	
H0b.71	200b-48h	Single-turn position fed back by the absolute encoder	0 to 2147483647	0	Encoder unit	Unchangeable	
H0b.74	200b-4Bh	System fault information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.77	200b-4Eh	Encoder position (low 32 bits)	0 to 4294967295	0	Encoder unit	Unchangeable	
H0b.79	200b-50h	Encoder position (high 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0b.81	200b-52h	Single-turn position of the rotary load (low 32 bits)	0 to 4294967295	0	Encoder unit	Unchangeable	
H0b.83	200b-54h	Single-turn position of the rotary load (high 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0b.85	200b-56h	Single-turn position of the rotary load (reference unit)	0 to 4294967295	0	Reference unit	Unchangeable	
H0b.87	200b-58h	IGBT junction temperature	0–200	0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.90	200b-5Bh	Group No. of the abnormal parameter	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0b.91	200b-5Ch	Offset within the group of the abnormal parameter	0–65535	0	-	Unchangeable	
H0b.92	200b-5Dh	Hall state	0–65535	0	-	Unchangeable	
H0b.93	200b-5Eh	Closed loop state	0: Half closed loop 1: Fully closed loop	0	-	Unchangeable	
H0b.94	200b-5Fh	Individual power-on time	0.0s–429496729.5s	0.0	s	Unchangeable	
H0b.96	200b-61h	Individual power-on time upon occurrence of the selected fault	0.0s–429496729.5s	0.0	s	Unchangeable	
H0b.98	200b-63h	Dynamic braking resistor load rate	0.0% to 200.0%	0.0	%	Unchangeable	

22.13H0C Fault and Protection Parameters 2

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H0C.53	200C-36h	Probe DI ON compensation time 2	-3000 ns–3000 ns	200	25ns	Real-time	
H0C.54	200C-37h	Probe DI OFF compensation time 2	-3000 ns–3000 ns	1512	25ns	Real-time	
H0C.71	200C-48h	Internal function switch 2	0–65535	512	-	Real-time	

22.14H0d Auxiliary Function Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0d.00	200d-01h	Software Reset	0: No operation 1: Enable	0	-	At stop	
H0d.01	200d-02h	Fault Reset	0: No operation 1: Enable	0	-	At stop	
H0d.02	200d-03h	Inertia auto-tuning enable	0–65	0	-	Real-time	
H0d.04	200d-05h	Read/write in encoder ROM	0: No operation 1: Write ROM 2: Read ROM 3: ROM failure	0	-	At stop	
H0d.05	200d-06h	Emergency stop	0: No operation 1: Emergency stop	0	-	Real-time	
H0d.06	200d-07h	Current loop auto-tuning test	0: No operation 1: Enable current loop auto-tuning 2: Enable current loop step test (static) 3: Enable current loop step test	0	-	At stop	
H0d.10	200d-0Bh	Analog channel auto adjusting	0: No operation 1: Adjusted through AI1 2: Adjusted through AI2	0	-	At stop	
H0d.12	200d-0Dh	Phase U/V current balance correction	0: Disabled 1: Enabled	0	-	At stop	
H0d.17	200d-12h	Forced DI/DO enable switch	bit0: Forced DI enable switch 0: Disabled 1: Enabled bit1: Forced DO enable switch 0: Disabled 1: Enabled	0	-	Real-time	
H0d.18	200d-13h	Forced DI value	0x0 to 0x1F	0x1F	-	Real-time	
H0d.19	200d-14h	Forced DO value	0x0 to 0x3	0x0	-	Real-time	
H0d.20	200d-15h	Absolute encoder reset	0: No operation 1: Reset fault 2: Reset fault and multi-turn data 3: Reset Inovance 2nd encoder fault 4: Reset Inovance 2nd encoder fault and multi-turn data	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0d.21	200d-16h	Read error status bit of Nikon and EnDat2.2 encoders	0: No operation 1: Reading error status bit	0	-	At stop	
H0d.29	200d-1Eh	Motor parameter auto-tuning	0: No operation 1: Enabled	0	-	At stop	

22.15H0E Communication Function Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0E.00	200E-01h	Node address	1–127	1	-	At stop	
H0E.01	200E-02h	Save objects written through communication to EEPROM	0: Not save 1: Save parameters 2: Save object dictionaries 3: Save parameters and object dictionaries 4: Save object dictionaries written before communication (OP) 255: Determine through H0E03 and H0E04	4	-	Real-time	
H0E.03	200E-04h	Save objects written through software (commissioning protocol) to EEPROM	0: Do not save 1: Save	1	-	Real-time	
H0E.04	200E-05h	Save objects written through communication to EEPROM (excluding commissioning protocol)	0: Do not save 1: Save	0	-	Real-time	
H0E.07	200E-08h	Object dictionary unit selection	0: Reference unit system (p/s, p/s^2) 1: User unit system (0.01 [mm/s]/[rpm], ms)	0	-	At stop	
H0E.20	200E-15h	EtherCAT slave name	0–65535	0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0E.21	200E-16h	EtherCAT slave alias	0–65535	0	-	At stop	
H0E.22	200E-17h	Number of synchronous loss events allowed by EtherCAT	1–20	8	-	Real-time	
H0E.24	200E-19h	Sync loss count	0–65535	0	-	Un changeable	
H0E.25	200E-1Ah	Max. error value and invalid frames of EtherCAT port 0 per unit time	0x0 to 0xFFFF	0x0	-	Un changeable	
H0E.26	200E-1Bh	Max. error value and invalid frames of EtherCAT port 1 per unit time	0x0 to 0xFFFF	0x0	-	Un changeable	
H0E.27	200E-1Ch	Max. transfer error of EtherCAT port per unit time	0x0 to 0xFFFF	0x0	-	Un changeable	
H0E.28	200E-1Dh	Max. EtherCAT data frame processing unit error per unit time	0x0 to 0xFF	0x0	-	Un changeable	
H0E.29	200E-1Eh	Max. link loss value of EtherCAT port 0 per unit time	0x0 to 0xFFFF	0x0	-	Un changeable	
H0E.31	200E-20h	EtherCAT synchronization mode setting	0–3	2	-	At stop	
H0E.32	200E-21h	EtherCAT synchronization error threshold	100 ns–8000 ns	4000	ns	At stop	
H0E.33	200E-22h	EtherCAT state machine status and port connection status	0x0 to 0xFFFF	0x0	-	Un changeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0E.34	200E-23h	Excessive CSP position command increment count	1–30	20	-	Real-time	
H0E.35	200E-24h	AL fault code	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0E.36	200E-25h	EtherCAT enhanced link enable	0: Disabled 1: Enabled	0	-	Real-time	
H0E.37	200E-26h	EtherCAT XML reset selection	0: Disabled 1: Enabled	0	-	Real-time	
H0E.73	200E-4Ah	EtherCAT port control mode and status display	0x0 to 0xFFFF	0x0	-	Unchangeable	
H0E.80	200E-51h	Modbus baud rate	0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps	9	-	Real-time	
H0E.81	200E-52h	Modbus data format	0: No parity, 2 stop bits (N-2) 1: Even parity, 1 stop bit (E-1) 2: Odd parity, 1 stop bit (O-1) 3: No parity, 1 stop bit (N-1)	3	-	Real-time	
H0E.82	200E-53h	Modbus response delay	0 ms–20 ms	0	ms	Real-time	
H0E.83	200E-54h	Modbus communication timeout	0 ms–600 ms	0	ms	Real-time	
H0E.84	200E-55h	Sequence of Modbus communication data bits	0: High bits before low bits 1: Low bits before high bits	1	-	Real-time	
H0E.90	200E-5Bh	Communication version	0.00–655.35	0.00	-	Unchangeable	
H0E.96	200E-61h	XML version information	0.00–655.35	0.00	-	Unchangeable	

22.16H0F Fully Closed-loop Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.00	200F-01h	Encoder feedback mode	0: Internal encoder feedback 1: External encoder feedback 2: Inner/Outer loop switchover	0	-	Real-time	
H0F.01	200F-02h	Fully closed-loop encoder application mode	0: Standard operating direction 1: Reverse operating direction	0	-	Real-time	
H0F.02	200F-03h	Fully closed-loop encoder absolute value	0: Incremental mode 1: Absolute linear mode	0	-	At stop	
H0F.03	200F-04h	Fully closed-loop encoder feedback type	0: Quadrature pulse 1: Inovance 2: BiSS-C 3: EnDat2.2 4: SSI	0	-	At stop	
H0F.04	200F-05h	Number of fully closed-loop encoder pulses per revolution	1–2147483647	10000	-	At stop	
H0F.06	200F-07h	Fully closed-loop encoder interface	0: CN2 1: CN7	1	-	At stop	
H0F.08	200F-09h	Excessive deviation threshold in compound control mode	0–2147483647	1000	-	Real-time	
H0F.10	200F-0Bh	Clear deviation in compound control mode	0 Rev to 100 Rev	1	Rev	Real-time	
H0F.13	200F-0Eh	Compound vibration suppression filter time	0.0 ms–6553.5 ms	0.0	ms	At stop	
H0F.16	200F-11h	Pulse deviation display in compound control mode	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0F.18	200F-13h	Internal position pulse feedback display	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	
H0F.20	200F-15h	Fully closed-loop encoder	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		position pulse feedback display					
H0F.22	200F-17h	Quadrature pulse phase Z detection invalid in fully closed-loop mode	0: Detected 1: Not detected	0	-	Real-time	
H0F.23	200F-18h	BiSS-C/SSI/ EDNAT2.2 fully closed-loop encoder absolute homing offset	-2147483648–2147483647	0	-	Real-time	
H0F.25	200F-1Ah	Set the source of touch probe Z signal in fully closed-loop mode.	0: Motor Z signal 1: External feedback Z signal	0	-	Real-time	
H0F.26	200F-1Bh	BiSS-C/SSI/ EDNAT2.2 fully closed-loop encoder absolute feedback offset	-2147483648–2147483647	0	-	Real-time	
H0F.28	200F-1Dh	Index value of BiSS-C/SSI communication alarm	0–65535	0	-	Unchangeable	
H0F.29	200F-1Eh	CRC of BiSS-C/ SSI fully closed-loop encoder feedback	0: Positive 1: Negative	1	-	Real-time	
H0F.30	200F-1Fh	BiSS-C/SSI/ EDNAT2.2 valid bits of encoder communication position feedback in full closed-loop mode	0–127	29	-	At stop	
H0F.31	200F-20h	Valid bit of BiSS-C/SSI encoder communication alarm index in	0–31	2	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		full closed-loop mode					
H0F.32	200F-21h	BiSS-C/SSI/ ENDAT encoder communication frequency in fully closed-loop mode	0 kHz–10000 kHz	2000	kHz	Real-time	
H0F.33	200F-22h	SSI/ENDAT encoder recovery time in fully closed-loop mode	0.000μs to 40.000μs	0.500	μs	Real-time	
H0F.35	200F-24h	BiSS-C error detection enable in fully closed-loop mode	0: Disabled 1: Enabled	0	-	At stop	
H0F.36	200F-25h	BiSS-C error bit polarity in fully closed-loop mode	0: Positive 1: Negative	0	-	At stop	
H0F.40	200F-29h	Fully closed-loop communication encoder fault info	0–65535	0	-	Unchangeable	
H0F.41	200F-2Ah	Inovance fully closed-loop encoder version	0.0–6553.5	0.0	-	Unchangeable	
H0F.42	200F-2Bh	Inovance fully closed-loop encoder resolution	0–4294967295	0	-	Unchangeable	
H0F.45	200F-2Eh	Positioning completed/ Position deviation threshold in fully closed-loop mode	0: Threshold scaled to outer loop unit 1: Same threshold used for inner and outer loops	0	-	At stop	
H0F.51	200F-34h	SSI encoder check bit selection in	0: No check 1: Check applied	1	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		fully closed-loop mode					
H0F.52	200F-35h	SSI encoder code system in full closed-loop mode	0: Binary 1: Gray code	1	-	At stop	
H0F.53	200F-36h	SSI encoder state word code system in fully closed-loop mode	0: Binary 1: Gray code	1	-	At stop	
H0F.54	200F-37h	SSI encoder parity check in fully closed-loop mode	0: Disabled 1: Enabled	0	-	At stop	
H0F.55	200F-38h	Fully closed-loop encoder communication timeout error count	0–65535	0	-	Unchangeable	
H0F.56	200F-39h	Encoder CRC error count in fully closed-loop mode	0–65535	0	-	Unchangeable	
H0F.57	200F-3Ah	Fully closed-loop encoder communication frame stop bit error count.	0–65535	0	-	Unchangeable	

22.17H11 Multi-Position Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H11.00	2011-01h	Multi-position running mode	0: Single run (number of displacements selected in H11.01) 1: Cyclic operation (number of displacement selected in H11.01) 2: DI-based operation (selected by DI) 3: Sequential operation 5: Axis-controlled continuous operation	1	-	At stop	
H11.01	2011-02h	Number of displacement references in multi-position mode	1–16	1	-	At stop	
H11.02	2011-03h	Starting displacement No. after pause	0: Continue to execute the unexecuted displacements 1: Start from displacement 1	0	-	At stop	
H11.03	2011-04h	Interval time unit	0: ms 1: s	0	-	At stop	
H11.04	2011-05h	Displacement reference type	0: Relative displacement reference 1: Absolute displacement reference	0	-	Real-time	
H11.05	2011-06h	Starting displacement No. in sequential operation	0–16	0	-	At stop	
H11.09	2011-0Ah	Deceleration upon axis control OFF	0 ms–65535 ms	65535	ms	Real-time	
H11.10	2011-0Bh	Starting speed of displacement 1	0[mm/s]/[rpm]–6000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	
H11.11	2011-0Ch	Stop speed of displacement 1	0[mm/s]/[rpm]–6000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	
H11.12	2011-0Dh	Displacement 1	-1073741824 to 1073741824	10000	Reference unit	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H11.14	2011-0Fh	Max. speed of displacement 1	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.15	2011-10h	Acc/Dec time of displacement 1	0 ms–65535 ms	10	ms	Real-time	
H11.16	2011-11h	Interval time after displacement 1	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.17	2011-12h	Displacement 2	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.19	2011-14h	Max. speed of displacement 2	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.20	2011-15h	Acc/Dec time of displacement 2	0 ms–65535 ms	10	ms	Real-time	
H11.21	2011-16h	Interval time after displacement 2	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.22	2011-17h	Displacement 3	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.24	2011-19h	Max. speed of displacement 3	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.25	2011-1Ah	Acc/Dec time of displacement 3	0 ms–65535 ms	10	ms	Real-time	
H11.26	2011-1Bh	Interval time after displacement 3	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.27	2011-1Ch	Displacement 4	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.29	2011-1Eh	Max. speed of displacement 4	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.30	2011-1Fh	Acc/Dec time of displacement 4	0 ms–65535 ms	10	ms	Real-time	
H11.31	2011-20h	Interval time after displacement 4	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.32	2011-21h	Displacement 5	-1073741824 to 1073741824	10000	Reference unit	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H11.34	2011-23h	Max. speed of displacement 5	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.35	2011-24h	Acc/Dec time of displacement 5	0 ms–65535 ms	10	ms	Real-time	
H11.36	2011-25h	Interval time after displacement 5	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.37	2011-26h	Displacement 6	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.39	2011-28h	Max. speed of displacement 6	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.40	2011-29h	Acc/Dec time of displacement 6	0 ms–65535 ms	10	ms	Real-time	
H11.41	2011-2Ah	Interval time after displacement 6	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.42	2011-2Bh	Displacement 7	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.44	2011-2Dh	Max. speed of displacement 7	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.45	2011-2Eh	Acc/Dec time of displacement 7	0 ms–65535 ms	10	ms	Real-time	
H11.46	2011-2Fh	Interval time after displacement 7	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.47	2011-30h	Displacement 8	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.49	2011-32h	Max. speed of displacement 8	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.50	2011-33h	Acc/Dec time of displacement 8	0 ms–65535 ms	10	ms	Real-time	
H11.51	2011-34h	Interval time after displacement 8	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.52	2011-35h	Displacement 9	-1073741824 to 1073741824	10000	Reference unit	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H11.54	2011-37h	Max. speed of displacement 9	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.55	2011-38h	Acc/Dec time of displacement 9	0 ms–65535 ms	10	ms	Real-time	
H11.56	2011-39h	Interval time after displacement 9	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.57	2011-3Ah	Displacement 10	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.59	2011-3Ch	Max. speed of displacement 10	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.60	2011-3Dh	Acc/Dec time of displacement 10	0 ms–65535 ms	10	ms	Real-time	
H11.61	2011-3Eh	Interval time after displacement 10	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.62	2011-3Fh	Displacement 11	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.64	2011-41h	Max. speed of displacement 11	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.65	2011-42h	Acc/Dec time of displacement 11	0 ms–65535 ms	10	ms	Real-time	
H11.66	2011-43h	Interval time after displacement 11	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.67	2011-44h	Displacement 12	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.69	2011-46h	Max. speed of displacement 12	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.70	2011-47h	Acc/Dec time of displacement 12	0 ms–65535 ms	10	ms	Real-time	
H11.71	2011-48h	Interval time after	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		displacement 12					
H11.72	2011-49h	Displacement 13	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.74	2011-4Bh	Max. speed of displacement 13	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.75	2011-4Ch	Acc/Dec time of displacement 13	0 ms–65535 ms	10	ms	Real-time	
H11.76	2011-4Dh	Interval time after displacement 13	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.77	2011-4Eh	Displacement 14	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.79	2011-50h	Max. speed of displacement 14	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.80	2011-51h	Acc/Dec time of displacement 14	0 ms–65535 ms	10	ms	Real-time	
H11.81	2011-52h	Interval time after displacement 14	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.82	2011-53h	Displacement 15	-1073741824 to 1073741824	10000	Reference unit	Real-time	
H11.84	2011-55h	Max. speed of displacement 15	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.85	2011-56h	Acc/Dec time of displacement 15	0 ms–65535 ms	10	ms	Real-time	
H11.86	2011-57h	Interval time after displacement 15	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	
H11.87	2011-58h	Displacement 16	-1073741824 to 1073741824	10000	Reference unit	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H11.89	2011-5Ah	Max. speed of displacement 16	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	200	[mm/s]/[rpm]	Real-time	
H11.90	2011-5Bh	Acc/Dec time of displacement 16	0 ms–65535 ms	10	ms	Real-time	
H11.91	2011-5Ch	Interval time after displacement 16	0 ms(s) to 10000 ms(s)	10	ms (s)	Real-time	

22.18H12 Multi-Speed Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.00	2012-01h	Multi-speed operation mode	0: Individual operation (number of speeds selected in H12.01) 1: Cyclic operation (number of speeds selected in H12.01) 2: DI-based operation	1	-	At stop	
H12.01	2012-02h	Number of speed references in multi-speed mode	1–16	16	-	At stop	
H12.02	2012-03h	Operating time unit	0: s 1: min	0	-	At stop	
H12.03	2012-04h	Acceleration time 1	0 ms–65535 ms	10	ms	Real-time	
H12.04	2012-05h	Deceleration time 1	0 ms–65535 ms	10	ms	Real-time	
H12.05	2012-06h	Acceleration time 2	0 ms–65535 ms	50	ms	Real-time	
H12.06	2012-07h	Deceleration time 2	0 ms–65535 ms	50	ms	Real-time	
H12.07	2012-08h	Acceleration time 3	0 ms–65535 ms	100	ms	Real-time	
H12.08	2012-09h	Deceleration time 3	0 ms–65535 ms	100	ms	Real-time	
H12.09	2012-0Ah	Acceleration time 4	0 ms–65535 ms	150	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.10	2012-0Bh	Deceleration time 4	0 ms–65535 ms	150	ms	Real-time	
H12.20	2012-15h	1st speed reference	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	
H12.21	2012-16h	Operating time of speed 1	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.22	2012-17h	1st speed rise/drop and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.23	2012-18h	Reference 2	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	100	[mm/s]/[rpm]	Real-time	
H12.24	2012-19h	Operating time of speed 2	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.25	2012-1Ah	2nd speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.26	2012-1Bh	Reference 3	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	300	[mm/s]/[rpm]	Real-time	
H12.27	2012-1Ch	Operating time of speed 3	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.28	2012-1Dh	3nd speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.29	2012-1Eh	Reference 4	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	500	[mm/s]/[rpm]	Real-time	
H12.30	2012-1Fh	Operating time of speed 4	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.31	2012-20h	4th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.32	2012-21h	Reference 5	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	700	[mm/s]/[rpm]	Real-time	
H12.33	2012-22h	Operating time of speed 5	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.34	2012-23h	5th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.35	2012-24h	Reference 6	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	900	[mm/s]/[rpm]	Real-time	
H12.36	2012-25h	Operating time of speed 6	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.37	2012-26h	6th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.38	2012-27h	Reference 7	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	600	[mm/s]/[rpm]	Real-time	
H12.39	2012-28h	Operating time of speed 7	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.40	2012-29h	7th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.41	2012-2Ah	Reference 8	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	300	[mm/s]/[rpm]	Real-time	
H12.42	2012-2Bh	Operating time of speed 8	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.43	2012-2Ch	8th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.44	2012-2Dh	Reference 9	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	100	[mm/s]/[rpm]	Real-time	
H12.45	2012-2Eh	Operating time of speed 9	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.46	2012-2Fh	9th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.47	2012-30h	Reference 10	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-100	[mm/s]/[rpm]	Real-time	
H12.48	2012-31h	Operating time of speed 10	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.49	2012-32h	10th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.50	2012-33h	Reference 11	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-300	[mm/s]/[rpm]	Real-time	
H12.51	2012-34h	Operating time of speed 11	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.52	2012-35h	11th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.53	2012-36h	Reference 12	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-500	[mm/s]/[rpm]	Real-time	
H12.54	2012-37h	Operating time of speed 12	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.55	2012-38h	12th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.56	2012-39h	Reference 13	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-700	[mm/s]/[rpm]	Real-time	
H12.57	2012-3Ah	Operating time of speed 13	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.58	2012-3Bh	13th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.59	2012-3Ch	Reference 14	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-900	[mm/s]/[rpm]	Real-time	
H12.60	2012-3Dh	Operating time of speed 14	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.61	2012-3Eh	14th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H12.62	2012-3Fh	Reference 15	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-600	[mm/s]/[rpm]	Real-time	
H12.63	2012-40h	Operating time of speed 15	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.64	2012-41h	15th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	
H12.65	2012-42h	Reference 16	-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]	-300	[mm/s]/[rpm]	Real-time	
H12.66	2012-43h	Operating time of speed 16	0.0s(m) to 6553.5s(m)	5.0	s (m)	Real-time	
H12.67	2012-44h	16th speed rise/drop time and curve smoothing parameter time	bit0-bit7: Speed rise and drop time 0: Zero acc and dec time 1: Acc and dec time 1 2: Acc and dec time 2 3: Acc and dec time 3 4: Acc and dec time 4 bit8-bit15: S curve smoothing parameter 1: Smoothing parameter 1 2: Smoothing parameter 2 3: Smoothing parameter 3 4: Smoothing parameter 4 5: Smoothing parameter 5 6: Smoothing parameter 6 7: Smoothing parameter 7 8: Smoothing parameter 8	256	-	Real-time	

22.19H13 Application Safety Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H13.00	2013-01h	Auto-tuned scheme 2 runaway distance threshold	0.00[mm]/[Rev]–655.35[mm]/[Rev]	0.00	[mm]/[Rev]	Unchangeable	
H13.01	2013-02h	Scheme 2 runaway distance threshold	0.00[mm]/[Rev]–15.00[mm]/[Rev]	0.50	[mm]/[Rev]	At stop	
H13.02	2013-03h	Scheme 2 runaway current threshold	0.0% to 400.0%	50.0	%	At stop	
H13.03	2013-04h	Runaway speed threshold in scheme 2 speed or position mode	1[mm/s]/[rpm]–6000[mm/s]/[rpm]	50	[mm/s]/[rpm]	At stop	
H13.04	2013-05h	Runaway speed threshold in scheme 2 torque mode	1[mm/s]/[rpm]–6000[mm/s]/[rpm]	500	[mm/s]/[rpm]	At stop	
H13.05	2013-06h	Scheme 2 runaway inspection window time	10 ms–100 ms	30	ms	At stop	

22.20H14 Gantry Synchronization Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H14.00	2014-01h	Gantry communication state	0–1	0	-	Unchangeable	
H14.01	2014-02h	Gantry alignment state	0–1	0	-	Unchangeable	
H14.02	2014-03h	Gantry function selection	0: None 1: Gantry synchronization	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H14.03	2014-04h	Gantry axis attribute (master-slave)	0: Slave axis 1: Master axis	0	-	At stop	
H14.04	2014-05h	Gantry mechanical attribute	0: Rigid gantry scheme 1-Two-axis position control 1: Flexible gantry scheme 1-Two-axis position control 2: Rigid gantry scheme 2-Master axis position control and slave axis torque control	0	-	At stop	
H14.05	2014-06h	Current axis position sync direction	0: Forward 1: Reverse	0	-	At stop	
H14.07	2014-08h	Gantry sync enable	0: Disabled 1: Enabled 2: DI-enabled	0	-	Real-time	
H14.08	2014-09h	Gantry sync position loop proportional gain	0.0% to 300.0%	0.0	%	Real-time	
H14.09	2014-0Ah	Gantry sync position loop integral time constant	0.5 ms–1000.0 ms	1000.0	ms	Real-time	
H14.10	2014-0Bh	Gantry sync speed loop proportional gain	0.0% to 300.0%	0.0	%	Real-time	
H14.11	2014-0Ch	Gantry sync speed loop integral time constant	0.5 ms–1000.0 ms	1000.0	ms	Real-time	
H14.12	2014-0Dh	Gantry sync speed limit	0.0rpm to 6000.0rpm	50.0	rpm	Real-time	
H14.13	2014-0Eh	Gantry alignment speed	0.0rpm to 3000.0rpm	10.0	rpm	Real-time	
H14.14	2014-0Fh	Gantry alignment acc./dec. time	0 ms–1000 ms	100	ms	Real-time	
H14.18	2014-13h	Torque pre-alignment before gantry homing	0: Disabled 1: Enabled	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H14.20	2014-15h	Gantry aligned by default upon power-on	0: No operation 1: Align at first power-on	1	-	At stop	
H14.21	2014-16h	Gantry alignment mode	0: Gantry homing alignment 2: Gantry torque alignment 3: Gantry enable alignment 4: Gantry DI alignment	0	-	At stop	
H14.25	2014-1Ah	Flexible gantry homing - Master/slave home deviation auto-tuning	0: Disabled 1: Torque alignment auto-tuning 2: Position auto-tuning	0	-	Real-time	
H14.26	2014-1Bh	Gantry torque alignment enable	0: Disabled 1: Enabled 2: DI-enabled 3: Enabled at power-on	0	-	Real-time	
H14.27	2014-1Ch	Gantry torque alignment torque	0.0% to 300.0%	10.0	%	Real-time	
H14.28	2014-1Dh	Gantry torque alignment count	1–2	2	-	Real-time	
H14.29	2014-1Eh	Gantry torque alignment speed	0.0rpm to 3000.0rpm	10.0	rpm	Real-time	
H14.30	2014-1Fh	Gantry torque alignment timeout alarm time	1s to 65535s	100	s	Real-time	
H14.31	2014-20h	Gantry torque alignment acc./dec. time	0 ms–1000 ms	100	ms	Real-time	
H14.32	2014-21h	Gantry torque alignment zero speed threshold	0.0rpm to 100.0rpm	2.0	rpm	Real-time	
H14.33	2014-22h	Gantry torque alignment mechanical limit evaluation position loop period count	0–65535	5	-	Real-time	
H14.35	2014-24h	2-axis position deviation (encoder unit)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H14.37	2014-26h	2-axis speed deviation	-32767rpm to 32767rpm	0	rpm	Unchangeable	
H14.38	2014-27h	Torque reference of active axis	-3276.7% to 3276.7%	0.0	%	Unchangeable	
H14.39	2014-28h	Torque reference of paired axis	-3276.7% to 3276.7%	0.0	%	Unchangeable	
H14.40	2014-29h	Motor speed of active axis	-32767rpm to 32767rpm	0	rpm	Unchangeable	
H14.41	2014-2Ah	Motor speed of paired axis	-32767rpm to 32767rpm	0	rpm	Unchangeable	
H14.44	2014-2Dh	Alarm time threshold of large gantry deviation	0.5 ms–1000.0 ms	3.0	ms	Real-time	
H14.45	2014-2Eh	Gantry position alarm threshold	0 to 4294967295	50000	Encoder unit	At stop	
H14.47	2014-30h	Large gantry position deviation alarm enable	0: Disabled 1: Enabled	1	-	Real-time	
H14.48	2014-31h	Alarm time threshold of large gantry torque deviation	0.5 ms–1000.0 ms	3.0	ms	Real-time	
H14.49	2014-32h	Gantry torque deviation alarm threshold	0.0% to 800.0%	300.0	%	At stop	
H14.50	2014-33h	Large gantry torque deviation alarm enable	0: Disabled 1: Enabled	0	-	Real-time	
H14.52	2014-35h	Gantry mismatch	0–1451	0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H14.71	2014-48h	Flexible gantry homing - Enable aligning slave axis homing position to home offset	0: No operation 1: Enabled	0	-	Real-time	
H14.74	2014-4Bh	Gantry scheme 2 slave axis enable	0: No operation 1: Enabled	0	-	At stop	

22.21H17 Virtual DI/DO Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.90	2017-5Bh	Communication VDI enable	0: Disabled 1: Enabled	0	-	At stop	
H17.91	2017-5Ch	VDI default value after power-on	bit0: VDI1 bit1: VDI2 bit2: VDI3 bit3: VDI4 bit4: VDI5 bit5: VDI6 bit6: VDI7 bit7: VDI8 bit8: VDI9 bit9: VDI10 bit10: VDI11 bit11: VDI12 bit12: VDI13 bit13: VDI14 bit14: VDI15 bit15: VDI16	0	-	Real-time	
H17.00	2017-01h	VDI1 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.01	2017-02h	VDI1 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.02	2017-03h	VDI2 function	0: No assignment 1: Servo ON 2: Alarm reset signal	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.03	2017-04h	VDI2 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.04	2017-05h	VDI3 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.05	2017-06h	VDI3 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.06	2017-07h	VDI4 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.07	2017-08h	VDI4 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.08	2017-09h	VDI5 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.09	2017-0Ah	VDI5 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.10	2017-0Bh	VDI6 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.11	2017-0Ch	VDI6 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.12	2017-0Dh	VDI7 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.13	2017-0Eh	VDI7 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.14	2017-0Fh	VDI8 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.15	2017-10h	VDI8 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.16	2017-11h	VDI9 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			59: Gantry synchronization enable				
H17.17	2017-12h	VDI9 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.18	2017-13h	VDI10 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.19	2017-14h	VDI10 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.20	2017-15h	VDI11 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.21	2017-16h	VDI11 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.22	2017-17h	VDI12 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.23	2017-18h	VDI12 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.24	2017-19h	VDI13 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.25	2017-1Ah	VDI13 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.26	2017-1Bh	VDI14 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.27	2017-1Ch	VDI14 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.28	2017-1Dh	VDI15 function	0: No assignment 1: Servo ON 2: Alarm reset signal	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3 54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.29	2017-1Eh	VDI15 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.30	2017-1Fh	VDI16 function	0: No assignment 1: Servo ON 2: Alarm reset signal 5: Multi-reference direction 6: Multi-reference switchover CMD1 7: Multi-reference switchover CMD2 8: Multi-reference switchover CMD3 9: Multi-reference switchover CMD4 14: Positive limit switch 15: Negative limit switch 16: Positive external torque limit 17: Negative external torque limit 18: Forward jog 19: Reverse jog 24: Electronic gear 28: Multi-position reference enable 31: Home switch 34: Emergency stop 36: Internal speed limit source 40: Multi-speed enable 46: Process segment enable 47: Process segment command switchover 1 48: Process segment command switchover 2 49: Process segment command switchover 3 50: Process segment command switchover 4 51: Event trigger process segment 1 52: Event trigger process segment 2 53: Event trigger process segment 3	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			54: Event trigger process segment 4 55: Process segment pause 56: Gantry torque alignment 57: Gantry DI alignment enable 58: Gantry DI alignment clear 59: Gantry synchronization enable				
H17.31	2017-20h	VDI16 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	
H17.92	2017-5Dh	Communication VDO enable	0: Disabled 1: Enabled	0	-	At stop	
H17.93	2017-5Eh	VDO default value after power-on	bit0: VDO1 bit1: VDO2 bit2: VDO3 bit3: VDO4 bit4: VDO5 bit5: VDO6 bit6: VDO7 bit7: VDO8 bit8: VDO9 bit9: VDO10 bit10: VDO11 bit11: VDO12 bit12: VDO13 bit13: VDO14 bit14: VDO15 bit15: VDO16	0x0	-	At stop	
H17.32	2017-21h	VDO virtual level	0x0 to 0xFFFF	0x0	-	Unchangeable	
H17.33	2017-22h	VDO1 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			27: Left limit 28: Right limit 33: Gantry alignment				
H17.34	2017-23h	VDO1 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.35	2017-24h	VDO2 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment	0	-	Real-time	
H17.36	2017-25h	VDO2 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.37	2017-26h	VDO3 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment	0	-	Real-time	
H17.38	2017-27h	VDO3 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.39	2017-28h	VDO4 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment				
H17.40	2017-29h	VDO4 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.41	2017-2Ah	VDO5 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment	0	-	Real-time	
H17.42	2017-2Bh	VDO5 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.43	2017-2Ch	VDO6 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.44	2017-2Dh	VDO6 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.45	2017-2Eh	VDO7 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment	0	-	Real-time	
H17.46	2017-2Fh	VDO7 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.47	2017-30h	VDO8 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment	0	-	Real-time	
H17.48	2017-31h	VDO8 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.49	2017-32h	VDO9 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment				
H17.50	2017-33h	VDO9 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.51	2017-34h	VDO10 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment	0	-	Real-time	
H17.52	2017-35h	VDO10 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.53	2017-36h	VDO11 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment	0	-	Real-time	
H17.54	2017-37h	VDO11 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.55	2017-38h	VDO12 function	0: Undefined	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment				
H17.56	2017-39h	VDO12 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.57	2017-3Ah	VDO13 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment	0	-	Real-time	
H17.58	2017-3Bh	VDO13 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.59	2017-3Ch	VDO14 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment				
H17.60	2017-3Dh	VDO14 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.61	2017-3Eh	VDO15 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment	0	-	Real-time	
H17.62	2017-3Fh	VDO15 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	
H17.63	2017-40h	VDO16 function	0: Undefined 1: Servo ready 2: Motor rotation signal 5: Positioning completed 6: Positioning near 9: Braking 10: Warning 11: Failure 22: Internal command completed 24: Internal motion completed 26: Closed-loop state 27: Left limit 28: Right limit 33: Gantry alignment	0	-	Real-time	
H17.64	2017-41h	VDO16 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	

22.22H18 Position Comparison Output Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H18.00	2018-01h	Position comparison output selection	0: Disable 1: Enable (rising edge-triggered)	0	-	Real-time	
H18.01	2018-02h	Position comparison output feedback source	0: Motor encoder feedback 1: Fully closed-loop position feedback	0	-	Real-time	
H18.02	2018-03h	Position comparison resolution	0: 24-bit 1: 23-bit 2: 22-bit 3: 21-bit 4: 20-bit 5: 19-bit 6: 18-bit 7: 17-bit	1	-	Real-time	
H18.03	2018-04h	Position comparison mode	0: Individual comparison mode 1: Cyclic comparison mode 2: Fixed cyclic comparison mode	0	-	Real-time	
H18.04	2018-05h	Current position as zero	0: Disable 1: Enable (rising edge-triggered)	0	-	Real-time	
H18.05	2018-06h	Position comparison output width	0.1 ms–204.7 ms	0.1	ms	Real-time	
H18.06	2018-07h	Position comparison output ABZ port polarity	Bit 0: OCZ output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic Bit 1: Z port output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic bit2: A/B output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H18.07	2018-08h	Position comparison start point	1–40	1	-	Real-time	
H18.08	2018-09h	Position comparison end point	1–40	1	-	Real-time	
H18.09	2018-0Ah	Current state of position comparison	0–1024	0	-	Unchangeable	
H18.10	2018-0Bh	Real-time position of position comparison	-2147483648–2147483647	0	-	Unchangeable	
H18.12	2018-0Dh	Zero offset of position comparison	-2147483648–2147483647	0	-	Real-time	
H18.14	2018-0Fh	Position comparison output delay compensation	-12.00μs to 12.00μs	0.00	μs	Real-time	
H18.15	2018-10h	Fixed cyclic comparison	1–65535	1	-	Real-time	
H18.16	2018-11h	ABZ output function setting	bit0: OCZ output function 0: Frequency-division output 1: Position comparison bit1: Z port output function 0: Frequency-division output 1: Position comparison bit2: A/B port output function 0: Frequency-division output 1: Position comparison	0	-	Real-time	
H18.17	2018-12h	Number of fixed mode cycles	0–65535	0	-	Unchangeable	

22.23H19 Target Position Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.00	2019-01h	Target value of position comparison 1	-2147483648–2147483647	0	-	Real-time	
H19.02	2019-03h	Attribute value of position comparison 1	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.03	2019-04h	Target value of position comparison 2	-2147483648–2147483647	0	-	Real-time	
H19.05	2019-06h	Attribute value of position comparison 2	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10:	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.06	2019-07h	Target value of position comparison 3	-2147483648–2147483647	0	-	Real-time	
H19.08	2019-09h	Attribute value of position comparison 3	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.09	2019-0Ah	Target value of position comparison 4	-2147483648–2147483647	0	-	Real-time	
H19.11	2019-0Ch	Attribute value of position comparison 4	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.12	2019-0Dh	Target value of position comparison 5	-2147483648–2147483647	0	-	Real-time	
H19.14	2019-0Fh	Attribute value of position comparison 5	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.15	2019-10h	Target value of position comparison 6	-2147483648–2147483647	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.17	2019-12h	Attribute value of position comparison 6	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.18	2019-13h	Target value of position comparison 7	-2147483648–2147483647	0	-	Real-time	
H19.20	2019-15h	Attribute value of position comparison 7	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.21	2019-16h	Target value of position comparison 8	-2147483648–2147483647	0	-	Real-time	
H19.23	2019-18h	Attribute value of position comparison 8	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.24	2019-19h	Target value of position comparison 9	-2147483648–2147483647	0	-	Real-time	
H19.26	2019-1Bh	Attribute value of position comparison 9	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.27	2019-1Ch	Target value of position comparison 10	-2147483648–2147483647	0	-	Real-time	
H19.29	2019-1Eh	Attribute value of position comparison 10	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.30	2019-1Fh	Target value of position comparison 11	-2147483648–2147483647	0	-	Real-time	
H19.32	2019-21h	Attribute value of position comparison 11	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.33	2019-22h	Target value of position comparison 12	-2147483648–2147483647	0	-	Real-time	
H19.35	2019-24h	Attribute value of position comparison 12	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.36	2019-25h	Target value of position comparison 13	-2147483648–2147483647	0	-	Real-time	
H19.38	2019-27h	Attribute value of position comparison 13	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.39	2019-28h	Target value of position comparison 14	-2147483648–2147483647	0	-	Real-time	
H19.41	2019-2Ah	Attribute value of position comparison 14	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.42	2019-2Bh	Target value of position comparison 15	-2147483648–2147483647	0	-	Real-time	
H19.44	2019-2Dh	Attribute value of position comparison 15	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.45	2019-2Eh	Target value of position comparison 16	-2147483648–2147483647	0	-	Real-time	
H19.47	2019-30h	Attribute value of position comparison 16	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.48	2019-31h	Target value of position comparison 17	-2147483648–2147483647	0	-	Real-time	
H19.50	2019-33h	Attribute value of position comparison 17	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.51	2019-34h	Target value of position comparison 18	-2147483648–2147483647	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.53	2019-36h	Attribute value of position comparison 18	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.54	2019-37h	Target value of position comparison 19	-2147483648–2147483647	0	-	Real-time	
H19.56	2019-39h	Attribute value of position comparison 19	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.57	2019-3Ah	Target value of position comparison 20	-2147483648–2147483647	0	-	Real-time	
H19.59	2019-3Ch	Attribute value of position comparison 20	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.60	2019-3Dh	Target value of position comparison 21	-2147483648–2147483647	0	-	Real-time	
H19.62	2019-3Fh	Attribute value of position comparison 21	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.63	2019-40h	Target value of position comparison 22	-2147483648–2147483647	0	-	Real-time	
H19.65	2019-42h	Attribute value of position comparison 22	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.66	2019-43h	Target value of position comparison 23	-2147483648–2147483647	0	-	Real-time	
H19.68	2019-45h	Attribute value of position comparison 23	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.69	2019-46h	Target value of position comparison 24	-2147483648–2147483647	0	-	Real-time	
H19.71	2019-48h	Attribute value of position comparison 24	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.72	2019-49h	Target value of position comparison 25	-2147483648–2147483647	0	-	Real-time	
H19.74	2019-4Bh	Attribute value of position comparison 25	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.75	2019-4Ch	Target value of position comparison 26	-2147483648–2147483647	0	-	Real-time	
H19.77	2019-4Eh	Attribute value of position comparison 26	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.78	2019-4Fh	Target value of position comparison 27	-2147483648–2147483647	0	-	Real-time	
H19.80	2019-51h	Attribute value of position comparison 27	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.81	2019-52h	Target value of position comparison 28	-2147483648–2147483647	0	-	Real-time	
H19.83	2019-54h	Attribute value of position comparison 28	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.84	2019-55h	Target value of position comparison 29	-2147483648–2147483647	0	-	Real-time	
H19.86	2019-57h	Attribute value of position comparison 29	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.87	2019-58h	Target value of position comparison 30	-2147483648–2147483647	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.89	2019-5Ah	Attribute value of position comparison 30	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.90	2019-5Bh	Target value of position comparison 31	-2147483648–2147483647	0	-	Real-time	
H19.92	2019-5Dh	Attribute value of position comparison 31	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.93	2019-5Eh	Target value of position comparison 32	-2147483648–2147483647	0	-	Real-time	
H19.95	2019-60h	Attribute value of position comparison 32	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.96	2019-61h	Target value of position comparison 33	-2147483648–2147483647	0	-	Real-time	
H19.98	2019-63h	Attribute value of position comparison 33	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.99	2019-64h	Target value of position comparison 34	-2147483648–2147483647	0	-	Real-time	
H19.101	2019-66h	Attribute value of position comparison 34	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.102	2019-67h	Target value of position comparison 35	-2147483648–2147483647	0	-	Real-time	
H19.104	2019-69h	Attribute value of position comparison 35	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.105	2019-6Ah	Target value of position comparison 36	-2147483648–2147483647	0	-	Real-time	
H19.107	2019-6Ch	Attribute value of position comparison 36	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.108	2019-6Dh	Target value of position comparison 37	-2147483648–2147483647	0	-	Real-time	
H19.110	2019-6Fh	Attribute value of position comparison 37	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	
H19.111	2019-70h	Target value of position comparison 38	-2147483648–2147483647	0	-	Real-time	
H19.113	2019-72h	Attribute value of position comparison 38	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
			bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output				
H19.114	2019-73h	Target value of position comparison 39	-2147483648–2147483647	0	-	Real-time	
H19.116	2019-75h	Attribute value of position comparison 39	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.117	2019-76h	Target value of position comparison 40	-2147483648–2147483647	0	-	Real-time	
H19.119	2019-78h	Attribute value of position comparison 40	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: Nabit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	

22.24H1F Software Tool Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H1F.90	201F-5Bh	DI function status 1 read through communication	0–65535	0	-	Unchangeable	
H1F.91	201F-5Ch	DI function status 2 read through communication	0–65535	0	-	Unchangeable	
H1F.92	201F-5Dh	DI function status 3 read through communication	0–65535	0	-	Unchangeable	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H1F.93	201F-5Eh	DI function status 4 read through communication	0–65535	0	-	Unchangeable	
H1F.94	201F-5Fh	DO function status 1 read through communication	0–65535	0	-	Unchangeable	
H1F.95	201F-60h	DO function status 2 read through communication	0–65535	0	-	Unchangeable	

22.25H21 Current Loop Gain Switchover Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H21.00	2021-01h	Current loop gain switchover	0: No operation 1: Enabled	0	-	Real-time	

22.26H22 Process Segment Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H22.00	2022-01h	Process segment command trigger	0–1000	0	-	Real-time	
H22.01	2022-02h	Process segment triggered by the event rising edge	0–65535	0	-	Real-time	
H22.02	2022-03h	Process segment triggered by the event falling edge	0–65535	0	-	Real-time	
H22.03	2022-04h	Acceleration/ Deceleration	0: Acceleration/Deceleration time	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		time upon technology segment pause	1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 5: Acceleration/Deceleration time 5 6: Acceleration/Deceleration time 6 7: Acceleration/Deceleration time 7				
H22.04	2022-05h	Positive software position limit	-2147483648 to 2147483647	2147483647	Reference unit	Real-time	
H22.06	2022-07h	Negative software position limit	-2147483648 to 2147483647	-2147483648	Reference unit	Real-time	
H22.08	2022-09h	Process segment number	0–65535	0	-	Unchangeable	
H22.09	2022-0Ah	Process segment function switch	0–65535	0	-	At stop	
H22.10	2022-0Bh	Process segment state	0–65535	0	-	Unchangeable	
H22.19	2022-14h	Target speed	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	50.0	[mm/s]/[rpm]	Real-time	
H22.20	2022-15h	Target speed 1	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	200.0	[mm/s]/[rpm]	Real-time	
H22.21	2022-16h	Target speed 2	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	500.0	[mm/s]/[rpm]	Real-time	
H22.22	2022-17h	Target speed 3	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	1000.0	[mm/s]/[rpm]	Real-time	
H22.23	2022-18h	Target speed 4	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	1500.0	[mm/s]/[rpm]	Real-time	
H22.24	2022-19h	Target speed 5	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	2000.0	[mm/s]/[rpm]	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H22.25	2022-1Ah	Target speed 6	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	2500.0	[mm/s]/[rpm]	Real-time	
H22.26	2022-1Bh	Target speed 7	0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]	3000.0	[mm/s]/[rpm]	Real-time	
H22.35	2022-24h	Accel/Decel time	0 ms–65535 ms	50	ms	Real-time	
H22.36	2022-25h	Acceleration/Deceleration time 1	0 ms–65535 ms	200	ms	Real-time	
H22.37	2022-26h	Acceleration/Deceleration time 2	0 ms–65535 ms	500	ms	Real-time	
H22.38	2022-27h	Acceleration/Deceleration time 3	0 ms–65535 ms	1000	ms	Real-time	
H22.39	2022-28h	Acceleration/Deceleration time 4	0 ms–65535 ms	1500	ms	Real-time	
H22.40	2022-29h	Acceleration/Deceleration time 5	0 ms–65535 ms	2000	ms	Real-time	
H22.41	2022-2Ah	Acceleration/Deceleration time 6	0 ms–65535 ms	2500	ms	Real-time	
H22.42	2022-2Bh	Acceleration/Deceleration time 7	0 ms–65535 ms	3000	ms	Real-time	
H22.51	2022-34h	Delay after completion of the process segment	0 ms–65535 ms	0	ms	Real-time	
H22.52	2022-35h	Delay time 1 after completion of the process segment	0 ms–65535 ms	50	ms	Real-time	
H22.53	2022-36h	Delay time 2 after completion of the process segment	0 ms–65535 ms	200	ms	Real-time	
H22.54	2022-37h	Delay time 3 after completion of	0 ms–65535 ms	500	ms	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		the process segment					
H22.55	2022-38h	Delay time 4 after completion of the process segment	0 ms–65535 ms	1000	ms	Real-time	
H22.56	2022-39h	Delay time 5 after completion of the process segment	0 ms–65535 ms	1500	ms	Real-time	
H22.57	2022-3Ah	Delay time 6 after completion of the process segment	0 ms–65535 ms	2000	ms	Real-time	
H22.58	2022-3Bh	Delay time 7 after completion of the process segment	0 ms–65535 ms	3000	ms	Real-time	
H22.70	2022-47h	Process segment homing mode	-32768–32767	-2	-	Real-time	
H22.71	2022-48h	Speed of high-speed search for home switch signal	0[mm/s]/[rpm]–3000[mm/s]/[rpm]	100	[mm/s]/[rpm]	Real-time	
H22.72	2022-49h	Speed of low-speed search for home switch signal	0[mm/s]/[rpm]–1000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	
H22.73	2022-4Ah	Acceleration/ Deceleration time during homing	0 ms–1000 ms	1000	ms	Real-time	
H22.74	2022-4Bh	Home search time limit	0 ms–65535 ms	10000	ms	Real-time	
H22.75	2022-4Ch	Mechanical home offset	-2147483648 to 2147483647	0	Reference unit	Real-time	
H22.79	2022-50h	Relative/ Absolute homing	0–65535	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H22.83	2022-54h	Jump count threshold	0–65534	0	-	Real-time	
H22.84	2022-55h	Jump count threshold 1	0–65534	20	-	Real-time	
H22.85	2022-56h	Jump count threshold 2	0–65534	40	-	Real-time	
H22.86	2022-57h	Jump count threshold 3	0–65534	80	-	Real-time	
H22.87	2022-58h	Jump count threshold 4	0–65534	160	-	Real-time	
H22.88	2022-59h	Jump count threshold 5	0–65534	320	-	Real-time	
H22.89	2022-5Ah	Jump count threshold 6	0–65534	640	-	Real-time	
H22.90	2022-5Bh	Jump count threshold 7	0–65534	1280	-	Real-time	

22.27H23 Process Segment Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H23.00	2023-01h	Definition of homing	0–4294967295	0	-	Real-time	
H23.02	2023-03h	Homing data	-2147483648–2147483647	0	-	Real-time	
H23.04	2023-05h	Definition of process segment 1	0–4294967295	0	-	Real-time	
H23.06	2023-07h	Data of process segment 1	-2147483648–2147483647	0	-	Real-time	
H23.08	2023-09h	Definition of process segment 2	0–4294967295	0	-	Real-time	
H23.10	2023-0Bh	Data of process segment 2	-2147483648–2147483647	0	-	Real-time	
H23.12	2023-0Dh	Definition of process segment 3	0–4294967295	0	-	Real-time	
H23.14	2023-0Fh	Data of process segment 3	-2147483648–2147483647	0	-	Real-time	
H23.16	2023-11h	Definition of process segment 4	0–4294967295	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H23.18	2023-13h	Data of process segment 4	-2147483648–2147483647	0	-	Real-time	
H23.20	2023-15h	Definition of process segment 5	0–4294967295	0	-	Real-time	
H23.22	2023-17h	Data of process segment 5	-2147483648–2147483647	0	-	Real-time	
H23.24	2023-19h	Definition of process segment 6	0–4294967295	0	-	Real-time	
H23.26	2023-1Bh	Data of process segment 6	-2147483648–2147483647	0	-	Real-time	
H23.28	2023-1Dh	Definition of process segment 7	0–4294967295	0	-	Real-time	
H23.30	2023-1Fh	Data of process segment 7	-2147483648–2147483647	0	-	Real-time	
H23.32	2023-21h	Definition of process segment 8	0–4294967295	0	-	Real-time	
H23.34	2023-23h	Data of process segment 8	-2147483648–2147483647	0	-	Real-time	
H23.36	2023-25h	Definition of process segment 9	0–4294967295	0	-	Real-time	
H23.38	2023-27h	Data of process segment 9	-2147483648–2147483647	0	-	Real-time	
H23.40	2023-29h	Definition of process segment 10	0–4294967295	0	-	Real-time	
H23.42	2023-2Bh	Data of process segment 10	-2147483648–2147483647	0	-	Real-time	
H23.44	2023-2Dh	Definition of process segment 11	0–4294967295	0	-	Real-time	
H23.46	2023-2Fh	Data of process segment 11	-2147483648–2147483647	0	-	Real-time	
H23.48	2023-31h	Definition of process segment 12	0–4294967295	0	-	Real-time	
H23.50	2023-33h	Data of process segment 12	-2147483648–2147483647	0	-	Real-time	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H23.52	2023-35h	Definition of process segment 13	0–4294967295	0	-	Real-time	
H23.54	2023-37h	Data of process segment 13	-2147483648–2147483647	0	-	Real-time	
H23.56	2023-39h	Definition of process segment 14	0–4294967295	0	-	Real-time	
H23.58	2023-3Bh	Data of process segment 14	-2147483648–2147483647	0	-	Real-time	
H23.60	2023-3Dh	Definition of process segment 15	0–4294967295	0	-	Real-time	
H23.62	2023-3Fh	Data of process segment 15	-2147483648–2147483647	0	-	Real-time	

22.28H30 Related Variables Read through Communication

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H30.00	2030-01h	Servo state read via communication	0–65535	0	-	Unchangeable	
H30.01	2030-02h	DO function status 1 read through communication	0–65535	0	-	Unchangeable	
H30.02	2030-03h	DO function status 2 read through communication	0–65535	0	-	Unchangeable	
H30.16	2030-11h	1st encoder communication timeout count	0–65535	0	-	Unchangeable	
H30.17	2030-12h	1st encoder communication CRC error count	0–65535	0	-	Unchangeable	
H30.18	2030-13h	1st encoder communication frame stop bit error count	0–65535	0	-	Unchangeable	

22.29H31 References Set through Communication

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H31.00	2031-01h	VDI virtual level set through communication	0–65535	0	-	Real-time	
H31.01	2031-02h	Frequency-division output frequency set through communication	0 Hz–16000000 Hz	0	Hz	Real-time	
H31.04	2031-05h	DO status set through communication	0–65535	0	-	Real-time	
H31.05	2031-06h	AO status set through communication	-10000 mV–10000 mV	0	mV	Real-time	
H31.09	2031-0Ah	Speed reference set through communication	-9999.000[mm/s]/[rpm]–9999.000[mm/s]/[rpm]	0.000	[mm/s]/[rpm]	Real-time	
H31.11	2031-0Ch	Torque reference set through communication	-100.000% to 100.000%	0.000	%	Real-time	

22.30H32 Direct Drive Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H32.00	2032-01h	Encoder interpolator mismatch alarm (E124)	0: Disabled 1: Enabled	1	-	At stop	
H32.01	2032-02h	Encoder interface switchover switch	0: Default encoder interface 1: Switching encoder interface	0	-	At stop	
H32.02	2032-03h	Angle auto-tuning upon power-on	0: Disabled 1: Enabled	0	-	At stop	
H32.03	2032-04h	Angle auto-tuning switch	0: Disabled 1: Control word 6 2: Control word 7	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		controlled by control word					
H32.04	2032-05h	Angle auto-tuning state	bit0: bit7 of 6041 bit1: E602.9	0	-	At stop	
H32.05	2032-06h	Pre-positioning retract selection	0: Disabled 1: Enabled	0	-	At stop	
H32.06	2032-07h	Position feedback	0: Disabled 1: Enabled	0	-	At stop	
H32.07	2032-08h	Incremental homing method	0: Z Signal short circuit 1: Only first short circuit	1	-	At stop	
H32.08	2032-09h	Homing signal width	100–65535	800	-	At stop	
H32.10	2032-0Bh	Max. reference current in angle auto-tuning through inching	10.0% to 300.0%	100.0	%	At stop	
H32.13	2032-0Eh	Motor operation threshold (ROT/DDR) in angle auto-tuning through inching	0.001deg to 20.000deg	0.200	deg	At stop	
H32.14	2032-0Fh	Motor standstill threshold (ROT/DDR) in angle auto-tuning through inching	0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	
H32.15	2032-10h	Motor operation threshold (DDL) in angle auto-tuning through inching	0.001 millimeters–20.000 millimeters	0.200	mm	At stop	
H32.16	2032-11h	Motor standstill threshold (DDL) in angle auto-tuning through inching	0.1 mm/s–100.0 mm/s	1.0	mm/s	At stop	
H32.18	2032-13h	Motor standstill threshold for inching angle auto-tuning	0.1s to 10.0s	0.5	s	At stop	
H32.20	2032-15h	Max. reference current in angle	10.0% to 300.0%	100.0	%	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
		auto-tuning through pre-positioning (closed-loop)					
H32.22	2032-17h	Electrical angle reference in angle auto-tuning through pre-positioning (closed-loop)	0.0deg to 360.0deg	0.0	deg	At stop	
H32.23	2032-18h	Electrical angle reference change range in angle auto-tuning through pre-positioning (closed-loop)	10.0deg to 170.0deg	90.0	deg	At stop	
H32.24	2032-19h	Motor stop threshold (ROT/DDR) in angle auto-tuning through pre-positioning (closed-loop)	0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	
H32.25	2032-1Ah	Motor stop threshold (DDL) in angle auto-tuning through pre-positioning (closed-loop)	0.1 mm/s–100.0 mm/s	1.0	mm/s	At stop	
H32.26	2032-1Bh	Damping in angle auto-tuning through pre-positioning (closed-loop)	0.00[N/(m/s)]/[N·m/rpm]–655.35[N/(m/s)]/[N·m/rpm]	0.00	[N/(m/s)]/[N·m/rpm]	At stop	
H32.29	2032-1Eh	Motor standstill threshold for close-loop pre-positioning angle auto-tuning	0.1s to 10.0s	0.5	s	At stop	
H32.30	2032-1Fh	Max. reference current in angle auto-tuning through position lock	10.0% to 300.0%	100.0	%	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H32.33	2032-22h	Motor operation threshold (ROT/DDR) in angle auto-tuning through position lock	0.001deg to 20.000deg	0.200	deg	At stop	
H32.34	2032-23h	Motor standstill threshold (ROT/DDR) in angle auto-tuning through position lock	0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	
H32.35	2032-24h	Motor operation threshold (DDL) in angle auto-tuning through position lock	0.001 millimeters–20.000 millimeters	0.200	mm	At stop	
H32.36	2032-25h	Motor standstill threshold (DDL) in angle auto-tuning through position lock	0.1 mm/s–100.0 mm/s	1.0	mm/s	At stop	
H32.37	2032-26h	Angle gain in angle auto-tuning through position lock	0deg/(p/s)–10000deg/(p/s)	1000	deg/(p/s)	At stop	
H32.38	2032-27h	Inertia ratio in angle auto-tuning through position lock	0.00–120.00	0.00	-	At stop	
H32.39	2032-28h	Gain class in angle auto-tuning through position lock	4level to 31level	16	level	At stop	
H32.40	2032-29h	Left/Right limit function	1. Left limit being positive 2. Left limit being negative	0	-	Real-time	
H32.41	2032-2Ah	Angle auto-tuning delay after power-on	0s to 65535s	3	s	Real-time	
H32.45	2032-2Eh	Black box channel 26 function	0: Real-time target speed (60Ffh) 1: Electric angle	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H32.50	2032-33h	32-bit range compatibility	0–99	1	-	At stop	
H32.53	2032-36h	Motor standstill threshold for position lock angle auto-tuning	0.1s to 10.0s	0.5	s	At stop	
H32.54	2032-37h	Hall auto-tuning selection	0–65535	0	-	At stop	
H32.55	2032-38h	Hall signal UVW manual adjustment	0–7	0	-	At stop	
H32.56	2032-39h	UVW filter time of Hall signal	0 ms–10 ms	5	ms	Real-time	
H32.57	2032-3Ah	Hall closed-loop locked-rotor speed	0[mm/s]/[rpm]–65535[mm/s]/[rpm]	2	[mm/s]/[rpm]	At stop	
H32.58	2032-3Bh	Hall closed-loop locked-rotor current	0.0% to 300.0%	120.0	%	At stop	
H32.59	2032-3Ch	Hall closed-loop locked-rotor window time	0 ms–2000 ms	10	ms	At stop	
H32.60	2032-3Dh	Hall closed-loop inertia ratio	0.00–120.00	0.00	-	At stop	
H32.61	2032-3Eh	Hall closed-loop rigidity	4–31	16	-	At stop	
H32.62	2032-3Fh	Electrical angle save flag	0–65535	0	-	Real-time	
H32.63	2032-40h	Hall1 electric angle	0–65535	0	-	At stop	
H32.64	2032-41h	Hall2 electric angle	0–65535	0	-	At stop	
H32.65	2032-42h	Hall3 electric angle	0–65535	0	-	At stop	
H32.66	2032-43h	Hall4 electric angle	0–65535	0	-	At stop	
H32.67	2032-44h	Hall5 electric angle	0–65535	0	-	At stop	
H32.68	2032-45h	Hall6 electric angle	0–65535	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H32.70	2032-47h	Motor overload protection mode	0: Internal motor overload curve 1: External motor overload curve 2: Current limit overload protection 3: Hide motor overload protection	0	-	At stop	
H32.73	2032-4Ah	Thermal threshold current of overload current limit	10.0% to 750.0%	115.0	%	At stop	
H32.74	2032-4Bh	Peak current of overload current limit	100.0% to 750.0%	300.0	%	At stop	
H32.75	2032-4Ch	Max. current duration of overload protection	0.01s to 655.35s	1.00	s	At stop	
H32.76	2032-4Dh	Current limit time constant of overload protection	0.01–655.35	1.00	-	At stop	
H32.77	2032-4Eh	Current limit alarm threshold of overload protection	0.0% to 750.0%	0.0	%	At stop	
H32.78	2032-4Fh	Current limit fault threshold of overload protection	0.0% to 750.0%	0.0	%	At stop	
H32.79	2032-50h	Thermal threshold current of overload	10.0% to 750.0%	115.0	%	At stop	
H32.80	2032-51h	Thermal current interval of overload	0.1% to 204.8%	6.4	%	At stop	
H32.81	2032-52h	Overload heat dissipation current interval	0.1% to 204.8%	6.4	%	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H32.82	2032-53h	Length of overload heat dissipation curve	1–200	1	-	At stop	
H32.83	2032-54h	Length of overload heat dissipation curve	1–200	1	-	At stop	

22.31H33 Compensation Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.00	2033-01h	Compensation data BUFFER0	0–65535	0	-	At stop	
H33.01	2033-02h	Compensation data BUFFER1	0–65535	0	-	At stop	
H33.02	2033-03h	Compensation data BUFFER2	0–65535	0	-	At stop	
H33.03	2033-04h	Compensation data BUFFER3	0–65535	0	-	At stop	
H33.04	2033-05h	Compensation data BUFFER4	0–65535	0	-	At stop	
H33.05	2033-06h	Compensation data BUFFER5	0–65535	0	-	At stop	
H33.06	2033-07h	Compensation data BUFFER6	0–65535	0	-	At stop	
H33.07	2033-08h	Compensation data BUFFER7	0–65535	0	-	At stop	
H33.08	2033-09h	Compensation data BUFFER8	0–65535	0	-	At stop	
H33.09	2033-0Ah	Compensation data BUFFER9	0–65535	0	-	At stop	
H33.10	2033-0Bh	Compensation data BUFFER10	0–65535	0	-	At stop	
H33.11	2033-0Ch	Compensation data BUFFER11	0–65535	0	-	At stop	
H33.12	2033-0Dh	Compensation data BUFFER12	0–65535	0	-	At stop	
H33.13	2033-0Eh	Compensation data BUFFER13	0–65535	0	-	At stop	
H33.14	2033-0Fh	Compensation data BUFFER14	0–65535	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.15	2033-10h	Compensation data BUFFER15	0–65535	0	-	At stop	
H33.16	2033-11h	Compensation data BUFFER16	0–65535	0	-	At stop	
H33.17	2033-12h	Compensation data BUFFER17	0–65535	0	-	At stop	
H33.18	2033-13h	Compensation data BUFFER18	0–65535	0	-	At stop	
H33.19	2033-14h	Compensation data BUFFER19	0–65535	0	-	At stop	
H33.20	2033-15h	Compensation data BUFFER20	0–65535	0	-	At stop	
H33.21	2033-16h	Compensation data BUFFER21	0–65535	0	-	At stop	
H33.22	2033-17h	Compensation data BUFFER22	0–65535	0	-	At stop	
H33.23	2033-18h	Compensation data BUFFER23	0–65535	0	-	At stop	
H33.24	2033-19h	Compensation data BUFFER24	0–65535	0	-	At stop	
H33.25	2033-1Ah	Compensation data BUFFER25	0–65535	0	-	At stop	
H33.26	2033-1Bh	Compensation data BUFFER26	0–65535	0	-	At stop	
H33.27	2033-1Ch	Compensation data BUFFER27	0–65535	0	-	At stop	
H33.28	2033-1Dh	Compensation data BUFFER28	0–65535	0	-	At stop	
H33.29	2033-1Eh	Compensation data BUFFER29	0–65535	0	-	At stop	
H33.30	2033-1Fh	Compensation data BUFFER30	0–65535	0	-	At stop	
H33.31	2033-20h	Compensation data BUFFER31	0–65535	0	-	At stop	
H33.32	2033-21h	Compensation data BUFFER32	0–65535	0	-	At stop	
H33.33	2033-22h	Compensation data BUFFER33	0–65535	0	-	At stop	
H33.34	2033-23h	Compensation data BUFFER34	0–65535	0	-	At stop	
H33.35	2033-24h	Compensation data BUFFER35	0–65535	0	-	At stop	
H33.36	2033-25h	Compensation data BUFFER36	0–65535	0	-	At stop	
H33.37	2033-26h	Compensation data BUFFER37	0–65535	0	-	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.38	2033-27h	Compensation data BUFFER38	0–65535	0	-	At stop	
H33.39	2033-28h	Compensation data BUFFER39	0–65535	0	-	At stop	
H33.40	2033-29h	Current Compensation BUFFER group number	0–65535	0	-	At stop	
H33.41	2033-2Ah	Compensation data sum	0–32767	0	-	At stop	
H33.44	2033-2Dh	Data command	0–1	1	-	At stop	
H33.45	2033-2Eh	Data storage position	0: Servo RAM 1: Servo FLASH 2: Encoder FLASH	1	-	At stop	
H33.46	2033-2Fh	Data clear	0–3	0	-	At stop	
H33.47	2033-30h	Software tool write status	0–2	0	-	At stop	
H33.48	2033-31h	Servo read status	0–65535	0	-	Unchangeable	
H33.49	2033-32h	Software tool read status	0–2	0	-	At stop	
H33.50	2033-33h	Servo write status	0–65535	0	-	Unchangeable	
H33.51	2033-34h	Data transmission completed flag	0–1	0	-	At stop	
H33.52	2033-35h	Servo data transfer completed flag	0–65535	0	-	Unchangeable	
H33.60	2033-3Dh	Accuracy compensation function	0–1	0	-	At stop	
H33.61	2033-3Eh	Accuracy compensation sum	0count to 2048count	0	count	At stop	
H33.62	2033-3Fh	Starting offset address of accuracy compensation	-21474836.48[mm]/[deg]–21474836.47[mm]/[deg]	0.00	[mm]/[deg]	At stop	
H33.64	2033-41h	Accuracy compensation data interval	-327.67[mm]/[deg]–327.67[mm]/[deg]	0.00	[mm]/[deg]	At stop	

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.65	2033-42h	Accuracy compensation dial phase sequence	0x0 to 0xFFFF	0x0	-	At stop	
H33.66	2033-43h	Accuracy compensation dial reference direction	0–1	0	-	At stop	
H33.67	2033-44h	Servo homing completed	0–65535	0	-	Un changeable	
H33.68	2033-45h	Current acting index of accuracy compensation	0–65535	0	-	Un changeable	
H33.69	2033-46h	Forced homing start	0–1	0	-	At stop	
H33.70	2033-47h	Forced homing mode	-32768–32767	-2	-	At stop	
H33.71	2033-48h	Forced homing at low speed	0[mm/s]/[rpm]–1000[mm/s]/[rpm]	10	[mm/s]/[rpm]	At stop	
H33.72	2033-49h	Single-turn absolute position of accuracy compensation home of absolute encoder	0 to 4294967295	0	Encoder unit	At stop	
H33.74	2033-4Bh	Min.pulse width of frequency-division output accuracy compensation	2count to 7count	3	count	At stop	
H33.75	2033-4Ch	Accuracy compensation data unit	0: [um]/[arcsec] 1: [mm]/[mrad]	0	-	At stop	
H33.81	2033-52h	Motor cogging torque ripple compensation sum	0count to 65535count	2000	count	At stop	

22.32H34 Servo Motor Parameters 2

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H34.12	2034-0Dh	Error type supported by EnDat2.2 encoder	0x0 to 0xFFFF	0x0	-	Unchangeable	
H34.13	2034-0Eh	Alarm types supported by EnDat2.2 encoders	0x0 to 0xFFFF	0x0	-	Unchangeable	
H34.14	2034-0Fh	Error value output by EnDat2.2 encoder	0x0 to 0xFFFF	0x0	-	Unchangeable	
H34.15	2034-10h	Alarm value output by EnDat2.2 encoder	0x0 to 0xFFFF	0x0	-	Unchangeable	

22.33List of 1000h Object Dictionary

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
1000.00h	1000-00h	Device type	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1001.00h	1001-00h	Error Register	0x0 to 0xFF	0x0	-	Unchangeable	
1018.01h	1018-01h	Vendor ID	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1018.02h	1018-02h	Product Code	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1018.03h	1018-03h	Revision	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1018.04h	1018-04h	Serial number	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.00h	1600-00h	Number of valid mapped	0–20	0	-	Unchangeable	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
		objects in RPDO1					
1600.01h	1600-01h	Mapped object 1 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.02h	1600-02h	Mapped object 2 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.03h	1600-03h	Mapped object 3 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.04h	1600-04h	Mapped object 4 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.05h	1600-05h	Mapped object 5 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.06h	1600-06h	Mapped object 6 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.07h	1600-07h	Mapped object 7 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.08h	1600-08h	Mapped object 8 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.09h	1600-09h	Mapped object 9 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.0Ah	1600-0Ah	Mapped object 10 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.0Bh	1600-0Bh	Mapped object 11 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.0Ch	1600-0Ch	Mapped object 12 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.0Dh	1600-0Dh	Mapped object 13 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.0Eh	1600-0Eh	Mapped object 14 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.0Fh	1600-0Fh	Mapped object 15 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
1600.10h	1600-10h	Mapped object 16 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.11h	1600-11h	Mapped object 17 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.12h	1600-12h	Mapped object 18 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.13h	1600-13h	Mapped object 19 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1600.14h	1600-14h	Mapped object 20 in RPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.00h	1A00-00h	Number of valid mapped objects in TPDO1	0–20	0	-	Unchangeable	
1A00.01h	1A00-01h	Mapped object 1 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.02h	1A00-02h	Mapped object 2 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.03h	1A00-03h	Mapped object 3 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.04h	1A00-04h	Mapped object 4 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.05h	1A00-05h	Mapped object 5 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.06h	1A00-06h	Mapped object 6 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.07h	1A00-07h	Mapped object 7 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.08h	1A00-08h	Mapped object 8 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.09h	1A00-09h	Mapped object 9 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
1A00.0Ah	1A00-0Ah	Mapped object 10 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.0Bh	1A00-0Bh	Mapped object 11 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.0Ch	1A00-0Ch	Mapped object 12 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.0Dh	1A00-0Dh	Mapped object 13 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.0Eh	1A00-0Eh	Mapped object 14 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.0Fh	1A00-0Fh	Mapped object 15 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.10h	1A00-10h	Mapped object 16 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.11h	1A00-11h	Mapped object 17 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.12h	1A00-12h	Mapped object 18 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.13h	1A00-13h	Mapped object 19 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1A00.14h	1A00-14h	Mapped object 20 in TPDO1	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1C12.00h	1C12-00h	Number of assigned PDOs	0x0 to 0x2	0x2	-	Unchangeable	
1C12.01h	1C12-01h	PDO mapping object index of assigned RxPDO1	0x1600 to 0x17FF	0x1701	-	Unchangeable	
1C12.02h	1C12-02h	PDO mapping object index of assigned RxPDO2	0x1600 to 0x17FF	0x170A	-	Unchangeable	
1C13.00h	1C13-00h	Number of assigned PDOs	0x0 to 0x2	0x2	-	Unchangeable	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
1C13.01h	1C13-01h	PDO mapping object index of assigned TxPDO1	0x1A00 to 0x1BFF	0x1B01	-	Unchangeable	
1C13.02h	1C13-02h	PDO mapping object index of assigned TxPDO2	0x1A00 to 0x1BFF	0x1B0A	-	Unchangeable	
1C32.01h	1C32-01h	Sync mode	0x0 to 0xFFFF	0x0	-	Unchangeable	
1C32.02h	1C32-02h	Cycle time	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1C32.04h	1C32-04h	Sync modes supported	0x0 to 0xFFFF	0x0	-	Unchangeable	
1C32.05h	1C32-05h	Minimum cycle time	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1C33.01h	1C33-01h	Sync mode	0x0 to 0xFFFF	0x0	-	Unchangeable	
1C33.02h	1C33-02h	Cycle time	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	
1C33.04h	1C33-04h	Sync modes supported	0x0 to 0xFFFF	0x0	-	Unchangeable	
1C33.05h	1C33-05h	Minimum cycle time	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	

22.34List of 6000h Object Dictionary

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
603Fh	603Fh	Error code	0x0 to 0xFFFF	0x0	-	Unchangeable	
6040h	6040h	Control word	0x0 to 0xFFFF	0x0	-	Real-time	
6041h	6041h	Status word	0x0 to 0xFFFF	0x0	-	Unchangeable	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
605Ah	605Ah	Quick stop mode	0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state 6: Ramp to stop as defined by 6085h, keeping position lock state 7: Stop at emergency stop torque, keeping position lock state	2	-	Real-time	
605Ch	605Ch	Stop mode at S-OFF	–4: Ramp to stop as defined by 6085h, keeping dynamic braking state –3: at zero speed, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Dynamic braking stop, keeping de-energized state	0	-	Real-time	
605Dh	605Dh	Halt mode	1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping position lock state 2: Ramp to stop as defined by 6085h, keeping position lock state 3: Stop at emergency stop torque, keeping position lock state	1	-	Real-time	
605Eh	605Eh	Stop mode at No. 2 fault	–5: Stop at zero speed, keeping dynamic braking state	2	-	Real-time	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
			–4: Stop at emergency stop torque, keeping dynamic braking state –3: Ramp to stop as defined by 6085h, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state				
6060h	6060h	Servo drive mode	1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Real-time	
6061h	6061h	Operation mode display	1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Unchangeable	
6062h	6062h	Position reference	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
6063h	6063h	Position actual value	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
6064h	6064h	Position actual value	-2147483648 to 2147483647	0	Reference unit	Unchangeable	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
6065h	6065h	Following error window	0 to 4294967295	219895614	Reference unit	Real-time	
6066h	6066h	Defines the time lapse to trigger excessive position deviation (EB00.0).	0 ms–65535 ms	0	ms	Real-time	
6067h	6067h	Position window	0 to 4294967295	46976	Reference unit	Real-time	
6068h	6068h	Position window time	0 ms–65535 ms	0	ms	Real-time	
606Ch	606Ch	Actual speed	–2147483648 to +2147483647	0	Reference unit/s	Unchangeable	
606Dh	606Dh	Velocity window	0[mm/s]/[rpm]–65535[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	
606Eh	606Eh	Velocity window time	0 ms–65535 ms	0	ms	Real-time	
606Fh	606Fh	Zero speed signal threshold	0[mm/s]/[rpm]–65535[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	
6070h	6070h	Velocity threshold time	0 ms–65535 ms	0	ms	Real-time	
6071h	6071h	Target torque	-4000.%–4000.%	0	0.10%	Real-time	
6072h	6072h	Max. torque reference	0.%–4000.%	3500	0.10%	Real-time	
6074h	6074h	Torque reference	-4000.%–4000.%	0	0.10%	Unchangeable	
6077h	6077h	Actual torque	-4000.%–4000.%	0	0.10%	Unchangeable	
607Ah	607Ah	Target position	-2147483648 to 2147483647	0	Reference unit	Real-time	
607Ch	607Ch	Home offset	-2147483648 to 2147483647	0	Reference unit	Real-time	
607D.01h	607D-01h	Min. position limit	-2147483648 to 2147483647	-2147483648	Reference unit	Real-time	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
607D.02h	607D-02h	Max. position limit	-2147483648 to 2147483647	2147483647	Reference unit	Real-time	
607Eh	607Eh	Reference polarity	0x0 to 0xFF	0x0	-	Real-time	
607Fh	607Fh	Max. speed	0 to 4294967295	4294967295	Reference unit/s	Real-time	
6081h	6081h	Profile velocity	0 to 4294967295	111848106	Reference unit/s	Real-time	
6083h	6083h	Profile acceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time	
6084h	6084h	Profile deceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time	
6085h	6085h	Quick stop deceleration	0 to 4294967295	2147483647	Reference unit/s^2	Real-time	
6087h	6087h	Torque slope	0.%/s–4294967295.%/s	4294967295	0.1%/s	Real-time	
6091.01h	6091-01h	Motor resolution	1–4294967295	1	-	At stop	
6091.02h	6091-02h	Shaft resolution	1–4294967295	1	-	At stop	
6098h	6098h	Homing method	-3–35	1	-	Real-time	
6099.01h	6099-01h	Speed during search for switch	0 to 4294967295	111848106	Reference unit/s	At stop	
6099.02h	6099-02h	Speed during search for zero	0 to 4294967295	11184810	Reference unit/s	At stop	
609Ah	609Ah	Homing acceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time	
60B0h	60B0h	Position offset	-2147483648 to 2147483647	0	Reference unit	Real-time	
60B1h	60B1h	Velocity offset	–2147483648 to +2147483647	0	Reference unit/s	Real-time	
60B2h	60B2h	Torque offset	-4000.%–4000.%	0	0.10%	Real-time	
60B8h	60B8h	Touch probe function	0x0 to 0xFFFF	0x0	-	Real-time	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
60B9h	60B9h	Touch probe status	0x0 to 0xFFFF	0x0	-	Unchangeable	
60BAh	60BAh	Touch probe 1 positive edge position value	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
60BBh	60BBh	Touch probe 1 negative edge position value	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
60BCh	60BCh	Touch probe 2 positive edge position value	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
60BDh	60BDh	Touch probe 2 negative edge position value	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
60C5h	60C5h	Max. acceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time	
60C6h	60C6h	Max. deceleration	0 to 4294967295	4294967295	Reference unit/s^2	Real-time	
60D5h	60D5h	Touch probe 1 positive edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable	
60D6h	60D6h	Touch probe 1 negative edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable	
60D7h	60D7h	Touch probe 2 positive edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable	
60D8h	60D8h	Touch probe 2 negative edge counter	0x0 to 0xFFFF	0x0	-	Unchangeable	
60E0h	60E0h	Positive torque limit	0.%–4000.%	3000	0.10%	Real-time	
60E1h	60E1h	Negative torque limit	0.%–4000.%	3000	0.10%	Real-time	
60F4h	60F4h	Position deviation	-2147483648 to 2147483647	0	Reference unit	Unchangeable	
60FCh	60FCh	Position reference	-2147483648–2147483647	0	-	Unchangeable	
60FDh	60FDh	DI state	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
60FFh	60FFh	PV, CSV mode speed reference	–2147483648 to +2147483647	0	Reference unit/s	Real-time	
60FE.01h	60FE-01h	Physical output	0x0 to 0xFFFFFFFF	0x0	-	Real-time	
60FE.02h	60FE-02h	Bitmask	0x0 to 0xFFFFFFFF	0x0	-	Real-time	

23 Parameter Description [Standard Model N]

23.1 H00 Servo Motor Parameters

H00.00 Motor SN

Address:	2000-01h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	14102	Change:	At stop

Value Range:

20000: linear motor-pulse encoder
14203: linear motor-BiSS-C encoder
14206: linear motor-SSI encoder
14207: linear motor-EnDat2.2 encoder
14202: linear motor-Inovance communication 23-bit encoder
14205: linear motor-Inovance interpolator 23-bit encoder
20001: DDR motor-pulse encoder
14210: DDR motor-Inovance interpolator 23-bit encoder
14201: DDR motor-Inovance communication 23-bit encoder
14211: DDR motor-BiSS-C encoder
14212: DDR motor-EnDat2.2 encoder
14213: DDR motor-SSI encoder
20002: rotary motor-pulse encoder
14000: rotary motor-Inovance communication 20-bit encoder
14101: rotary motor-Inovance communication 23-bit encoder
14102: rotary motor-Inovance communication 26-bit encoder
14020: rotary motor-Harmonic 20-bit encoder-2.5M baud rate
14021: rotary motor-Harmonic 17-bit encoder-2.5M baud rate
14022: rotary motor-Harmonic 17-bit encoder-4M baud rate
14120: rotary motor-Nikon 20-bit encoder-2.5M baud rate
14121: rotary motor-Nikon 17-bit encoder-2.5M baud rate
14122: rotary motor-Nikon 17-bit encoder-4M baud rate
14130: rotary motor-TAMAGAWA 17-bit encoder
14131: rotary motor-TAMAGAWA 23-bit encoder
14140: rotary motor-EnDat2.2 encoder
14150: rotary motor-SSI encoder
14160: rotary motor-BiSS-C encoder

Description

20000: linear motor-pulse encoder
14203: linear motor-BiSS-C encoder
14206: linear motor-SSI encoder
14207: linear motor-EnDat2.2 encoder
14202: linear motor-Inovance communication 23-bit encoder
14205: linear motor-Inovance interpolator 23-bit encoder
20001: DDR motor-pulse encoder
14210: DDR motor-Inovance interpolator 23-bit encoder
14201: DDR motor-Inovance communication 23-bit encoder
14211: DDR motor-BiSS-C encoder
14212: DDR motor-EnDat2.2 encoder
14213: DDR motor-SSI encoder
20002: rotary motor-pulse encoder
14000: rotary motor-Inovance communication 20-bit encoder
14101: rotary motor-Inovance communication 23-bit encoder
14102: rotary motor-Inovance communication 26-bit encoder
14020: rotary motor-Harmonic 20-bit encoder-2.5M baud rate
14021: rotary motor-Harmonic 17-bit encoder-2.5M baud rate
14022: rotary motor-Harmonic 17-bit encoder-4M baud rate
14120: rotary motor-Nikon 20-bit encoder-2.5M baud rate
14121: rotary motor-Nikon 17-bit encoder-2.5M baud rate
14122: rotary motor-Nikon 17-bit encoder-4M baud rate
14130: rotary motor-TAMAGAWA 17-bit encoder
14131: rotary motor-TAMAGAWA 23-bit encoder
14140: rotary motor-EnDat2.2 encoder
14150: rotary motor-SSI encoder
14160: rotary motor-BiSS-C encoder

H00.02 Customized No.

Address:	2000-03h	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	42949672.95	Data Type:	UInt32
Default:	0.00	Change:	Unchangeable

Value Range:

0.00–42949672.95

Description

Differentiates the customized MCU software version, which is not applicable to standard models.

H00.04 **Encoder version**

Address:	2000-05h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0–6553.5

Description
Saved in the encoder and used to differentiate the encoder software version.

H00.05 **Serial-type motor code**

Address:	2000-06h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535

Description
Displays the code of the serial-type motor, which is determined by the motor model and unchangeable.

H00.06 **FPGA customized SN**

Address:	2000-07h	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:
0.00–655.35

Description
Differentiates the customized FPGA software version, which is not applicable to standard models.

H00.07 **STO version**

Address:	2000-08h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0–6553.5

Description
Displays the software version number of STO function.

H00.08 **Bus encoder type**

Address:	2000-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

14100: Multi-turn absolute encoder

Others: Single-turn absolute encoder

H00.14 **Rated speed**

Address:	2000-0Fh	Effective mode:	Upon the next power-on
Min.:	50	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	3000	Change:	At stop

Value Range:

50[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Set the motor rated speed.

H00.15 **Maximum speed**

Address:	2000-10h	Effective mode:	Upon the next power-on
Min.:	50	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	6000	Change:	At stop

Value Range:

50[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Set the maximum motor speed.

H00.18 **Stator resistance**

Address:	2000-13h	Effective mode:	Upon the next power-on
Min.:	0.001	Unit:	Ω
Max.:	65.535	Data Type:	UInt16
Default:	0.500	Change:	At stop

Value Range:

0.001Ω to 65.535Ω

Description

Set the motor stator resistance.

H00.19 **Stator inductance Lq**

Address:	2000-14h	Effective mode:	Upon the next power-on
Min.:	0.01	Unit:	mH
Max.:	655.35	Data Type:	UInt16
Default:	3.27	Change:	At stop

Value Range:

0.01mH to 655.35mH

Description

Set the motor stator inductance Lq.

H00.20 **Stator inductance Ld**

Address:	2000-15h	Effective mode:	Upon the next power-on
Min.:	0.01	Unit:	mH
Max.:	655.35	Data Type:	UInt16
Default:	3.87	Change:	At stop

Value Range:

0.01mH to 655.35mH

Description

Set the motor stator inductance Ld.

H00.22 **Torque coefficient Kt**

Address:	2000-17h	Effective mode:	Upon the next power-on
Min.:	0.01	Unit:	[N/Arms]/[N·m/Arms]
Max.:	655.35	Data Type:	UInt16
Default:	0.51	Change:	At stop

Value Range:

0.01[N/Arms]/[N·m/Arms]–655.35[N/Arms]/[N·m/Arms]

Description

Set the motor torque coefficient Kt.

H00.40 **Motor control type**

Address:	2000-29h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-

Max.:	3	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0: General-purpose rotary motor (ROT)
1: Direct drive rotary motor (DDR)
2: Direct drive linear motor (DDL)
3: Voice coil motor (VOL)

Description

The motor type supported by the drive.
0: General-purpose rotary motor (ROT)
1: Direct drive rotary motor (DDR)
2: Direct drive linear motor (DDL)
3: Voice coil motor (VOL)

H00.41 Master encoder configuration

Address:	2000-2Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Unchangeable

Value Range:

0：CN2
1：CN7

Description

Defines the terminal for the master encoder.

H00.43 Number of BiSS-C/SSI/EnDat2.2 data bits

Address:	2000-2Ch	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	32	Change:	At stop

Value Range:

0–40

Description

Defines the length of the data configured based on BiSS-C/SSI/EnDat2.2 protocol.

H00.44 Number of BiSS-C/SSI fault bits

Address:	2000-2Dh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16

Default: 2 Change: At stop

Value Range:

0–31

Description

Defines the length of the fault configured based on BiSS-C/SSI protocol.

H00.45 Encoder pitch 1

Address: 2000-2Eh Effective mode: Upon the next power-on

Min.: 0.00 Unit: [mm]/[deg]

Max.: 655.35 Data Type: UInt16

Default: 2.00 Change: At stop

Value Range:

0.00[mm]/[deg]–655.35[mm]/[deg]

Description

Defines the encoder pitch characteristics, which should be used together with encoder pitch fluctuation suppressor 1 (see details in H08.90).

H00.46 Encoder pitch 2

Address: 2000-2Fh Effective mode: Upon the next power-on

Min.: 0.00 Unit: [mm]/[deg]

Max.: 655.35 Data Type: UInt16

Default: 0.50 Change: At stop

Value Range:

0.00[mm]/[deg]–655.35[mm]/[deg]

Description

Defines the encoder pitch characteristics, which should be used together with encoder pitch fluctuation suppressor 2 (see details in H08.90).

H00.47 Encoder type

Address: 2000-30h Effective mode: Upon the next power-on

Min.: 0 Unit: -

Max.: 1 Data Type: UInt16

Default: 0 Change: At stop

Value Range:

0：Optical scale

1：Magnetic scale

Description

Pulse Encoder type:

0：Optical scale

1：Magnetic scale

H00.48 **Linear motor pole pitch (N-S)**

Address:	2000-31h	Effective mode:	Upon the next power-on
Min.:	0.00		
Max.:	655.35	Unit:	mm
Default:	16.00	Data Type:	UInt16
Value Range:		Change:	At stop

0.00 mm–655.35 mm

Description

Defines the N-S pole pitch of the linear motor.

H00.49 **Direct drive motor encoder resolution**

Address:	2000-32h	Effective mode:	Upon the next power-on
Min.:	0.000		
Max.:	65.535	Unit:	μm/p
Default:	1.000	Data Type:	UInt16
Value Range:		Change:	At stop

0.000 μm/p–65.535 μm/p

Description

Defines the encoder resolution of the linear motor.

H00.54 **BiSS-C/SSI CRC**

Address:	2000-37h	Effective mode:	Upon the next power-on
Min.:	0		
Max.:	1	Unit:	-
Default:	1	Data Type:	UInt16
Value Range:		Change:	At stop

0–1

Description

Defines the CRC polarity of the BiSS-C/SSI protocol.

0：Positive

1：Negative

H00.55 **Rated torque (Uint32)**

Address:	2000-38h	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	[N]/[N·m]
Max.:	42949672.95	Data Type:	UInt32
Default:	2.00	Change:	At stop
Value Range:			

0.00[N]/[N·m]–42949672.95[N]/[N·m]

Description

Set the motor rated torque.

H00.57 **Max. torque (Uint32)**

Address:	2000-3Ah	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	[N]/[N·m]
Max.:	42949672.95	Data Type:	UInt32
Default:	7.00	Change:	At stop

Value Range:

0.00[N]/[N·m]–42949672.95[N]/[N·m]

Description

Set the maximum motor torque.

H00.59 **Encoder counting direction**

Address:	2000-3Ch	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0：Forward

1：Reverse

Description

Motor phase sequence:

0：Forward

1：Reverse

H00.63 **Max. current (Uint32)**

Address:	2000-40h	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	A
Max.:	42949672.95	Data Type:	UInt32
Default:	3.00	Change:	At stop

Value Range:

0.00A–42949672.95A

Description

Set the maximum current.

H00.65 **Rated current (Uint32)**

Address:	2000-42h	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	A
Max.:	42949672.95	Data Type:	UInt32
Default:	1.00	Change:	At stop

Value Range:

0.00A–42949672.95A

Description

Set the rated current.

H00.67 **Moment of inertia (Uint32)**

Address:	2000-44h	Effective mode:	Upon the next power-on
Min.:	0.00000	Unit:	[g]/[0.00001kg·cm²]
Max.:	42949.67295	Data Type:	UInt32
Default:	0.00001	Change:	At stop

Value Range:

0.00000[g]/[0.00001kg·cm²]–42949.67295[g]/[0.00001kg·cm²]

Description

Set the moment of inertia.

H00.69 **Linear back EMF coefficient (Uint32)**

Address:	2000-46h	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	[V/(m/s)]/[100mV/rpm]
Max.:	42949672.95	Data Type:	UInt32
Default:	33.00	Change:	At stop

Value Range:

0.00[V/(m/s)]/[100mV/rpm]–42949672.95[V/(m/s)]/[100mV/rpm]

Description

Set the Linear back EMF coefficient.

23.2 H01 Servo Drive Parameters

H01.00 **MCU software version**

Address:	2001-01h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0–6553.5

Description

Displays the MCU software version.

H01.01 **FPGA software version**

Address:	2001-02h	Effective mode:	-

Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0–6553.5
Description
Display the FPGA software version.

H01.02 **Servo drive series No.**

Address:	2001-03h	Effective mode:	-
Min.:	0		
Max.:	65535	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	Unchangeable

0–65535
Description
Display servo drive series number.

H01.06 **Board software version**

Address:	2001-07h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0–6553.5
Description
Display board software version.

H01.10 **Drive series No.**

Address:	2001-0Bh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	3	Change:	At stop

Value Range:
2: S1R6
3: S2R8
5: S5R5
6: S7R6
7: S012
8: S018

9: S022
10: S027
10001: T3R5
10002: T5R4
10003: T8R4
10004: T012
10005: T017
10006: T021
10007: T026

Description

Display the serial number of the drive.

2: S1R6
3: S2R8
5: S5R5
6: S7R6
7: S012
8: S018
9: S022
10: S027
10001: T3R5
10002: T5R4
10003: T8R4
10004: T012
10005: T017
10006: T021
10007: T026

H01.11 DC-AC voltage class

Address:	2001-0Ch	Effective mode:	-
Min.:	0	Unit:	V
Max.:	65535	Data Type:	UInt16
Default:	220	Change:	Unchangeable

Value Range:

0 V–65535 V

Description

Display DC-AC voltage class.

H01.12 Drive rated power

Address:	2001-0Dh	Effective mode:	-
Min.:	0.00	Unit:	kW
Max.:	42949672.95	Data Type:	UInt32

Default: 0.40 Change: Unchangeable

Value Range:

0.00 kW–42949672.95 kW

Description

Display drive rated power.

H01.14 Max. output power of the drive

Address: 2001-0Fh Effective mode: -

Min.: 0.00 Unit: kW

Max.: 42949672.95 Data Type: UInt32

Default: 0.40 Change: Unchangeable

Value Range:

0.00 kW–42949672.95 kW

Description

Display the maximum output power of the drive.

H01.16 Rated output current of the drive

Address: 2001-11h Effective mode: -

Min.: 0.00 Unit: A

Max.: 42949672.95 Data Type: UInt32

Default: 2.80 Change: Unchangeable

Value Range:

0.00 A–42949672.95 A

Description

Display the rated output current of the drive.

H01.18 Max. output current of the drive

Address: 2001-13h Effective mode: -

Min.: 0.00 Unit: A

Max.: 42949672.95 Data Type: UInt32

Default: 10.10 Change: Unchangeable

Value Range:

0.00 A–42949672.95 A

Description

Display the maximum output current of the drive.

H01.40 DC bus overvoltage protection threshold

Address: 2001-29h Effective mode: Real time

Min.: 0 Unit: V

Max.: 2000 Data Type: UInt16

Default: 420 Change: Real time

Value Range:
0 V–2000 V
Description
Display DC bus overvoltage protection threshold.

H01.75 Current loop amplification factor

Address:	2001-4Ch	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:
0.00–655.35
Description
Display current loop amplification factor.

H01.88 Junction temperature parameter version 1

Address:	2001-59h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0–6553.5
Description
Display version 1 of the junction temperature parameter.

H01.89 Junction temperature parameter version 2

Address:	2001-5Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Displays version 2 of the junction temperature parameter.

H01.90 Motor property mask

Address:	2001-5Bh	Effective mode:	Upon next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16

Default: 0 Change: At stop

Value Range:

0–65535

Description

The setpoint 1 indicates the bit function of H0060 is being masked.

23.3 H02 Basic Control Parameters

H02.00 **Control mode**

Address: 2002-01h Effective mode: Real time

Min.: 0 Unit: -

Max.: 9 Data Type: UInt16

Default: 9 Change: At stop

Value Range:

0: Velocity mode

1: Position mode

2: Torque mode

7: Technology segment

9: EtherCAT mode

Description

0: Velocity mode

1: Position mode

2: Torque mode

7: Technology segment

9: EtherCAT mode

H02.01 **Absolute system selection**

Address: 2002-02h Effective mode: Upon next power-on

Min.: 0 Unit: -

Max.: 4 Data Type: UInt16

Default: 0 Change: At stop

Value Range:

0：Incremental mode

1：Absolute position linear mode

2：Absolute position rotation mode

3：Absolute position linear mode (without encoder overflow alarm)

4：Absolute position single-turn mode

Description

Absolute system mode selection
0: Incremental mode
1: Absolute position linear mode
2: Absolute position rotation mode
3: Absolute position linear mode (without encoder overflow alarm)
4: Absolute position single-turn mode

H02.02 **Rotation direction selection**

Address:	2002-03h	Effective mode:	Upon the next power-on
Min.:	0		
Max.:	1	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	At stop

0: Counterclockwise (CCW) as forward direction
1: Clockwise (CW) as forward direction

Description

Defines the forward direction of the motor when viewed from the motor shaft side.
0: Counterclockwise (CCW) as forward direction
1: Clockwise (CW) as forward direction

H02.03 **Output pulse phase**

Address:	2002-04h	Effective mode:	Upon the next power-on
Min.:	0		
Max.:	1	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	At stop

0: Phase A leads phase B
1: Phase A lags behind phase B

Description

Defines the relationship between phase A and phase B on the condition that the motor direction of rotation remains unchanged when pulse output is enabled.

0: Phase A leads phase B
1: Phase A lags behind phase B

H02.05 **Stop mode at S-ON OFF**

Address:	2002-06h	Effective mode:	At stop
Min.:	-4		
Max.:	2	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real-time

-4: Ramp to stop as defined by 6085h, keeping dynamic braking state
-3: at zero speed, keeping dynamic braking state

-2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state
-1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state
2: Dynamic braking stop, keeping de-energized state

Description

Defines the deceleration mode of the motor for stopping rotating upon S-ON OFF and the motor status after stop.
-4: Ramp to stop as defined by 6085h, keeping dynamic braking state
-3: Stop at zero speed, keeping dynamic braking state
-2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state
-1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized status
2: Dynamic braking stop, keeping de-energized state
Note: After the brake is enabled, H02.05 is forced to "4: Ramp to stop as defined by 6085h, keeping dynamic braking state".

H02.06 Stop mode at No. 2 fault

Address:	2002-07h	Effective mode:	At stop
Min.:	-5	Unit:	-
Max.:	4	Data Type:	Int16
Default:	2	Change:	Real-time

Value Range:

–5: Stop at zero speed, keeping dynamic braking state
–4: Stop at emergency stop torque, keeping dynamic braking state
–3: Ramp to stop as defined by 6085h, keeping dynamic braking state
–2: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping dynamic braking state
–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping de-energized state
2: Ramp to stop as defined by 6085h, keeping de-energized state
3: Stop at emergency stop torque, keeping de-energized state
4: Dynamic braking stop, keeping de-energized state

Description

Defines the deceleration mode of the servo motor for stopping rotating and the servo motor status when a No. 2 fault occurs.
–5: Stop at zero speed, keeping dynamic braking state
–4: Stop at emergency stop torque, keeping dynamic braking state
–3: Ramp to stop as defined by 6085h, keeping dynamic braking state
–2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state

–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state
2: Ramp to stop as defined by 6085h, keeping de-energized stat
3: Stop at emergency stop torque, keeping de-energized state
4: Dynamic braking stop, keeping de-energized state
Note: If the brake is enabled, H02.06 is forced to "3: Ramp to stop as defined by 6085h, keeping dynamic braking state".

H02.07 **Stop mode at overtravel**

Address:	2002-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0: Coast to stop, keeping de-energized state
1: Stop at zero speed, keeping position lock state
2: Stop at zero speed, keeping de-energized state
3: Ramp to stop as defined by 6085h, keeping de-energized state
4: Ramp to stop based on 6085h, keeping position lock state
5: Dynamic braking stop, keeping de-energized state
6: Dynamic braking stop, keeping dynamic braking state
7: Not responding to overtravel

Description
Defines the deceleration mode of the servo motor for stopping rotating and the servo motor status when overtravel occurs.
0: Coast to stop, keeping de-energized state
1: Stop at zero speed, keeping position lock state
2: Stop at zero speed, keeping de-energized state
3: Ramp to stop as defined by 6085h, keeping de-energized state
4: Ramp to stop based on 6085h, keeping position lock state
5: Dynamic braking stop, keeping de-energized state
6: Dynamic braking stop, keeping dynamic braking state
7: Not responding to overtravel
Note: When H02.07 is set to 7 (Not responding to overtravel), some PLC may stop sending position references to stop the drive.
After the brake function is enabled, H02.07 will be forcibly set to "4: Ramp to stop as defined by 6085h, keeping position lock state".

H02.08 **Stop mode at No.1 fault**

Address:	2002-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0: Coast to stop, keeping de-energized state

1: Dynamic braking stop, keeping de-energized state

2: Dynamic braking stop, keeping dynamic braking state

Description

Defines the deceleration mode of the servo motor for stopping rotating and the servo motor status when a No. 1 fault occurs.

0: Coast to stop, keeping de-energized state

1: Dynamic braking stop, keeping de-energized status

2: Dynamic braking stop, keeping dynamic braking state

Note: After the brake is enabled, H02.08 is forced to "2: Dynamic braking stop, keeping dynamic braking state".

H02.09 Delay from brake output ON to command received

Address:	2002-0Ah	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	500	Data Type:	UInt16
Default:	250	Change:	Real-time

Value Range:

0 ms–500 ms

Description

Defines the delay from the moment the brake output signal is ON to the moment the servo drive starts to receive commands after power-on.

H02.10 Delay from brake output OFF to motor de-energized

Address:	2002-0Bh	Effective mode:	Real time
Min.:	50	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	150	Change:	Real-time

Value Range:

50 ms–1000 ms

Description

Defines the delay from the moment brake output is OFF to the moment when the motor at standstill enters the de-energized status.

H02.11 Motor speed threshold at brake output OFF in rotation state

Address:	2002-0Ch	Effective mode:	Real time
Min.:	20	Unit:	[mm/s]/[rpm]
Max.:	3000	Data Type:	UInt16

Default: 30 Change: Real-time

Value Range:

20[mm/s]/[rpm]–3000[mm/s]/[rpm]

Description

Defines the motor speed threshold when brake (BK) output is OFF in the rotating state.

H02.12 Delay from S-ON OFF to brake output OFF in rotation state

Address:	2002-0Dh	Effective mode:	Real time
Min.:	1		
Max.:	65535	Unit:	ms
Default:	500	Data Type:	UInt16
		Change:	Real-time

Value Range:

1 ms–65535 ms

Description

Sets the delay time from BK OFF to S-ON OFF when the motor is in rotating state.

H02.15 LED alarm display

Address:	2002-10h	Effective mode:	Real time
Min.:	0		
Max.:	1	Unit:	-
Default:	0	Data Type:	UInt16
		Change:	Real-time

Value Range:

0: Output alarm information immediately

1: Not output alarm information

Description

Defines whether to switch the keypad to the fault display mode when a No. 3 fault occurs.

0: Output alarm information immediately

1: Not output alarm information

H02.16 Brake enable switch

Address:	2002-11h	Effective mode:	At stop
Min.:	0		
Max.:	1	Unit:	-
Default:	0	Data Type:	UInt16
		Change:	Real-time

Value Range:

0: OFF

1: ON

Description

Used to turn on or off the brake function.

0: OFF

1: ON

If H00.98 is higher than or equal to A502 and the motor and the drive suppor the brake, H02.16 will be set to 1 forcibly. If the motor does not support the brake function, H02.16 will be set to 0 even if the drive supports the brake.
If H00.95 is lower than A502, the drive cannot detect whether the motor supports the brake. If the drive supports the brake, you can set H02.16 to 1 to enable the brake function. If the drive does not support the brake function, you can enable the brake through configuring the DO brake function.

H02.17 Stop mode upon main circuit power failure

Address:	2002-12h	Effective mode:	Real-time
Min.:	0		
Max.:	3	Unit:	-
Default:	2	Data Type:	UInt16
Value Range:		Change:	Real-time

0: Keep current action

1: Stop upon fault as defined by H02.06

2: Stop at S-ON OFF as defined by H02.05

3: Stop quickly as defined by H02.18

Description

Defines the stop mode of the motor for stopping rotating upon main circuit power failure.

0: Keep current action

1: Stop upon fault as defined by H02.06

2: Stop at S-ON OFF as defined by H02.05

3: Stop quickly as defined by H02.18

H02.18 Quick stop mode

Address:	2002-13h	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0: Coast to stop, keeping de-energized state

1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state

2: Ramp to stop as defined by 6085h, keeping de-energized state

3: Stop at emergency stop torque, keeping de-energized state

5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state

6: Ramp to stop as defined by 6085h, keeping position lock state

7: Stop at emergency stop torque, keeping position lock state

Description

Defines the deceleration mode of the motor for stopping rotating upon quick stop and the motor status after stop.
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state

2: Ramp to stop as defined by 6085h, keeping de-energized state
3: Stop at emergency stop torque, keeping de-energized state
5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state
6: Ramp to stop as defined by 6085h, keeping position lock state
7: Stop at emergency stop torque, keeping position lock state
Note: When the brake function is enabled and the value of H02.18 is lower than 4, the stop mode is forcibly set to "2: Ramp to stop as defined by 6085h, keeping de-energized state".

H02.21 Permissible minimum resistance of braking resistor

Address:	2002-16h	Effective mode:	-
Min.:	1		
Max.:	1000	Unit:	Ω
Default:	40	Data Type:	UInt16
Value Range:		Change:	Unchangeable

1 Ω–1000 Ω

Description

The permissible minimum resistance of the braking resistor is only related to the servo drive model.

H02.22 Power of built-in braking resistor

Address:	2002-17h	Effective mode:	-
Min.:	0	Unit:	W
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Unchangeable

Value Range:

0W–65535W

Description

The power of the built-in braking resistor is only related to the servo drive model, which is unmodifiable.

H02.23 Resistance of built-in braking resistor

Address:	2002-18h	Effective mode:	-
Min.:	0		
Max.:	65535	Unit:	Ω
Default:	50	Data Type:	UInt16
Value Range:		Change:	Unchangeable

0 Ω–65535 Ω

Description

The resistance of the built-in braking resistor is only related to the servo drive model, which is unmodifiable.

H02.24 Resistor heat dissipation coefficient

Address:	2002-19h	Effective mode:	Real time
Min.:	10		
Max.:	100	Unit:	%
Default:	30	Data Type:	UInt16
		Change:	Real-time

Value Range:

10%–100%

Description

Defines the heat dissipation coefficient of the braking resistor, which is applicable to both external and built-in braking resistors.
Set this parameter properly according to actual heat dissipation conditions of the resistor.
Recommendations:
Generally, the value of H02.24 cannot exceed 30% for natural cooling.
The value of H02.24 cannot exceed 50% for forced air cooling.

H02.25 Braking resistor type

Address:	2002-1Ah	Effective mode:	Real time
Min.:	0		
Max.:	3	Unit:	-
Default:	3	Data Type:	UInt16
		Change:	Real-time

Value Range:

0: Built-in

1: External, natural cooling

2: External, forced air cooling

3: No resistor needed

Description

Defines the resistor type and the mode of absorbing and releasing the braking energy.

0: Built-in

1: External, natural

2: External, forced

3: No resistor

H02.26 Power of external braking resistor

Address:	2002-1Bh	Effective mode:	Real time
Min.:	1	Unit:	W
Max.:	65535	Data Type:	UInt16
Default:	40	Change:	Real-time

Value Range:

1 W–65535W

Description

Defines the power of external braking resistor.

H02.27 Resistance of external braking resistor

Address:	2002-1Ch	Effective mode:	Real time
Min.:	15		
Max.:	1000	Unit:	Ω
Default:	50	Data Type:	UInt16
Value Range:		Change:	Real time

15 Ω–1000 Ω

Description

Defines the resistance of the external braking resistor.

H02.28 Parameters Initialization

Address:	2002-1Dh	Effective mode:	Real time
Min.:	0		
Max.:	2	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	At stop

0: Parameters in group H02 and above initialized

1: Parameters in group H00, H02 and above initialized

2: All parameters initialized (default values used for model-related parameters

Description

Used to restore parameters to default.

0: Parameters in group H02 and above initialized

1: Parameters in group H00, H02 and above initialized

2: All parameters initialized (default values used for model-related parameters)

H02.30 User password

Address:	2002-1Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time
Value Range:			

0–65535

Description

Set the user password.

H02.31 **System parameter initialization**

Address:	2002-20h	Effective mode:	Real time
Min.:	0		
Max.:	2	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	At stop

0: No operation
1: Restore default settings
2: Clear fault records

Description

Used to restore default values or clear fault records.
0: No operation
1: Restore default settings
2: Clear fault records

H02.32 **Selection of parameters in group H0b**

Address:	2002-21h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0–99

Description

Sets the offset of H0b parameters to be displayed on the operating panel.
For example, the setpoint 0 indicates the value of H0b.00 (Motor speed actual value) is displayed on the keypad.
The setpoint 1 indicates the value of H0b.01 is displayed on the operating panel.

H02.35 **Keypad data update frequency**

Address:	2002-24h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	20	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 Hz–20 Hz

Description

Set the keypad data update frequency.

H02.38 **Overload time of external resistor**

Address:	2002-27h	Effective mode:	Upon next power-on
Min.:	0	Unit:	s
Max.:	200	Data Type:	UInt16
Default:	40	Change:	Real time

Value Range:
0s–200s

Description
Set the overload time threshold of the external braking resistor.

H02.41 **Manufacturer password**

Address:	2002-2Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real time

Value Range:
0–65535

Description
You need to input this manufacturer password to enable the access to protected manufacturer parameters.

H02.47 **Delay time from power cable breakage to brake OFF**

Address:	2002-30h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms–1000 ms

Description
Sets the delay time from power cable breakage to brake OFF.

23.4 H03 Terminal Input Parameters

H03.02 **DI1 function**

Address:	2003-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	14	Change:	Real-time

Value Range:
0: No assignment
1: Servo ON

2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
38: Touch probe 1
39: Touch probe 2
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of DI1.

H03.03 **DI1 logic selection**

Address:	2003-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16

Default: 0 Change: Real-time

Value Range:

0: Normally open

1: Closed

Description

Used to set the level logic of DI1 when the function assigned to DI is active.

H03.04 **DI2 function**

Address: 2003-05h
Min.: 0
Max.: 59
Default: 15

Effective mode: Real time
Unit: -
Data Type: UInt16
Change: Real time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
38: Touch probe 1
39: Touch probe 2
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2

53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of DI2.

H03.05 **DI2 logic selection**

Address:	2003-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Set the DI2 logic when the DI function allocated to DI2 is enabled.

H03.06 **DI3 function**

Address:	2003-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	31	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog

24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
38: Touch probe 1
39: Touch probe 2
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description
Defines the function of DI3.

H03.07 **DI3 logic selection**

Address:	2003-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Normally open
1: Closed

Description
Set the DI3 logic when the DI function allocated to DI3 is enabled.

H03.08 **DI4 function**

Address:	2003-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	34	Change:	Real-time

Value Range:
0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
38: Touch probe 1
39: Touch probe 2
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description
Defines the function of DI4.

H03.09 **DI4 logic selection**

Address:	2003-0Ah	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0：Normally open

1：Normally closed

Description

Set the DI4 logic when the DI function allocated to DI4 is enabled.

H03.10 DI5 function

Address:	2003-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	38	Change:	Real-time

Value Range:

0: No assignment

1: Servo ON

2: Alarm reset signal

5: Multi-reference direction

6: Multi-reference switchover CMD1

7: Multi-reference switchover CMD2

8: Multi-reference switchover CMD3

9: Multi-reference switchover CMD4

14: Positive limit switch

15: Negative limit switch

16: Positive external torque limit

17: Negative external torque limit

18: Forward jog

19: Reverse jog

24: Electronic gear

28: Multi-position reference enable

31: Home switch

34: Emergency stop

36: Internal speed limit source

38: Touch probe 1

39: Touch probe 2

40: Multi-speed enable

46: Process segment enable

47: Process segment command switchover 1

48: Process segment command switchover 2

49: Process segment command switchover 3

50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of DI5. The touch probe is only available for high speed DI.

H03.11 DI5 logic selection

Address:	2003-0Ch	Effective mode:	Real time
Min.:	0		
Max.:	1	Unit:	-
Default:	0	Data Type:	Int16
Value Range:		Change:	Real-time

0: Normally open
1: Normally closed

Description

Set the DI5 logic when the DI function allocated to DI5 is enabled.

H03.50 Voltage-type AI1 offset

Address:	2003-33h	Effective mode:	Real time
Min.:	-5000	Unit:	mV
Max.:	5000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-5000 mV–5000 mV

Description

Defines the actual AI1 input voltage when the drive sampling voltage is 0 after zero drift correction.

H03.51 Voltage-type AI1 input filter time constant

Address:	2003-34h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	655.35	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:

0.00 ms–655.35 ms

Description

It sets the filter time constant of voltage signal input from AI1.

Set this parameter properly to avoid motor reference fluctuation caused by unstable analog voltage input and reduce motor misoperation caused by interference signals.

The filter function cannot eliminate or suppress zero drift or dead zone.

H03.53 Voltage-type AI1 dead zone

Address:	2003-36h	Effective mode:	Real time
Min.:	0.0	Unit:	mV
Max.:	1000.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:

0.0 mV–1000.0 mV

Description

Defines the AI1 input voltage range when the drive sampling voltage is 0.

H03.54 Voltage-type AI1 zero drift

Address:	2003-37h	Effective mode:	Real time
Min.:	-500.0	Unit:	mV
Max.:	500.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:

-500.0 mV–500.0 mV

Description

Zero drift refers to the value of the drive o sampling voltage relative to GND upon zero AI voltage.

Set H0d.10 (Automatic adjustment of analog channels) to 1 (AI2 adjustment) to perform automatic adjustment on AI2 zero drift. The AI1 zero drift after adjustment will be saved into H03.54.

H03.55 Voltage-type AI2 offset

Address:	2003-38h	Effective mode:	Real time
Min.:	-5000	Unit:	mV
Max.:	5000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:
-5000 mV–5000 mV
Description
Defines the actual AI2 input voltage when the drive sampling voltage is 0 after zero drift correction.

H03.56 Voltage-type AI2 input filter time constant

Address:	2003-39h	Effective mode:	Real time
Min.:	0.00		
Max.:	655.35	Unit:	ms
Default:	2.00	Data Type:	UInt16
Value Range:		Change:	Real-time

0.00 ms–655.35 ms
Description
It sets the filter time constant of voltage signal input from AI2.
Set this parameter properly to avoid motor reference fluctuation caused by unstable analog voltage input and reduce motor misoperation caused by interference signals.
The filter function cannot eliminate or suppress zero drift or dead zone.

H03.58 Voltage-type AI2 dead zone

Address:	2003-3Bh	Effective mode:	Real time
Min.:	0.0	Unit:	mV
Max.:	1000.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:
0.0 mV–1000.0 mV
Description
Defines the AI2 input voltage range when the drive sampling voltage is 0.

H03.59 Voltage-type AI2 zero drift

Address:	2003-3Ch	Effective mode:	Real time
Min.:	-500.0		
Max.:	500.0	Unit:	mV
Default:	0.0	Data Type:	UInt16
Value Range:		Change:	Real-time

-500.0 mV–500.0 mV
Description
Zero drift refers to the value of the drive o sampling voltage relative to GND upon zero AI voltage.
Set H0d.10 (Automatic adjustment of analog channels) to 2 (AI2 adjustment) to perform automatic adjustment on AI2 zero drift. The AI1 zero drift after adjustment will be saved into H03.59.

H03.60 **DI1 fitter time**

Address:	2003-3Dh	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:

0.00 ms–500.00 ms

Description

Defines the filter time of DI1. The DI function is active only after the effective level is kept within the time defined by H03.60.

H03.61 **DI2 fitter time**

Address:	2003-3Eh	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:

0.00 ms–500.00 ms

Description

Defines the filter time of DI2. The DI function is active only after the effective level is kept within the time defined by H03.61.

H03.62 **DI3 fitter time**

Address:	2003-3Fh	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:

0.00 ms–500.00 ms

Description

Defines the filter time of DI3. The DI function is active only after the effective level is kept within the time defined by H03.62.

H03.63 **DI4 fitter time**

Address:	2003-40h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:

0.00 ms–500.00 ms

Description

Defines the filter time of DI4. The DI function is active only after the effective level is kept within the time defined by H03.63.

H03.64 DI5 fitter time

Address:	2003-41h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:

0.00 ms–500.00 ms

Description

Defines the filter time of DI5. The DI function is active only after the effective level is kept within the time defined by H03.64.

H03.80 Speed corresponding to analog 10 V

Address:	2003-51h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	3000	Change:	At stop

Value Range:

0[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the corresponding motor speed when the sampling voltage is 10 V. Speed reference value = Sampling voltage/10 x H03.80.

H03.81 Torque corresponding to analog 10 V

Address:	2003-52h	Effective mode:	Real time
Min.:	0.00	Unit:	Multiple
Max.:	8.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:

0.00–8.00

Description

Defines the motor torque corresponding to a sampling voltage of 10 V. Torque reference value = Sampling voltage/10 x H03.81.

23.5 H04 Terminal Output Parameters

H04.00 **DO1 function**

Address: 2004-01h
Min.: 0
Max.: 33
Default: 1
Effective mode: Real time
Unit: -
Data Type: UInt16
Change: Real-time

Value Range:
0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking
10: Alarm
11: Failure
22: Internal command completed
24: Internal motion completed
25: Comparison output DO
26: Closed-loop state
27: Left limit
28: Right limit
31: Forced communication DO
32: EDM output
33: Gantry alignment

Description
Defines the function of DO1.

H04.01 **DO1 logic selection**

Address: 2004-02h
Min.: 0
Max.: 1
Default: 0
Effective mode: Real time
Unit: -
Data Type: UInt16
Change: Real-time

Value Range:
0: Normally open
1: Normally closed

Description
Defines the level logic of DO1 when the function assigned to DO1 is active.

H04.02 **DO2 function**

Address: 2004-03h
Effective mode: Real time

Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	11	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking

10: Warning
11: Failure
22: Internal command completed
24: Internal motion completed
25: Comparison output DO
26: Closed-loop state
27: Left limit
28: Right limit
31: Forced communication DO
32: EDM output
33: Gantry alignment

Description

Defines the function of DO2.

H04.03 DO2 logic selection

Address:	2004-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Defines the level logic of DO2 when the function assigned to DO2 is active.

H04.22 DO source selection

Address:	2004-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:

Bit0: DO1 output source
0: DO1 function output
1: Bit0 of H31.04
Bit1: DO2 output source
0: DO2 function output
1: Bit1 of H31.04

Description

Defines whether the logic of a physical DO terminal is defined by the actual state of the drive or by communication.

H04.23 EtherCAT communication-forced DO logic in non-OP status

Address:	2004-18h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: DO1
0: Maintain output
1: No output
Bit1: DO2
0: Maintain output
1: No output

Description

Set DO state upon EtherCAT communication failure.

H04.24 DO brake enable

Address:	2004-19h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled
1: Enabled

Description

0: You can only control the motor brake through the built-in brake terminal even if the DO brake function is available.
1: The DO brake function must be available.
Note: This function is not available for functional safety models.

H04.50 **AO1 signal selection**

Address:	2004-33h	Effective mode:	Real time
Min.:	0		
Max.:	10	Unit:	-
Default:	0	Data Type:	Int16
Value Range:		Change:	Real-time

0: Motor speed (1 V/1000 [mm/s]/[rpm])
1: Speed reference (1 V/1000 [mm/s]/[rpm])
2: Torque reference (1 V/100 x rated torque)
3: Position deviation (0.5 mV/1 reference unit)
4: Position deviation (0.5 mV/1 encoder unit)
5: Position reference speed (1 V/1000 [mm/s]/[rpm])
6: Positioning completed
8: AI1 voltage
9: AI2 voltage
10: Defined by H31.05

Description

Set the signal source of AO1.

H04.51 **AO1 offset voltage**

Address:	2004-34h	Effective mode:	Real time
Min.:	-10000	Unit:	mV
Max.:	10000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-10000 mV–10000 mV

Description

Defines the actual AO1 output voltage after offset when the output voltage is 0 V in theory.

H04.52 **AO1 ratio**

Address:	2004-35h	Effective mode:	Real time
Min.:	-99.99		
Max.:	99.99	Unit:	-
Default:	1.00	Data Type:	Int16
Value Range:		Change:	Real-time

-99.99–99.99

Description

Defines the actual AO1 output voltage after amplification when the output voltage is 1 V in theory.

23.6 H05 Position Control Parameters

H05.00 **Primary position reference source**

Address:	2005-01h	Effective mode:	Real time
Min.:	0		
Max.:	2	Unit:	-
Default:	2	Data Type:	UInt16
Value Range:		Change:	Real-time

2: Multi-position reference

Description

Defines the position reference source in position control mode.

H05.02 **Pulses per revolution**

Address:	2005-03h	Effective mode:	Upon next power-on
Min.:	0		
Max.:	4294967295	Unit:	[P/N-N]/[P/Rev]
Default:	0	Data Type:	UInt32
Value Range:		Change:	At stop

0–4294967295

Description

Defines the number of pulses required per revolution of the motor.

H05.04 **First-order low-pass filter time constant**

Address:	2005-05h	Effective mode:	Real time
Min.:	0.0		
Max.:	6553.5	Unit:	ms
Default:	0.0	Data Type:	UInt16
Value Range:		Change:	At stop

0.0 ms–6553.5 ms

Description

Defines the first-order low pass filter time constant of position references.

H05.06 **Moving average filter time constant 1**

Address:	2005-07h	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	128.0	Data Type:	UInt16
Default:	0.0	Change:	At stop
Value Range:			

0.0 ms–128.0 ms

Description

Defines the moving average filter time constant of position references.

H05.07 **Electronic gear ratio 1 (numerator)**

Address:	2005-08h	Effective mode:	Real time
Min.:	1		
Max.:	1073741824	Unit:	-
Default:	1	Data Type:	UInt32
Value Range:		Change:	Real-time

1–1073741824

Description

Defines the numerator of electronic gear ratio 1.

H05.09 **Electronic gear ratio 1 (denominator)**

Address:	2005-0Ah	Effective mode:	Real time
Min.:	1		
Max.:	1073741824	Unit:	-
Default:	1	Data Type:	UInt32
Value Range:		Change:	Real-time

1–1073741824

Description

Defines the denominator of electronic gear ratio 1.

H05.11 **Electronic gear ratio 2 (numerator)**

Address:	2005-0Ch	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	1073741824	Data Type:	UInt32
Default:	1	Change:	Real-time
Value Range:			

1–1073741824

Description

Defines the numerator of electronic gear ratio 2.

H05.13 **Electronic gear ratio 2 (denominator)**

Address:	2005-0Eh	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	1073741824	Data Type:	UInt32
Default:	1	Change:	Real-time
Value Range:			

1–1073741824

Description

Defines the denominator of electronic gear ratio 2.

H05.17 **Number of encoder frequency-division pulses**

Address:	2005-12h	Effective mode:	Upon next power-on
Min.:	0		
Max.:	4194303	Unit:	[P/N-N]/[P/Rev]
Default:	2500	Data Type:	UInt32
Value Range:		Change:	At stop

0–4194303

Description

Defines the number of pulses output by PAO or PBO per revolution.
Pulse output resolution per revolution = (H05.17) x 4

H05.19 **Speed feedforward control**

Address:	2005-14h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: No speed feedforward
1: Internal speed feedforward
2: H05.72
3: Zero phase

Description

Defines the source of the speed loop feedforward signal.
0: No speed feedforward
1: Internal speed feedforward
2: H05.72
3: Zero phase
Note: If you select external speed feedforward, you must set the feedforward source through H05.72.

H05.20 **Condition for positioning completed signal output**

Address:	2005-15h	Effective mode:	Real time
Min.:	0		
Max.:	10	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real-time

0: When absolute value of position deviation is smaller than the value of H05.21, a positioning completion ON signal is output.
1: When filtered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.

2: When unfiltered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
3: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the unfiltered position command and the absolute value of the position deviation.
4: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the filtered position command and the absolute value of the position deviation.
5: When the unfiltered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
6: When the filtered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
7: When the unfiltered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
8: When the filtered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
9: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
10: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.

Description

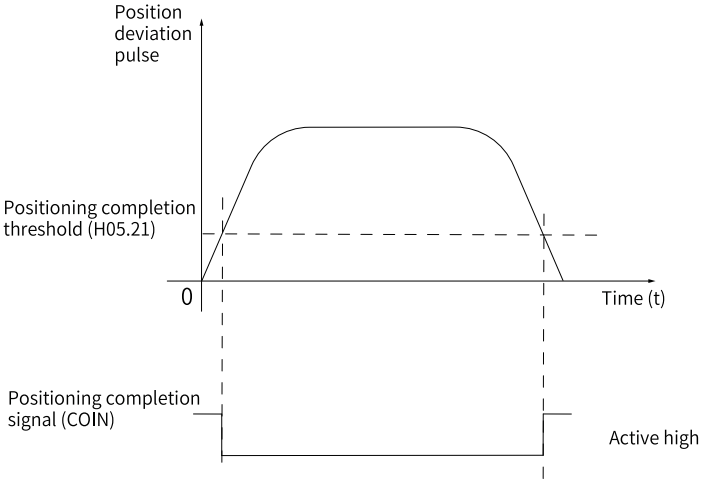
Defines the condition for outputting positioning completed/proximity signal. In the position control mode, if the absolute value of the position deviation during operation is within the setpoint of H05.21, the drive outputs the positioning completed/proximity signal. You can set the condition for outputting the positioning completed/proximity signal in H05.20.
0: When absolute value of position deviation is smaller than the value of H05.21,a positioning completion ON signal is output.
1: When filtered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
2: When unfiltered position command is 0 and absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
3: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the unfiltered position command and the absolute value of the position deviation.
4: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output. Thereafter, when the position command is 0, a positioning completion ON signal is output within the positioning holding time H05.60. After the positioning holding time H05.60 elapsed, the output of the positioning completion signal is determined according to the filtered position command and the absolute value of the position deviation.
5: When the unfiltered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
6: When the filtered position command is 0, the zero-speed signal is ON and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
7: When the unfiltered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
8: When the filtered position command is 0, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
9: When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the unfiltered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
10: When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, positioning completion evaluation starts after the delay time H05.60 elapses. When the filtered position command is 0 and the absolute value of the position deviation is less than H05.21, a positioning completion ON signal is output.
Note: The parameter takes effect when H02.00 is not 9.

H05.21 Threshold of positioning completed

Address:	2005-16h	Effective mode:	Real time
Min.:	1	Unit:	Encoder unit
Max.:	65535	Data Type:	UInt16
Default:	46976	Change:	Real-time

Value Range:
1 to 65535
Description

Defines the threshold of the absolute value of position deviation when the drive outputs the positioning completed signal.
Positioning completed signal: DO function 5 (FunOUT.5: COIN).



Note: The parameter takes effect when H02.00 is not 9.

H05.22 **Proximity threshold**

Address:	2005-17h	Effective mode:	Real time
Min.:	1		
Max.:	65535	Unit:	Encoder unit
Default:	65535	Data Type:	UInt16
Value Range:		Change:	Real-time

1 to 65535

Description

Defines the threshold of the absolute value of position deviation when the drive outputs the proximity signal.
Note: The parameter takes effect when H02.00 is not 9.

H05.30 **Homing enable selection**

Address:	2005-1Fh	Effective mode:	Real time
Min.:	0		
Max.:	6	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real-time

0: Disabled
6: Current position as home

Description

Defines the homing mode and the trigger signal source.
0: Disabled
6: Current position as home
Note: When H05.30 = 6, position feedback is the setpoint of H05.36 regardless of the value of H05.40.

H05.35 Home search time limit

Address:	2005-24h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10000	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Defines the maximum homing time.

H05.36 Mechanical home offset

Address:	2005-25h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
Defines the absolute position of the motor after homing.

H05.38 Frequency-division output source

Address:	2005-27h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Encoder frequency-division output
2: Frequency-division output inhibited
3: Second encoder frequency-division output
4: H31-01 reference frequency output
Description

Defines the output source of the pulse output terminal.
0: Encoder frequency-division output
2: Frequency-division output inhibited
3: Second encoder frequency-division output
4: H31.01 reference frequency output

H05.39 Electronic gear ratio switchover condition

Address:	2005-28h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Switchover after position reference is kept 0 for 2.5 ms
1: Switched in real time

Description

Defines the condition for switching the electronic gear ratio. After the fully closed-loop function is enabled and H0F.00 is set to 2, the setpoint is forcibly set to 0.
When its value is 0: when H0F.00 = 2, the switching condition is that the position command is 0 and positioning is completed and lasts for 2.5 ms; when H0F.00 is not 2, the switching condition is that the position command keeps at 0 for 2.5 ms.

H05.40 Mechanical home offset and action upon overtravel

Address:	2005-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: H05.36 as the coordinate after homing, reverse homing applied after homing triggered again on overtravel
1: H05.36 as the relative offset after homing, reverse homing applied after homing triggered again on overtravel
2: H05.36 as the coordinate after homing, reverse homing auto-applied on overtravel
3: H05.36 as the relative offset after homing, reverse homing auto-applied on overtravel

Description

Defines the offset relationship between the mechanical home and mechanical zero point, and the action upon overtravel during homing.
0: H05.36 as the coordinate after homing, reverse homing applied after homing triggered again on overtravel
1: H05.36 as the relative offset after homing, reverse homing applied after homing triggered again on overtravel
2: H05.36 as the coordinate after homing, reverse homing auto-applied on overtravel
3: H05.36 as the relative offset after homing, reverse homing auto-applied on overtravel

H05.41 Z pulse output polarity

Address:	2005-2Ah	Effective mode:	Upon the next power-on
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x1	Change:	At stop

Value Range:
bit0: Frequency-division Z output polarity
0: Positive (high level upon active Z pulse)
1: Negative (low level upon active Z pulse)
bit1: OCZ output polarity
0: Positive (high level upon active Z pulse)
1: Negative (low level upon active Z pulse)
bit2: Inner loop probe Z signal source
0: Motor Z signal
1: Frequency-division output Z signal

Description
Defines the output level when the Z pulse of pulse output terminal is active.
bit0: Frequency division Z output polarity
0: Positive (high level upon valid Z pulse)
1: Negative (low level upon valid Z pulse) bit1: OCZ output polarity
0: Positive (high level upon valid Z pulse)
1: Negative (low level upon valid Z pulse) Bit2: Inner loop probe Z signal source
0: Motor Z signal
1: Frequency-division output Z signal

H05.44 Numerator of frequency-division output reduction ratio

Address:	2005-2Dh	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	16383	Data Type:	UInt16

Default:	1	Change:	At stop

Value Range:
1–16383
Description
Defines the numerator of frequency-division output reduction ratio.

H05.45 Denominator of frequency-division output reduction ratio

Address:	2005-2Eh	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	8191	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1–8191
Description
Defines the denominator of frequency-division output reduction ratio.

H05.46 DI selection of multi-turn frequency-division Z starting point

Address:	2005-2Fh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	5	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: No operation
1: DI1
2: DI2
3: DI3
4: DI4
5: DI5
Description
Sets the start point for frequency-division output. It is only effective when the frequency division ratio is greater than 1.
0: No operation
1: DI1
2: DI2
3: DI3
4: DI4
5: DI5

H05.47 **Frequency-division Z pulse width**

Address:	2005-30h	Effective mode:	Real time
Min.:	0	Unit:	μs
Max.:	400	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0μs to 400μs

Description

Defines the minimum output width (μs) of frequency-division output PZ. When the pulse signal is used as master encoder and fully closed-loop encoder, the setpoint 0 indicates the original Z signal will be outputted. Other setpoints indicate the frequency-division Z signal will be output.

H05.48 **Frequency-division output dead zone setting threshold**

Address:	2005-31h	Effective mode:	Real time
Min.:	0	Unit:	Encoder unit
Max.:	255	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 255

Description

Defines the dead zone threshold of frequency-division output to prevent frequency-division output caused by encoder jitter.

Note: After this function is enabled, during uniform low-speed operation, intermittent frequency-division pulse output may occur. Set this parameter with caution.

H05.50 **Mechanical gear ratio in absolute position rotation mode (numerator)**

Address:	2005-33h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

1–65535

Description

Defines the numerator of the transmission ratio between the mechanical rotary load and the motor in the absolute position rotation mode.

H05.51 **Mechanical gear ratio in absolute position rotation mode (denominator)**

Address:	2005-34h	Effective mode:	Real time

Min.:	1	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

1–65535

Description

Defines the denominator of the transmission ratio between the mechanical rotary load and the motor in the absolute position rotation mode.

H05.52 Pulses per revolution of the load in absolute position rotation mode (low 32 bits)

Address:	2005-35h	Effective mode:	Real time
Min.:	0		
Max.:	4294967295	Unit:	Encoder unit
Default:	0	Data Type:	UInt32
Value Range:		Change:	At stop

0–4294967295

Description

Defines the number of pulses per revolution of the rotary load in the absolute position rotation mode (low 32 bits).

H05.54 Pulses per revolution of the load in absolute position rotation mode (high 32 bits)

Address:	2005-37h	Effective mode:	Real time
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	At stop

Value Range:

0 to 4294967295

Description

Defines the number of pulses per revolution of the rotary load in the absolute position rotation mode (high 32 bits).

H05.58 Torque threshold in homing upon hit-and-stop

Address:	2005-3Bh	Effective mode:	Real time
Min.:	0.0		
Max.:	400.0	Unit:	%
Default:	100.0	Data Type:	UInt16
Value Range:		Change:	Real-time

0.0%–400.0%

Description

Defines the maximum positive/negative torque limit in homing upon hit-andstop.

H05.59 **Positioning window time**

Address:	2005-3Ch	Effective mode:	Real time
Min.:	0		
Max.:	30000	Unit:	ms
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real-time

0 ms–30000 ms

Description

If the positioning deviation is less than the time threshold of positioning completed, the positioning completed signal is active only if the set time threshold is exceeded.

H05.60 **Hold time of positioning completed**

Address:	2005-3Dh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	30000	Data Type:	UInt16
Default:	0	Change:	Real-time
Value Range:			

0 ms–30000 ms

Description

Defines the hold time of an active positioning completed signal.

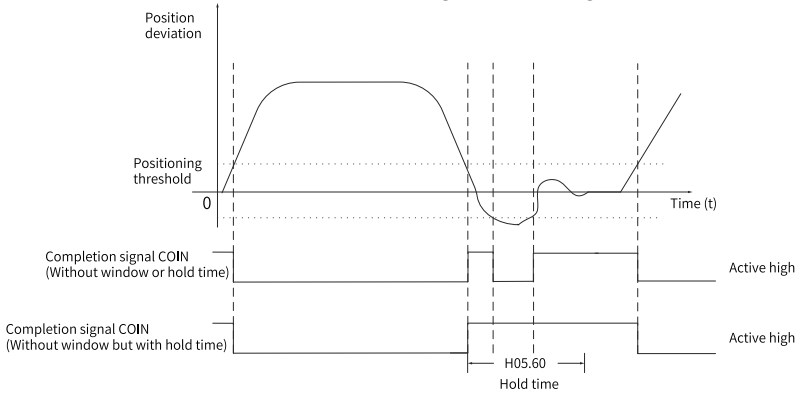


Figure 23-1 Schematic diagram for the window time (H05.59) and hold time (H05.60) of positioning completed signal

When the COIN (positioning completed) signal has a hold time of 0, it remains active until the next position reference is received.

H05.66 **Himing time unit**

Address:	2005-43h	Effective mode:	Real time
Min.:	0		
Max.:	2	Unit:	ms
Default:	2	Data Type:	UInt16
Value Range:		Change:	At stop

0：1ms
1：10ms
2：100ms

Description

Defines the homing time unit.
0：1 ms
1：10 ms
2：100 ms
Note：The actual timeout time is H05.35 x H05.66 ms.

H05.67 **Offset between zero point and single-turn absolute position**

Address:	2005-44h	Effective mode:	Real time
Min.:	-2147483648		
Max.:	2147483647	Unit:	Encoder unit
Default:	0	Data Type:	UInt32
Value Range:		Change:	At stop

-2147483648–2147483647

Description

Display or set the offset position relative to the home when the servo system is in absolute single-turn mode (H0201=4).

H05.71 **Motor Z signal width**

Address:	2005-48h	Effective mode:	Real time
Min.:	1		
Max.:	100	Unit:	ms
Default:	4	Data Type:	UInt16
Value Range:		Change:	Real time

1ms–100ms

Description

Output pulse width when motor Z signal is active.

H05.72 **External speed feedforward source selection**

Address:	2005-49h	Effective mode:	Real time
Min.:	0		
Max.:	2	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real time

0：60B1
1：AI1
2：AI2

Description

Defines the source of external speed feedforward.
0：60B1
1：AI1
2：AI2

23.7 H06 Speed Control Parameters

H06.00 **Source of main speed reference A**

Address:	2006-01h	Effective mode:	Real time
Min.:	0		
Max.:	2	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	At stop

0：H06.03
1：AI1
2：AI2

Description

Defines the source of auxiliary speed reference B.
0：H06.03
1：AI1
2：AI2

H06.01 **Source of auxiliary speed reference B**

Address:	2006-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	5	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Digital setting (H06.03)
1: AI1
2: AI2
5: Multi-speed reference

Description

Defines the source of auxiliary speed reference B.
0: Digital setting (H06.03)
1: AI1
2: AI2
5: Multi-speed reference

H06.02 Speed reference source

Address:	2006-03h	Effective mode:	Real time
Min.:	0		
Max.:	4	Unit:	-
Default:	0	Data Type:	Int16
Value Range:		Change:	At stop

0: Source of main speed reference A
1: Source of auxiliary speed reference B
2: A+B
3: Switched between A and B
4: Communication

Description

Defines the source of speed references.
0: Source of main speed reference A
1: Source of auxiliary speed reference B
2: A+B
3: Switched between A and B
4: Communication

H06.03 Speed reference set through keypad

Address:	2006-04h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	200	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the speed reference value set through the keypad.

H06.04 DI jog speed reference

Address:	2006-05h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16

Default: 150 Change: Real-time

Value Range:

0[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the DI jog speed reference.

H06.05 Acceleration ramp time of speed reference

Address:	2006-06h	Effective mode:	Real time
Min.:	0		
Max.:	65535	Unit:	ms
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real-time

0 ms–65535 ms

Description

Defines the acceleration ramp time of speed reference.
H06.05 defines the time for the speed reference to change from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm].
The formulas for calculating the actual acceleration and deceleration time are as follows:
Actual acceleration time t = Speed reference ÷ 1000 x Acceleration ramp time of speed reference

H06.06 Dec. ramp time of speed reference

Address:	2006-07h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Sets deceleration ramp time of speed reference.
H06.06 defines the time for the speed reference to change from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm].
The formulas for calculating the actual acceleration and deceleration time are as follows:
Actual deceleration time t = Speed reference ÷ 1000 x Deceleration ramp time of speed reference

H06.07 Maximum speed limit

Address:	2006-08h	Effective mode:	Real time
Min.:	0		
Max.:	10000	Unit:	[mm/s]/[rpm]
Default:	7000	Data Type:	UInt16
		Change:	Real-time

Value Range:
0[mm/s]/[rpm]–10000[mm/s]/[rpm]
Description
Defines the maximum speed threshold.

H06.08 **Forward speed threshold**

Address:	2006-09h	Effective mode:	Real time
Min.:	0		
Max.:	10000	Unit:	[mm/s]/[rpm]
Default:	7000	Data Type:	UInt16
Value Range:		Change:	Real-time

0[mm/s]/[rpm]~10000[mm/s]/[rpm]
Description
Defines the forward speed threshold.

H06.09 **Reverse speed threshold**

Address:	2006-0Ah	Effective mode:	Real time
Min.:	0		
Max.:	10000	Unit:	[mm/s]/[rpm]
Default:	7000	Data Type:	UInt16
Value Range:		Change:	Real-time

0[mm/s]/[rpm]~10000[mm/s]/[rpm]
Description
Defines the reverse speed threshold.

H06.10 **Deceleration unit in emergency stop**

Address:	2006-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Multiplied by 1
1: Multiplied by 10
2: Multiplied by 100
Description
Sets the deceleration unit in emergency stop.
0: Multiplied by 1
1: Multiplied by 10
2: Multiplied by 100

H06.11 **Torque feedforward control**

Address:	2006-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: No torque feedforward

1: Internal torque feedforward

2: 60B2h as external torque feedforward

3: STune mode 5

Description

Defines the source for torque feedforward control.

0: No torque feedforward

1: Internal torque feedforward

3: STune mode 5

H06.12 **Acceleration/Deceleration ramp time of speed jog**

Address:	2006-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0ms–65535ms

Description

Set the acceleration/deceleration ramp time of speed jog.
The time is that for the speed reference to accelerate from 0 to 1000 [mm/s]/[rpm] or to decelerate from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm].
The formulas for calculating the actual acceleration and deceleration time are as follows:
Actual acc./dec. time t = Speed reference ÷ 1000 x Acceleration ramp time of speed reference

H06.13 **Speed feedforward smoothing filter**

Address:	2006-0Eh	Effective mode:	Real time
Min.:	0	Unit:	μs
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0μs–65535μs

Description

Defines the speed feedforward smoothing filter time.

H06.15 **Zero clamp speed threshold**

Address:	2006-10h	Effective mode:	Real time
Min.:	0		
Max.:	10000	Unit:	[mm/s]/[rpm]
Default:	10	Data Type:	UInt16
		Change:	Real-time

Value Range:
0[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description
Defines the zero clamp speed threshold.

H06.16 **Threshold of TGON (motor rotation) signal**

Address:	2006-11h	Effective mode:	Real time
Min.:	0		
Max.:	1000	Unit:	[mm/s]/[rpm]
Default:	20	Data Type:	UInt16
		Change:	Real-time

Value Range:
0[mm/s]/[rpm]~1000[mm/s]/[rpm]

Description
Sets the threshold of TGON (motor rotation) signal.

H06.17 **Threshold of V-Cmp (speed matching) signal**

Address:	2006-12h	Effective mode:	Real time
Min.:	0		
Max.:	100	Unit:	[mm/s]/[rpm]
Default:	10	Data Type:	UInt16
		Change:	Real-time

Value Range:
0[mm/s]/[rpm]~100[mm/s]/[rpm]

Description
Defines the threshold of speed match signal.

H06.18 **Threshold of speed reach signal**

Address:	2006-13h	Effective mode:	Real time
Min.:	20		
Max.:	10000	Unit:	[mm/s]/[rpm]
Default:	1000	Data Type:	UInt16
		Change:	Real-time

Value Range:
20[mm/s]/[rpm]~10000[mm/s]/[rpm]

Description
Defines the threshold of speed reached signal.

H06.19 Threshold of zero speed output signal

Address:	2006-14h	Effective mode:	Real time
Min.:	1		
Max.:	10000	Unit:	[mm/s]/[rpm]
Default:	10	Data Type:	UInt16
Value Range:		Change:	Real-time

1[mm/s]/[rpm]~10000[mm/s]/[rpm]

Description

Defines the threshold of zero speed output signal.

H06.50 Speed S-curve enable switch

Address:	2006-33h	Effective mode:	Real time
Min.:	0		
Max.:	1	Unit:	-
Default:	1	Data Type:	UInt16
Value Range:		Change:	At stop

0: Disabled
1: Enabled

Description

0: Accelerate/Decelerate at fixed acceleration rate

1: Accelerate/Decelerate based on the S-curve

H06.51 Increasing acceleration 1 of speed S-curve acceleration segment

Address:	2006-34h	Effective mode:	Real time
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	50.0	Data Type:	UInt16
Value Range:		Change:	At stop

0.0%~100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.52 Decreasing acceleration 1 of speed S-curve acceleration segment

Address:	2006-35h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop
Value Range:			

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.53 Decreasing deceleration 1 of speed S-curve deceleration segment

Address:	2006-36h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% to 100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.54 Decreasing acceleration 1 of speed S-curve deceleration segment

Address:	2006-37h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% to 100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.55 Increasing acceleration 2 of speed S-curve acceleration segment

Address:	2006-38h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0%~100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference.
Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.56 **Decreasing acceleration 2 of speed S-curve acceleration segment**

Address:	2006-39h	Effective mode:	Real time
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	50.0	Data Type:	UInt16
Value Range:		Change:	At stop

0.0%–100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.57 **Decreasing deceleration 2 of speed S-curve deceleration segment**

Address:	2006-3Ah	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.58 **Decreasing acceleration 2 of speed S-curve deceleration segment**

Address:	2006-3Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.59 **Increasing acceleration 3 of speed S-curve acceleration segment**

Address:	2006-3Ch	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16

Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.60 Decreasing acceleration 3 of speed S-curve acceleration segment

Address:	2006-3Dh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.61 Decreasing deceleration 3 of speed S-curve deceleration segment

Address:	2006-3Eh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0%–100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.62 Decreasing acceleration 3 of speed S-curve deceleration segment

Address:	2006-3Fh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.63 Increasing acceleration 4 of speed S-curve acceleration segment

Address:	2006-40h	Effective mode:	Real time
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	50.0	Data Type:	UInt16
Value range:		Change:	At stop

0.0%–100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.64 Decreasing acceleration 4 of speed S-curve acceleration segment

Address:	2006-41h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.65 Decreasing deceleration 4 of speed S-curve deceleration segment

Address:	2006-42h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.66 **Decreasing acceleration 4 of speed S-curve deceleration segment**

Address:	2006-43h	Effective mode:	Real time
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	50.0	Data Type:	UInt16
Value Range:		Change:	At stop

0.0%–100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.67 **Increasing acceleration 5 of speed S-curve acceleration segment**

Address:	2006-44h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.68 **Decreasing acceleration 5 of speed S-curve acceleration segment**

Address:	2006-45h	Effective mode:	Real time
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	50.0	Data Type:	UInt16
Value Range:		Change:	At stop

0.0%–100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.69 **Decreasing deceleration 5 of speed S-curve deceleration segment**

Address:	2006-46h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.70 **Decreasing acceleration 5 of speed S-curve deceleration segment**

Address:	2006-47h	Effective mode:	Real
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	50.0	Data Type:	UInt16
Value Range:		Change:	At stop

0.0%~100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.71 **Increasing acceleration 6 of speed S-curve acceleration segment**

Address:	2006-48h	Effective mode:	Real time
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	50.0	Data Type:	UInt16
Value Range:		Change:	At stop

0.0%~100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.72 **Decreasing acceleration 6 of speed S-curve acceleration segment**

Address:	2006-49h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.73 **Decreasing deceleration 6 of speed S-curve deceleration segment**

Address:	2006-4Ah	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.74 **Decreasing acceleration 6 of speed S-curve deceleration segment**

Address:	2006-4Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0%–100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.75 **Increasing acceleration 7 of speed S-curve acceleration segment**

Address:	2006-4Ch	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.76 **Decreasing acceleration 7 of speed S-curve acceleration segment**

Address:	2006-4Dh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0%–100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.77 **Decreasing deceleration 7 of speed S-curve deceleration segment**

Address:	2006-4Eh	Effective mode:	Real time
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	50.0	Data Type:	UInt16
		Change:	At stop

Value Range:
0.0%–100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.78 **Decreasing acceleration 7 of speed S-curve deceleration segment**

Address:	2006-4Fh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% to 100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference. Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

H06.79 **Increasing acceleration 8 of speed S-curve acceleration segment**

Address:	2006-50h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:
0.0% to 100.0%
Description
8 groups of S curve smoothing parameters can be set for each speed reference. Increasing acceleration time at acceleration segment: The percentage of motor increasing acceleration time in the selected acceleration time.

H06.80 **Decreasing acceleration 8 of speed S-curve acceleration segment**

Address:	2006-51h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at acceleration segment: The percentage of motor decreasing acceleration time in the selected acceleration time.

H06.81 **Decreasing deceleration 8 of speed S-curve deceleration segment**

Address:	2006-52h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.

Decreasing acceleration time at deceleration segment: The percentage of motor decreasing deceleration time in the selected deceleration time.

H06.82 **Decreasing acceleration 8 of speed S-curve deceleration segment**

Address:	2006-53h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0%–100.0%

Description

8 groups of S curve smoothing parameters can be set for each speed reference.
Decreasing acceleration time at deceleration segment: The percentage of motor decreasing acceleration time in the selected deceleration time.

23.8 H07 Torque Control Parameters

H07.00 **Source of main torque reference A**

Address:	2007-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Keypad (H07.03)

1: AI1

2: AI2

Description

Defines the source of the main torque reference A.

0: Keypad (H07.03)

1: AI1

2: AI2

H07.01 **Source of auxiliary torque reference B**

Address:	2007-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Keypad (H07.03)

1: AI1

2: AI2

Description

Defines the source of auxiliary torque references.

0: Keypad (H07.03)

1: AI1

2: AI2

H07.02 **Torque reference source**

Address:	2007-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Source of main torque reference A

1: Source of auxiliary torque reference B

2: Source of A+B
3: Switched between A and B
4: Communication

Description

Selects torque reference.
0: Source of main torque reference A
1: Source of auxiliary torque reference B
2: Source of A+B
3: Switched between A and B
4: Communication

H07.03 Torque reference set through keypad

Address:	2007-04h	Effective mode:	Real time
Min.:	-400.0	Unit:	%
Max.:	400.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:

-400.0% to 400.0%

Description

Set torque reference.

H07.05 Torque reference filter time constant 1

Address:	2007-06h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	30.00	Data Type:	Int16
Default:	0.50	Change:	Real-time

Value Range:

0.00ms–30.00ms

Description

Defines the torque reference filter time constant 1.

H07.06 Torque reference filter time constant 2

Address:	2007-07h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	30.00	Data Type:	Int16
Default:	0.27	Change:	Real-time

Value Range:

0.00ms–30.00ms

Description

Defines the torque reference filter time constant 2.

H07.07 **Torque Limit source**

Address:	2007-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Positive/Negative internal torque limit

1: Internal or external limit as defined by DI

2: T_LMT

3: T_LMT or external limit as defined by DI (FunIN.16 or FunIN.17)

4: T_LMT or internal limit (FunIN.16 or FunIN.17) as defined by DI

Description

Defines the torque limit source.

0: Positive/Negative internal torque limit

1: Internal or external limit as defined by DI

2: T_LMT

3: T_LMT or external limit as defined by DI (FunIN.16 or FunIN.17)

4: T_LMT or internal limit (FunIN.16 or FunIN.17) as defined by DI

H07.08 **T-LMT selection**

Address:	2007-09h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: AI1

2: AI2

Description

Set the AI as the torque limit source.

1: AI1

2: AI2

H07.09 **Positive internal torque limit**

Address:	2007-0Ah	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:

0.0%–400.0%

Description
Sets the forward run internal torque limit.

H07.10 Negative internal torque limit

Address:	2007-0Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
Sets the reverse run internal torque limit.

H07.11 Positive external torque limit

Address:	2007-0Ch	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:
0.0%–400.0%
Description
Set the forward external torque limit.

H07.12 Negative external torque limit

Address:	2007-0Dh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
Set the reverse external torque limit.

H07.15 Emergency-stop torque

Address:	2007-10h	Effective mode:	At stop
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
Set the torque for emergency stop.

H07.17 Speed limit source

Address:	2007-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Internal speed limit
1: V-LMT
2: H07.19 or H07.20 as defined by DI
Description
Select the speed limit source
0: Internal speed limit
1: V-LMT
2: H07.19 or H07.20 as defined by DI
Note: This parameter takes effect when H02.00 is not 9.

H07.18 V-LMT selection

Address:	2007-13h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
1: AI1
2: AI2
Description
Set the AI as the speed limit source.
1: AI1
2: AI2

H07.19 Positive speed limit/Speed limit 1 in torque control

Address:	2007-14h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:
0[mm/s]/[rpm]–10000[mm/s]/[rpm]
Description
Set the positive speed limit/Speed limit 1 in torque control.

H07.20 Negative speed limit/Speed limit 2 in torque control

Address:	2007-15h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:
0[mm/s]/[rpm]–10000[mm/s]/[rpm]
Description
Set the negative speed limit/Speed limit 2 in torque control.

H07.21 Torque reach base value

Address:	2007-16h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0%–400.0%
Description
Set torque reach base value.

H07.22 Torque reach valid value

Address:	2007-17h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	20.0	Change:	Real-time

Value Range:
0.0%~400.0%
Description
Set torque reach valid value.

H07.23 Torque reach invalid value

Address:	2007-18h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16

Default: 10.0 Change: Real-time

Value Range:

0.0% to 400.0%

Description

Set torque reach invalid value.

H07.24 Field weakening depth

Address:	2007-19h	Effective mode:	Real time
Min.:	60		
Max.:	115	Unit:	%
Default:	115	Data Type:	UInt16
		Change:	Real-time

Value Range:

60%~115%

Description

Set the flux weakening depth.

H07.25 Max. permissible demagnetizing current

Address:	2007-1Ah	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	300	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0% to 300%

Description

Set the maximum allowable demagnetization current value.

H07.26 Field weakening selection

Address:	2007-1Bh	Effective mode:	Real time
Min.:	0		
Max.:	1	Unit:	-
Default:	0	Data Type:	UInt16
		Change:	At stop

Value Range:

0: Disabled
1: Enabled

Description

Enable/disable field weakening.
0: Disabled
1: Enabled

H07.27 Flux weakening gain

Address:	2007-1Ch	Effective mode:	Real time
Min.:	0.001	Unit:	kHz
Max.:	1.000	Data Type:	UInt16
Default:	0.030	Change:	Real-time

Value Range:
0.001 kHz–1.000 kHz
Description
Set the gain of flux weakening.

H07.28 Speed of flux weakening point

Address:	2007-1Dh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Set the speed of flux weakening point.

H07.35 Torque non-standard feature enable

Address:	2007-24h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
bit0: Motor output correction enable
bit1: Shield compensation data enable
Description
Torque non-standard feature enable switch.
Bit0: motor torque output correction enable
Bit1: Shield compensation data enable

H07.36 Time constant of low-pass filter 2

Address:	2007-25h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	10.00	Data Type:	UInt16
Default:	0.00	Change:	Real-time

Value Range:
0.00 ms–10.00 ms
Description
Set the time constant of low-pass filter 2.

H07.37 Torque reference filter selection

Address:	2007-26h	Effective mode:	Real time
Min.:	0		
Max.:	1	Unit:	-
Default:	0	Data Type:	UInt16
		Change:	Real-time

Value Range:
0: First-order filter
1: Biquad filter
Description
Select the torque reference filter.
0: First-order filter
1: Biquad filter
When second-order filter is selected, the filter structure is biquad filter for ROT motors, and the filter parameters are set through H07.38. For DDR/DDL motors, the filter structure is biquad low-pass filter, and the filter parameters are set through H07.42.

H07.38 Biquad filter attenuation ratio

Address:	2007-27h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	50	Data Type:	UInt16
Default:	16	Change:	Real-time

Value Range:
0–50
Description
Defines the attenuation ratio of biquad filter.

H07.40 Speed limit threshold in torque control mode

Address:	2007-29h	Effective mode:	Real time
Min.:	0		
Max.:	300	Unit:	ms
Default:	10	Data Type:	UInt16
		Change:	Real-time

Value Range:
0 ms–300 ms
Description
Sets speed limit time window in the torque control mode.

H07.42 **Biquad low pass filter damping coefficient**

Address:	2007-2Bh	Effective mode:	Real time
Min.:	0.001	Unit:	-
Max.:	10.000	Data Type:	UInt16
Default:	1.000	Change:	Real-time

Value Range:
0.001–10.000
Description
Defines the damping coefficient of biquad low-pass filter.

23.9 H08 Gain Parameters

H08.00 **Speed loop gain**

Address:	2008-01h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	40.0	Change:	Real-time

Value Range:
0.0 Hz–2000.0 Hz
Description
Defines the responsiveness of the speed loop. The higher the setpoint, the faster the speed loop response is. Note that an excessively high setpoint may cause vibration.
In the position control mode, the position loop gain must be increased together with the speed loop gain.

H08.01 **Speed loop integral time constant**

Address:	2008-02h
Min.:	0.15
Max.:	512.00
Default:	19.89

Value Range:
0.15 ms–512.00 ms
Description
Defines the integral time constant of the speed loop.
The lower the setpoint, the better the integral action, and the quicker will the deviation value be close to 0.
Note:
There is no integral action when H08.01 is set to 512.00.

H08.02 **Position loop gain**

Address: 2008-03h
Min.: 0.0
Max.: 2000.0
Default: 64.0
Effective mode: Real time
Unit: Hz
Data Type: UInt16
Change: Real-time

Value Range:
0.0Hz–2000.0Hz

Description
Defines the proportional gain of the position loop.
Defines the responsiveness of the position loop. A high setpoint shortens the positioning time. Note that an excessively high setpoint may cause vibration.
The 1st group of gain parameters include H08.00 (Speed loop gain), H08.01 (Speed loop integral time constant), H08.02, and H07.05 (Filter time constant 1 of torque reference).

H08.03 **2nd speed loop gain**

Address: 2008-04h
Min.: 0.1
Max.: 2000.0
Default: 75.0
Effective mode: Real time
Unit: Hz
Data Type: UInt16
Change: Real-time

Value Range:
0.1Hz~2000.0Hz

Description
Set 2nd speed loop gain.

H08.04 **2nd speed loop integral time constant**

Address: 2008-05h
Min.: 0.15
Max.: 512.00
Default: 10.61
Effective mode: Real time
Unit: ms
Data Type: UInt16
Change: Real-time

Value Range:
0.15ms–512.00ms

Description
Set the 2nd speed loop integral time constant.

H08.05 **2nd position loop gain**

Address: 2008-06h
Min.: 0.1
Max.: 2000.0
Default: 120.0
Effective mode: Real time
Unit: Hz
Data Type: UInt16
Change: Real-time

Value Range:
0.1 Hz–2000.0 Hz

Description

Defines the second gain set of the position loop and speed loop. The 2nd group of gain parameters include H08.03 (Speed loop gain), H08.04 (Speed loop integral time constant), H08.05, and H07.06 (Torque reference filter time constant 2).

H08.08 2nd gain mode setting

Address:	2008-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Fixed to the 1st gain, switched between P and PI as defined by bit26 of external 60FEh

1: Switched between the 1st and 2nd gain sets as defined by H08.09

Description

Defines the mode for switching to the 2nd gain set.

0: Fixed to the 1st gain, switched between P and PI as defined by bit26 of external 60FEh

1: Switched between the 1st and 2nd gain sets as defined by H08.09

H08.09 Gain switchover condition

Address:	2008-0Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Fixed to the 1st gain set (PS)

1: Switched as defined by bit26 of 60FEh

2: Torque reference too large (PS)

3: Speed reference too large (PS)

4: Speed reference change rate too large (PS)

5: Speed reference low/high speed threshold (PS)

6: Position deviation too large (P)

7: Position reference available (P)

8: Positioning unfinished (P)

9: Actual speed (P)

10: Position reference + Actual speed (P)

Description

Defines the gain switchover condition.
0: Fixed to the 1st gain set (PS)
1: Switched as defined by bit26 of 60FEh
2: Torque reference too large (PS)
3: Speed reference too large (PS)
4: Speed reference change rate too large (PS)
5: Speed reference low/high speed threshold (PS)
6: Position deviation too large (P)
7: Position reference available (P)
8: Positioning unfinished (P)
9: Actual speed (P)
10: Position reference + Actual speed (P)

H08.10 Gain switchover delay

Address:	2008-0Bh	Effective mode:	Real time
Min.:	0.0		
Max.:	1000.0	Unit:	ms
Default:	5.0	Data Type:	UInt16
Value Range:		Change:	Real-time

0.0 ms–1000.0 ms

Description

Defines the delay when the drive switches from the 2nd gain set to the 1st gain set.

H08.11 Gain switchover level

Address:	2008-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20000	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0–20000

Description

Defines the gain switchover level.

Gain switchover is affected by both the level and the dead time, as defined by H08.09. The unit of gain switchover level varies with the switchover condition.

H08.12 Gain switchover hysteresis

Address:	2008-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20000	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:
0–20000
Description
Defines the dead time for gain switchover.
Gain switchover is affected by both the level and the dead time, as defined by H08.09. The unit of gain switchover hysteresis varies with the switchover condition.
Note:
The set value of H08.11 (Gain switchover level) must be no less than that of H08.12; otherwise, the H08.11 will be set to a value equal to H08.12 automatically.

H08.13 Position gain switchover time

Address:	2008-0Eh	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	3.0	Change:	Real-time

Value Range:
0.0 ms–1000.0 ms
Description
In position control, if H08.05 (2nd position loop gain) is much higher than H08.02 (Position loop gain), set the time for switching from H08.02 to H08.05. This parameter can be used to reduce the impact caused by an increase in the position loop gain.

H08.15 Load moment of inertia ratio

Address:	2008-10h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	120.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:
0.00–120.00
Description
Defines the mechanical load inertia ratio relative to the motor moment of inertia.
When H08.15 is set to 0, it indicates the motor carries no load; if it is set to 1.00, it indicates the mechanical load inertia is the same as the motor moment of inertia.

H08.17 Zero phase delay

Address:	2008-12h	Effective mode:	Real time

Min.:	0.0	Unit:	ms
Max.:	4.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0 ms–4.0 ms

Description

Set zero phase delay.

H08.18 Time constant of speed feedforward filter

Address:	2008-13h	Effective mode:	Real time
Min.:	0.00		
Max.:	64.00	Unit:	ms
Default:	0.50	Data Type:	UInt16
Value Range:		Change:	Real-time

0.00 ms–64.00 ms

Description

Defines the filter time constant of speed feedforward.

H08.19 Speed feedforward gain

Address:	2008-14h	Effective mode:	Real time
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	0.0	Data Type:	UInt16
Value Range:		Change:	Real-time

0.0%~100.0%

Description

In position control and full closed-loop control, speed feedforward is the product of speed feedforwad signal multiplied by H08.19 and is part of the speed reference.
Increasing the setpoint improves the responsiveness to position references and reduces the position deviation during operation at a constant speed.
Set H08.18 to a fixed value first, and then increase the value of H08.19 gradually from 0 to a certain value at which speed feedforward achieves the desired effect.
Adjust H08.18 and H08.19 repeatedly until a balanced performance is achieved.
Note:
For how to enable the speed feedforward function and select the speed feedforward signal, see H05.19 (Speed feedforward control).

H08.20 Torque feedforward filter time constant

Address:	2008-15h	Effective mode:	Real time
Min.:	0.00		
Max.:	64.00	Unit:	ms
Default:	0.50	Data Type:	UInt16
Value Range:		Change:	Real-time

0.00 ms–64.00 ms

Description

Defines the filter time constant of torque feedforward.

H08.21 Torque feedforward gain

Address:	2008-16h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0% to 300.0%

Description

In control modes other than torque control, torque feedforward is the product of torque feedforwad signal multiplied by H08.21 and is part of the torque reference.

Increasing the setpoint improves the responsiveness to variable speed references.

Increasing the setpoint improves the responsiveness to position references and reduces the position deviation during operation at a constant speed.

During parameter adjustment, set H08.20 (Torque feedforward filter time constant) to the default value first, and then increase H08.21 gradually to enhance the effect of torque feedforward. When speed overshoot occurs, keep H08.21 unchanged and increase the value of H08.20. Adjust H08.20 and H08.21 repeatedly until a balanced performance is achieved.

Note:

For how to enable the torque feedforward function and select the torque feedforward signal, see H06.11 (Torque feedforward control).

H08.22 Speed feedback filtering option

Address:	2008-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inhibited
1: 2 times
2: 4 times
3: 8 times
4: 16 times

Description

Defines the moving average filtering times for speed feedback.
0: Inhibited
1: 2 times
2: 4 times
3: 8 times
4: 16 times
Note: The larger the parameter value, the smaller the speed feedback ripple, but the larger the feedback delay.

H08.23 Cutoff frequency of speed feedback low-pass filter

Address:	2008-18h	Effective mode:	Real time
Min.:	100	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
100 Hz–8000 Hz
Description
Defines the cutoff frequency for first-order low-pass filtering on the speed feedback.
Note:
The lower the setpoint, the weaker the speed feedback fluctuation, and the longer the feedback delay will be.
Setting this parameter to 8000 Hz negates the filtering effect.

H08.24 PDFF control coefficient

Address:	2008-19h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	200.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:
0.0% to 200.0%
Description
Defines the control mode of the speed loop.
When this parameter is set to 100.0, the speed loop adopts PI control (default) with quick dynamic response.
When this parameter is set to 0.0, speed loop integral action is enhanced, which filters out low-frequency interference but also slows down the dynamic response.
H08.24 can be used to keep a good responsiveness of the speed loop, with the anti-interference capacity in low-frequency bands improved and the speed feedback overshoot unaffected.

H08.25 **Speed measurement method**

Address:	2008-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: M-method
1: MT-method

Description
Defines the speed measurement method.
0: M-method
1: MT-method

Note: This parameter is activated only when it is set to 1 and a pulse encoder is used.

H08.27 **Speed observer cutoff frequency**

Address:	2008-1Ch	Effective mode:	Real time
Min.:	50	Unit:	Hz
Max.:	600	Data Type:	UInt16
Default:	170	Change:	Real-time

Value Range:
50 Hz–600 Hz

Description
Defines the cutoff frequency of the speed observer. Note that an excessively high setpoint may incur resonance. Decrease the setpoint properly in case of large speed feedback noise.

H08.28 **Speed observer inertia correction coefficient**

Address:	2008-1Dh	Effective mode:	Real time
Min.:	1	Unit:	%
Max.:	1600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
1% to 1600%

Description
Defines the speed observer inertia correction coefficient. If H08.15 is set based on the actual inertia, there is no need to adjust this parameter.

H08.29 **Speed observer filter time**

Address:	2008-1Eh	Effective mode:	Real time

Min.:	0.00	Unit:	ms
Max.:	10.00	Data Type:	UInt16
Default:	0.80	Change:	Real-time

Value Range:

0.00 ms–10.00 ms

Description

Defines the speed observer filter time. It is recommended to set this parameter to a value equal to the sum of H07.05 plus 0.2 ms.

H08.31 Disturbance cutoff frequency

Address:	2008-20h	Effective mode:	Real time
Min.:	1	Unit:	Hz
Max.:	4000	Data Type:	UInt16
Default:	600	Change:	Real-time

Value Range:

1 Hz–4000 Hz

Description

Defines the cutoff frequency of the disturbance observer. Increasing the setpoint improves the responsiveness of the disturbance observer and the compensation effect. Note that an excessively high setpoint may incur resonance.

H08.32 Disturbance compensation gain

Address:	2008-21h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	100	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0% to 100%

Description

Defines the compensation gain of the disturbance observer. The setpoint 100% indicates full compensation.

H08.33 Disturbance observer inertia correction coefficient

Address:	2008-22h	Effective mode:	Real time
Min.:	1		
Max.:	1600	Unit:	%
Default:	100	Data Type:	UInt16
Value Range:		Change:	Real-time

1%–1600%

Description

Defines the disturbance observer inertia correction coefficient. If H08.15 is set based on the actual inertia, there is no need to adjust this parameter.

H08.37 Phase modulation for medium-frequency jitter suppression 2

Address:	2008-26h	Effective mode:	Real time
Min.:	-90	Unit:	°
Max.:	90	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-90° to 90°

Description

Defines the compensation phase of medium-frequency jitter suppression 2.

H08.38 Medium-frequency suppression 2 frequency

Address:	2008-27h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	1000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

0 Hz–1000 Hz

Description

Set this parameter based on actual resonance frequency. The valid suppression frequency range for medium-frequency jitter suppression 2 is 100 Hz to 1000 Hz.

H08.39 Compensation gain of medium-frequency jitter suppression 2

Address:	2008-28h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	300	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

0%–300%

Description

Defines the compensation gain for medium-frequency jitter suppression 2. Set this parameter to 40%...55% in general cases. Setting this parameter to 0 negates the effect of medium-frequency jitter suppression 2.

H08.40 Speed observer selection

Address:	2008-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

0: Disabled
1: Enabled

Description

Used to set the enable bit for speed observer.
0: Disabled
1: Enabled

H08.42 Model control selection

Address:	2008-2Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled
1: Enabled
2: Reserved
4: Model tracking B

Description

Used to enable model tracking control.

H08.43 Model gain

Address:	2008-2Ch	Effective mode:	Real time
Min.:	0.1	Unit:	-
Max.:	2000.0	Data Type:	UInt16
Default:	40.0	Change:	Real-time

Value Range:

0.1–2000.0

Description

Defines the single inertia model gain. The higher the gain, the faster the position response. Note that an excessively high setpoint may incur excessive overshoot.

H08.46 Feedforward value

Address:	2008-2Fh	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	102.4	Data Type:	UInt16
Default:	95.0	Change:	Real-time

Value Range:

0.0–102.4

Description

Defines the speed feedforward gain for single inertia model control. If overshoot occurs, reduce the setpoint properly.

H08.48 Model torque feedforward forward compensation coefficient

Address:	2008-31h	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	204.8	Data Type:	UInt16
Default:	102.4	Change:	Real-time

Value Range:

0.0–204.8

Description

Defines the speed feedforward gain for single inertia model control. If overshoot occurs, reduce the setpoint properly.

H08.49 Model torque feedforward reverse compensation coefficient

Address:	2008-32h	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	204.8	Data Type:	UInt16
Default:	102.4	Change:	Real-time

Value Range:

0.0–204.8

Description

Defines the speed feedforward gain for single inertia model control. If overshoot occurs, reduce the setpoint properly.

H08.53 Medium- and low-frequency jitter suppression frequency 3

Address:	2008-36h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0Hz~300.0Hz

Description

Set this parameter based on actual resonance frequency. The resonance suppression range is 100 Hz to 300 Hz.

H08.54 Medium- and low-frequency jitter suppression compensation 3

Address:	2008-37h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	200	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0% to 200%

Description

Defines the compensation gain for medium- and low-frequency suppression compensation 3. The setpoint 200% indicates full compensation.

H08.56 Medium- and low-frequency jitter suppression phase modulation 3

Address:	2008-39h	Effective mode:	Real time
Min.:	0		
Max.:	600	Unit:	%
Default:	100	Data Type:	UInt16
Value Range:		Change:	Real-time

0%–600%

Description

Adjust this parameter based on the actual compensation effect.

H08.59 Medium- and low-frequency jitter suppression frequency 4

Address:	2008-3Ch	Effective mode:	Real time
Min.:	0.0		
Max.:	300.0	Unit:	Hz
Default:	0.0	Data Type:	UInt16
Value Range:		Change:	Real-time

0.0Hz–300.0Hz

Description

Set this parameter based on actual resonance frequency. The resonance suppression range is 100 Hz to 300 Hz.

H08.60 Medium- and low-frequency jitter suppression compensation 4

Address:	2008-3Dh	Effective mode:	Real time
Min.:	0		
Max.:	200	Unit:	%
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real-time

0%–200%

Description

Defines the compensation gain for medium- and low-frequency suppression compensation 4. The setpoint 200% indicates full compensation.

H08.61 Medium- and low-frequency jitter suppression phase modulation 4

Address:	2008-3Eh	Effective mode:	Real time
Min.:	0		
Max.:	600	Unit:	%
Default:	100	Data Type:	UInt16
Value Range:		Change:	Real-time

0%–600%

Description

Adjust this parameter based on the actual compensation effect.

H08.62 **Position loop integral time constant**

Address:	2008-3Fh	Effective mode:	Real time
Min.:	0.15		
Max.:	512.00	Unit:	-
Default:	512.00	Data Type:	UInt16
Value Range:		Change:	Real-time

0.15–512.00

Description

Defines the position loop integral time constant.

H08.63 **2nd position loop integral time constant**

Address:	2008-40h	Effective mode:	Real time
Min.:	0.15		
Max.:	512.00	Unit:	-
Default:	512.00	Data Type:	UInt16
Value Range:		Change:	Real-time

0.15–512.00

Description

Defines the 2nd position loop integral time constant.

H08.64 **Speed observer feedback source**

Address:	2008-41h	Effective mode:	Real time
Min.:	0		
Max.:	1	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real-time

0: Observer output speed
1: Observer observed speed

Description

Select the speed observer feedback source.
0: Observer output speed
1: Observer observed speed

H08.65 **Zero deviation control selection**

Address:	2008-42h	Effective mode:	Real time
Min.:	0		
Max.:	1	Unit:	-
Default:	0	Data Type:	UInt16
		Change:	Real-time

Value Range:
0: Disabled
1: Enabled

Description
Used to enable/disable zero deviation control.
0: Disabled
1: Enabled

H08.66 Zero deviation control position average filter

Address:	2008-43h	Effective mode:	Real time
Min.:	0.0		
Max.:	320.0	Unit:	ms
Default:	5.0	Data Type:	UInt16
Value Range:		Change:	At stop

0.0 ms–320.0 ms

Description
Defines the average filter time of zero deviation control position. It is recommended to increase the setpoint in case of large noise caused by low command resolution.

H08.68 Speed feedforward of zero deviation control

Address:	2008-45h	Effective mode:	Real time
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	100.0	Data Type:	UInt16
Value Range:		Change:	Real-time

0.0%–100.0%

Description
Defines the speed feedforward of zero deviation control.

H08.69 Torque feedforward of zero deviation control

Address:	2008-46h	Effective mode:	Real time
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	100.0	Data Type:	UInt16
Value Range:		Change:	Real-time

0.0%–100.0%

Description
Defines the torque feedforward of zero deviation control.

H08.90 Encoder scale spacing ripple suppressor enable

Address:	2008-5Bh	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	6	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: 1st group activated only-adaptive mode

2: 1st group activated only-hysteresis mode

3: Two groups activated-adaptive mode

4: Two groups activated-hysteresis mode

Description

Sets encoder scale pitch ripple suppression.

0: Disabled

1: 1st group activated only-adaptive mode. This function is used only to suppress or clear the control loop torque ripple caused by encoder pitch ripple and reduce speed fluctuation and operational noise to some extent.

2: 1st group activated only-hysteresis mode. This function is not suitable for applications with frequent speed changes and short travel, but works better for long travel with slow speed changes (for example, digital printing)

3: Two groups activated-adaptive mode. This function decides the number of suppressors needed based on the amount of torque ripple caused by encoder pitch ripple.

4: Two groups activated-hysteresis mode. Hysteresis mode is only suitable for reciprocating constant speed operation, while adaptive mode is suitable for slow speed change scenarios. Choose the suitable mode as needed.

23.10H09 Auto-tuning Parameters

H09.00 **Auto-tuning mode**

Address:	2009-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	9	Data Type:	UInt16
Default:	4	Change:	Real-time

Value Range:

0: Disabled, manual gain tuning required

1: Enabled, gain parameters generated automatically based on the stiffness level

2: Positioning mode, gain parameters generated automatically based on the stiffness level

3: Interpolation mode+Inertia auto-tuning

4: Normal mode+Inertia auto-tuning

5: Stune mode 5

6: Quick positioning mode+Inertia auto-tuning

9: Model tracking + Inertia auto-tuning + Friction force compensation

Description

Sets encoder scale pitch ripple suppression.
0: Disabled
1: 1st group activated only-adaptive mode. This function is used only to suppress or clear the control loop torque ripple caused by encoder pitch ripple and reduce speed fluctuation and operational noise to some extent.
2: 1st group activated only-hysteresis mode. This function is not suitable for applications with frequent speed changes and short travel, but works better for long travel with slow speed changes (for example, digital printing)
3: Two groups activated-adaptive mode. This function decides the number of suppressors needed based on the amount of torque ripple caused by encoder pitch ripple.
4: Two groups activated-hysteresis mode. Hysteresis mode is only suitable for reciprocating constant speed operation, while adaptive mode is suitable for slow speed change scenarios. Choose the suitable mode as needed.

H09.01 Stiffness level selection

Address:	2009-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	41	Data Type:	UInt16
Default:	15	Change:	Real-time

Value Range:

0–41

Description

Defines the stiffness level of the servo system. The higher the stiffness level, the stronger the gains and the quicker the response will be. But an excessively high stiffness level will cause vibration.
The setpoint 0 indicates the weakest stiffness and 41 indicates the strongest stiffness.

H09.02 Mode selection of adaptive notch

Address:	2009-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Adaptive notch no longer updated
1: One adaptive notch activated (3rd notch)
2: Two adaptive notches activated (3rd and 4th notches)
3: Resonance point tested only (displayed in H09.24)
4: Adaptive notch cleared, values of 3rd and 4th notches restored to default

Description

Defines the operation mode of the adaptive notch.

0: Adaptive notch no longer updated

1: One adaptive notch activated (3rd notch)

2: Two adaptive notches activated (3rd and 4th notches)

3: Resonance point tested only (displayed in H09.24)

4: Adaptive notch cleared, values of 3rd and 4th notches restored to default

H09.03 Online inertia auto-tuning mode

Address:	2009-04h	Effective mode:	Real time
Min.:	0		
Max.:	3	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real-time

0: Disabled

1: Enabled, changing slowly

2: Enabled, changing normally

3: Enabled, changing quickly

Description

Defines whether to enable online inertia auto-tuning and the inertia ratio update speed during online inertia auto-tuning.

0: Disabled

1: Enabled, changing slowly

2: Enabled, changing normally

3: Enabled, changing quickly

H09.05 Offline inertia auto-tuning mode

Address:	2009-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop
Value Range:			

0: Bi-directional

1: Unidirectional

Description

Defines the offline inertia auto-tuning mode. The offline inertia auto-tuning function can be enabled through H0d.02.

0: Bi-directional

1: Unidirectional

H09.06 Max. speed of inertia auto-tuning

Address:	2009-07h	Effective mode:	Real time

Min.:	100	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	500	Change:	At stop

Value Range:

100[mm/s]/[rpm]–1000[mm/s]/[rpm]

Description

Defines the maximum permissible speed reference in offline inertia auto-tuning mode.

During inertia auto-tuning, the higher the speed, the more accurate the auto-tuned values. Use the default setpoint in general cases.

H09.07 Time constant for accelerating to max. speed during inertia auto-tuning

Address:	2009-08h	Effective mode:	Real time
Min.:	10		
Max.:	5000	Unit:	ms
Default:	125	Data Type:	UInt16
Value Range:		Change:	At stop

10 ms–5000 ms

Description

Defines the time for the motor to accelerate from 0 [mm/s]/[rpm] to the maximum speed of inertia auto-tuning (H09.06) during offline inertia autotuning.

H09.08 Interval time after an individual inertia auto-tuning

Address:	2009-09h	Effective mode:	Real time
Min.:	50		
Max.:	10000	Unit:	ms
Default:	800	Data Type:	UInt16
Value Range:		Change:	At stop

50 ms–10000 ms

Description

Defines the interval time between two consecutive speed references when H09.05 (Offline inertia auto-tuning mode) is set to 1 (Positive/Negative triangular wave mode).

H09.09 Motor rotating distance per inertia auto-tuning

Address:	2009-0Ah	Effective mode:	Real time
Min.:	0.00		
Max.:	100.00	Unit:	[mm]/[Rev]
Default:	1.00	Data Type:	UInt16
Value Range:		Change:	Real-time

0.00[mm]/[Rev]–100.00[mm]/[Rev]

Description

Defines the motor revolutions per inertia auto-tuning when H09.05 (Offline inertia auto-tuning mode) is set to 1 (Positive/Negative triangular wave mode).

Note:
When using the offline inertia auto-tuning function, check that the travel distance of the motor at the stop position is larger than the value of H09.09. If not, decrease the value of H09.06 (Maximum speed for inertia auto-tuning) or H09.07 (Time constant of accelerating to max. speed during inertia auto-tuning) properly until the motor travel distance fulfills the requirement.

H09.11 Vibration threshold

Address:	2009-0Ch	Effective mode:	Real time
Min.:	0.0		
Max.:	100.0	Unit:	%
Default:	5.0	Data Type:	UInt16
Value Range:		Change:	Real-time

0.0%–100.0%

Description

Defines the alarm threshold for current feedback vibration.

H09.12 Frequency of the 1st notch

Address:	2009-0Dh	Effective mode:	Real time
Min.:	50		
Max.:	8000	Unit:	Hz
Default:	8000	Data Type:	UInt16
Value Range:		Change:	Real-time

50 Hz–8000 Hz

Description

Defines the center frequency of the notch, which is the mechanical resonance frequency.
In the torque control mode, setting the notch frequency to 8000 Hz deactivates the notch function.

H09.13 Width level of the 1st notch

Address:	2009-0Eh	Effective mode:	Real time
Min.:	0		
Max.:	20	Unit:	-
Default:	2	Data Type:	UInt16
Value Range:		Change:	Real-time

0–20

Description

Defines the width level of the notch. Use the default setpoint in general cases. Width level is the ratio of the notch width to the notch center frequency.

H09.14 Depth level of the 1st notch

Address:	2009-0Fh	Effective mode:	Real time
Min.:	0		
Max.:	99	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real-time

0–99

Description

Defines the depth level of the notch.
The depth level of the notch is the ratio between the input to the output at the notch center frequency.
The higher the setpoint, the lower the notch depth and the weaker the mechanical resonance suppression will be. Note that an excessively high setpoint may cause system instability.

H09.15 **Frequency of the 2nd notch**

Address:	2009-10h	Effective mode:	Real time
Min.:	50		
Max.:	8000	Unit:	Hz
Default:	8000	Data Type:	UInt16
		Change:	Real-time

Value Range:

50 Hz–8000 Hz

Description

Set the frequency of the 2nd notch.

H09.16 **Width level of the 2nd notch**

Address:	2009-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0–20

Description

Set the width level of the 2nd notch.

H09.17 **Depth level of the 2nd notch**

Address:	2009-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–99

Description

Set the depth level of the 2nd notch.

H09.18 **Frequency of the 3rd notch**

Address:	2009-13h	Effective mode:	Real time

Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
50 Hz–8000 Hz
Description
Set the frequency of the 3rd notch.

H09.19 Width level of the 3rd notch

Address:	2009-14h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0–20
Description
Set the width level of the 3rd notch.

H09.20 Depth level of the 3rd notch

Address:	2009-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–99
Description
Set the depth level of the 3rd notch.

H09.21 Frequency of the 4th notch

Address:	2009-16h	Effective mode:	Real time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
50 Hz–8000 Hz
Description
Set the width level of the 4th notch.

H09.22 **Width level of the 4th notch**

Address:	2009-17h	Effective mode:	Real time
Min.:	0		
Max.:	20	Unit:	-
Default:	2	Data Type:	UInt16
Value Range:		Change:	Real-time

0–20

Description

Set the width level of the 4th notch.

H09.23 **Depth level of the 4th notch**

Address:	2009-18h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time
Value Range:			

0–99

Description

Set the depth level of the 4th notch.

H09.24 **Auto-tuned resonance frequency**

Address:	2009-19h	Effective mode:	-
Min.:	0	Unit:	Hz
Max.:	5000	Data Type:	UInt16
Default:	0	Change:	Unchangeable
Value Range:			

0 Hz–5000 Hz

Description

When H09.02 (Adaptive notch mode) is set to 3, the current mechanical resonance frequency is displayed.

H09.32 **Gravity compensation value**

Address:	2009-21h	Effective mode:	Real time
Min.:	-100.0		
Max.:	100.0	Unit:	%
Default:	0.0	Data Type:	UInt16
Value Range:		Change:	Real-time

-100.0%–100.0%

Description

Defines the gravity compensation value. Setting this parameter properly in vertical axis applications can reduce the falling amplitude upon start.

H09.33 **Positive friction compensation value**

Address:	2009-22h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0% to 100.0%
Description
Defines the positive friction compensation value.

H09.34 **Negative friction compensation value**

Address:	2009-23h	Effective mode:	Real time
Min.:	-100.0	Unit:	%
Max.:	0.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
-100.0%–0.0%
Description
Defines the negative direction friction compensation value.

H09.35 **Friction compensation speed**

Address:	2009-24h	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	20.0	Data Type:	UInt16
Default:	2.0	Change:	Real-time

Value Range:
0.0–20.0
Description
Defines the friction compensation speed.

H09.36 **Friction compensation speed**

Address:	2009-25h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x13	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:
0: Slow mode+Speed reference
1: Slow mode+Model speed
2: Slow mode+Speed feedback
3: Slow mode+Observe speed
16: Quick mode +Speed reference
17: Quick mode +Model speed

18: Quick mode +Speed feedback
19: Quick mode+Observe speed

Description

Friction compensation speed
0: Slow mode+Speed reference
1: Slow mode+Model speed
2: Slow mode+Speed feedback
3: Slow mode+Observe speed
16: Quick mode +Speed reference
17: Quick mode +Model speed
18: Quick mode +Speed feedback
19: Quick mode+Observe speed

H09.37 Vibration monitoring time

Address:	2009-26h	Effective mode:	Real time
Min.:	0		
Max.:	65535	Unit:	-
Default:	300	Data Type:	UInt16
Value Range:		Change:	Real time

0–65535

Description

The resonance detection suppression function is turned off automatically after the time defined by this parameter elapses. To suppress the resonance suppression function, set this parameter to 65536 (in seconds).

H09.38 Frequency of low-frequency resonance suppression 1 at the mechanical end

Address:	2009-27h	Effective mode:	Real time
Min.:	1.0	Unit:	Hz
Max.:	100.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:

1.0 Hz–100.0 Hz

Description

Set this parameter based on the actual jitter frequency.

H09.39 Low-frequency resonance suppression 1 at the mechanical end

Address:	2009-28h	Effective mode:	Real time
Min.:	0		
Max.:	3	Unit:	-
Default:	2	Data Type:	UInt16
Value Range:		Change:	At stop

0–3

Description

Defines different low-frequency resonance suppression types at the mechanical load. Type 1 features the shortest delay.

H09.44 Frequency of low-frequency resonance suppression 2 at the mechanical end

Address:	2009-2Dh	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0 Hz–200.0 Hz

Description

Set this parameter based on the actual jitter frequency.

H09.45 Responsiveness of low-frequency resonance suppression 2 at mechanical load end

Address:	2009-2Eh	Effective mode:	Real time
Min.:	0.01	Unit:	-
Max.:	10.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:

0.01–10.00

Description

Use the default setpoint in general cases. To increase the setpoint, reduce the delay time.

H09.47 Width of low-frequency resonance suppression 2 at mechanical load end

Address:	2009-30h		
Min.:	0.00		
Max.:	2.00	Unit:	-
Default:	1.00	Data Type:	UInt16
		Change:	At stop

Value Range:

0.00–2.00

Description

Use the default setpoint in general cases. To increase the setpoint, increase the delay time.

H09.49 Frequency of low-frequency resonance suppression 3 at the mechanical end

Address:	2009-32h	Effective mode:	Real time

Min.:	0.0	Unit:	-
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:
0.0 Hz–200.0 Hz

Description
Set the frequency of low-frequency resonance suppression 3 at mechanical load end.

H09.50 Responsiveness of low-frequency resonance suppression 3 at mechanical load end

Address:	2009-33h	Effective mode:	Real time
Min.:	0.01	Unit:	-
Max.:	10.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:
0.01–10.00

Description
Set the responsiveness of low-frequency resonance suppression 3 at mechanical load end.

H09.52 Width of low-frequency resonance suppression 3 at mechanical load end

Address:	2009-35h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	2.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:
0.00–2.00

Description
Set the width of low-frequency resonance suppression 3 at mechanical load end.

H09.54 Resonance detection torque threshold

Address:	2009-37h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	50.0	Change:	Real-time

Value Range:
0.0% to 300.0%

Description
If the torque fluctuation exceeds the setpoint, an error will be reported. Setting this parameter to 0 hides the resonance detection function.

H09.56 Max. overshoot allowed by ETune

Address:	2009-39h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	2936	Change:	Real-time

Value Range:

0–65535

Description

Defines the maximum overshoot value allowed during ETune adjustment.

H09.57 STune resonance suppression switchover frequency

Address:	2009-3Ah	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	4000	Data Type:	UInt16
Default:	650	Change:	Real-time

Value Range:

0 Hz–4000 Hz

Description

If the resonance frequency is lower than the setpoint, use medium-frequency resonance suppression 2 to suppress resonance. Otherwise, use the notch to suppress resonance.

H09.58 STune resonance suppression reset selection

Address:	2009-3Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled
1: Enabled

Description

Used to enable STune resonance suppression reset to clear parameters related to resonance suppression, medium-frequency resonance suppression 2 and notches 3 and 4.
0: Disabled
1: Enabled

H09.62 Stune stop delay judgment

Address:	2009-3Fh	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	50.00	Data Type:	UInt16

Default: 1.00 Change: Real-time

Value Range:
0.00 ms–50.00 ms

Description
Set Stune stop delay threshold.

H09.63 STune quick convergence speed

Address: 2009-40h Effective mode: Real time
Min.: 0.00
Max.: 50.00 Unit: -
Default: 1.00 Data Type: UInt16
Change: Real-time

Value Range:
0.00–50.00

Description
Set STune quick convergence speed.

H09.71 Starting frequency

Address: 2009-48h Effective mode: Real time
Min.: 0
Max.: 8000 Unit: Hz
Default: 15 Data Type: UInt16
Change: Real-time

Value Range:
0 Hz–8000 Hz

Description
Set the starting frequency for high-performance auto-tuning sweep frequency.

H09.72 End frequency

Address: 2009-49h Effective mode: Real time
Min.: 0
Max.: 8000 Unit: Hz
Default: 8000 Data Type: UInt16
Change: Real-time

Value Range:
0 Hz–8000 Hz

Description
Set the end frequency for high-performance auto-tuning sweep frequency.

H09.73 Frequency subdivision

Address: 2009-4Ah Effective mode: Real time
Min.: 0 Unit: -
Max.: 500 Data Type: UInt16
Default: 50 Change: Real-time

Value Range:
0–500
Description
Set the frequency resolution for high-performance auto-tuning low frequency band (start frequency–start frequency 2). The larger the setting, the smaller the resolution.

H09.74 Excitation amplitude

Address:	2009-4Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	15.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
Set the excitation amplitude for high-performance auto-tuning sweep frequency.

H09.75 Starting frequency 2

Address:	2009-4Ch	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
0 Hz–8000 Hz
Description
Set the starting frequency for medium and high frequency in high-performance auto-tuning.

H09.76 Frequency subdivision 2

Address:	2009-4Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1000	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
0–1000
Description
Set the frequency resolution for high-performance auto-tuning low frequency band (start frequency 2–end frequency). The larger the setting, the smaller the resolution.

H09.77 Biquad filter mode

Address:	2009-4Eh	Effective mode:	Real time

Min.:	0	Unit:	Hz
Max.:	6	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled
1: First-order low-pass
2: Second-order low-pass
3: Notch
4: Lead-lag
5: User-defined

Description

Used to select biquad filter mode.
0: Disabled
1: First-order low-pass
2: Second-order low-pass
3: Notch
4: Lead-lag
5: User-defined

H09.78 Biquad filter numerator frequency

Address:	2009-4Fh	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	16000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

0 Hz–16000 Hz

Description

Set the biquad filter numerator frequency.

H09.79 Biquad filter numerator damping coefficient

Address:	2009-50h	Effective mode:	Real time
Min.:	0.001	Unit:	-
Max.:	10.000	Data Type:	UInt16
Default:	1.000	Change:	Real-time

Value Range:

0.001–10.000

Description

Set the biquad filter numerator damping coefficient.

H09.80 **Biquad filter denominator frequency**

Address:	2009-51h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	16000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

0 Hz–16000 Hz

Description

Set the biquad filter denominator frequency.

H09.81 **Biquad filter denominator damping coefficient**

Address:	2009-52h	Effective mode:	Real time
Min.:	0.001	Unit:	-
Max.:	10.000	Data Type:	UInt16
Default:	1.000	Change:	Real-time

Value Range:

0.001–10.000

Description

Set the biquad filter denominator damping coefficient.

H09.82 **Vibration frequency 1**

Address:	2009-53h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0 Hz–300.0 Hz

Description

Set vibration frequency 1.

H09.83 **Resonance frequency 1**

Address:	2009-54h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0 Hz–300.0 Hz

Description

Set resonance frequency 1.

H09.84 **Vibration damping 1**

Address:	2009-55h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	0.50	Data Type:	UInt16
Default:	0.05	Change:	Real-time

Value Range:
0.00–0.50
Description
Set vibration damping 1.

H09.85 **Resonance damping 1**

Address:	2009-56h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	0.50	Data Type:	UInt16
Default:	0.05	Change:	Real-time

Value Range:
0.00–0.50
Description
Set resonance damping 1.

H09.86 **Vibration frequency 2**

Address:	2009-57h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0 Hz–300.0 Hz
Description
Set vibration frequency 2.

H09.87 **Resonance frequency 2**

Address:	2009-58h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0 Hz–300.0 Hz
Description
Set resonance frequency 2.

H09.88 Vibration damping 2

Address:	2009-59h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	0.50	Data Type:	UInt16
Default:	0.05	Change:	Real-time

Value Range:

0.00–0.50

Description

Set vibration damping 2.

H09.89 Resonance damping 2

Address:	2009-5Ah	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	0.50	Data Type:	UInt16
Default:	0.05	Change:	Real-time

Value Range:

0.00–0.50

Description

Set resonance damping 2.

H09.92 Model friction force compensation enable

Address:	2009-5Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

Disable/enable model friction force compensation.

H09.93 Model friction force compensation coefficient

Address:	2009-5Eh	Effective mode:	Real time
Min.:	0.00	Unit:	%/1000 rpm
Max.:	50.00	Data Type:	UInt16
Default:	0.00	Change:	Real-time

Value Range:

0.00%/1000 rpm–50.00%/1000 rpm

Description

Set the model friction compensation coefficient.

H09.98 **Vibration suppression auto-tuning**

Address:	2009-63h	Effective mode:	Real time
Min.:	0		
Max.:	2	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real-time

0: Disabled
1: Fast auto-tuning
2: Slow

Description

0: Disabled
1: Fast auto-tuning
2: Slow

23.11 H0A Fault and Protection Parameters

H0A.00 **Power input phase loss and failure protection**

Address:	200A-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Enable
1: Disable

Description

Servo drives supporting single-phase/three-phase 220 V and three-phase 380 V power supplies Objects available. When voltage fluctuation or phase loss occurs on the power supply, the drive triggers power input phase loss protection based on H0A.00.

0: Enable
1: Disable

H0A.01 **Absolute position limit**

Address:	200A-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled
1: Enabled
2: Enabled after homing

Description

Used to set the activation condition for enabling the software position limit function and the software limit.

0: Disabled

1: Enabled

2: Enabled after homing

H0A.04 Motor overload protection gain

Address:	200A-05h	Effective mode:	Real time
Min.:	50	Unit:	-
Max.:	300	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

50–300

Description

Determines the motor overload duration before E620.0 (Motor overload) is reported.

You can change the setpoint to advance or delay the time when overload protection is triggered based on the motor temperature. The setpoint 50% indicates the time is cut by half; 150% indicates the time is increased by 50%. Set this parameter based on the actual temperature of the motor.

H0A.08 Overspeed threshold

Address:	200A-09h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	20000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–20000[mm/s]/[rpm]

Description

Defines the overspeed threshold of the motor.

H0A.10 Threshold of excessive local position deviation

Address:	200A-0Bh	Effective mode:	Real time
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	219895614	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the threshold for excessive position deviation in the position control mode.
When the position deviation exceeds this threshold, the drive reports EB00.0 (Position deviation too large).

H0A.12 Runaway protection enable

Address:	200A-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Disabled

1: Runaway protection scheme 1

2: Runaway protection scheme 2

Description

Defines whether to enable runaway protection.

0: Disables E234 detection when the motor drives a vertical axis or is driven by the load

1: Enables runaway protection scheme 1

2: Enable runaway protection scheme 2

H0A.13 Angle auto-tuning mode

Address:	200A-0Eh	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: pre-positioning

1: Inching

2: Voltage injection

6: Static hall

8: Closed-loop pre-positioning

9: Position locking

Description

Selects the motor angle auto-tuning mode:

0: pre-positioning

1: Inching

2: Voltage injection

6: Static hall

8: Closed-loop pre-positioning9: Position locking

Limitation for method 2:

1. It is only applicable to motors with iron cores, including ROT and DDR motors. It is not recommended for DDL motors.
2. If other auto-tuning methods fail, you can use method 2 after performing the following test. Without power-off and without a software reset, perform angle auto-tuning with method 2 at five different positions and record the results (H00.28). If the maximum deviation among the five results is within 5400, you can use method 2 on the DDL motor.

4.11.1H0A.13

H0A.17 **Reference pulse selection**

Address:	200A-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Pulse unit

1: Reference unit

Description

Used to set the threshold unit for large position deviation, positioning completion, and positioning proximity.

0: Pulse unit

1: Reference unit

H0A.18 **IGBT over-temperature threshold**

Address:	200A-13h	Effective mode:	Real time
Min.:	120	Unit:	°C
Max.:	175	Data Type:	UInt16
Default:	140	Change:	Real-time

Value Range:

120°C–175°C

Description

Defines the threshold for reporting E640.0 (IGBT overtemperature) and E640.1 (Flywheel diode overtemperature).

H0A.19 **Filter time constant of touch probe 1**

Address:	200A-14h	Effective mode:	Real time
Min.:	0.00	Unit:	μs
Max.:	6.30	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:

0.00μs to 6.30μs

Description

Set the filter time constant of touch probe 1.

H0A.20 Filter time constant of touch probe 2

Address:	200A-15h	Effective mode:	Real time
Min.:	0.00	Unit:	μs
Max.:	6.30	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:

0.00μs to 6.30μs

Description

Set the filter time constant of touch probe 2.

H0A.21 STO function display selection

Address:	200A-16h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–7

Description

Defines whether to display the STO status or report E150.0 after the STO function is triggered.

0: Displays the STO status. The keypad displays "sto_" after the STO function is triggered. In this case, no fault is reported and no output is generated from the fault DO.

1: Displays the STO fault. The keypad displays "E150.0" after the STO function is triggered. In this case, the dive reports the fault and the faulty DO outputs.

H0A.23 TZ signal filter time

Address:	200A-18h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	25ns
Max.:	31	Data Type:	UInt16
Default:	15	Change:	At stop

Value Range:

0 ns–31 ns

Description

Set TZ signal filter time.

H0A.25 Speed display DO low-pass filter time

Address:	200A-1Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	5000	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 ms–5000 ms

Description

Defines the low-pass filter time constant of the speed information for speed feedback and position references.

H0A.26 Motor overload detection

Address:	200A-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Show motor overload alarm (E909.0) and fault (E620.0)
1: Hide motor overload alarm (E909.0) and fault (E620.0)

H0A.27 Average filter time for speed display DO

Address:	200A-1Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	50	Change:	At stop

Value Range:

0 ms–100 ms

Description

Defines the average filter time constant of the speed information for speed feedback and position references.

H0A.28 Quadrature encoder filter time

Address:	200A-1Dh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	25ns
Max.:	255	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0 ns–255 ns

Description

Defines the quadrature encoder feedback filter time.

H0A.29 Fully closed-loop encoder (ABZ) filter time

Address:	200A-1Eh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	25ns
Max.:	65535	Data Type:	UInt16
Default:	4111	Change:	At stop

Value Range:

bit0–bit7: Fully closed loop encoder (ABZ) pulse signal filtering time
bit8–bit15: Fully closed loop encoder (ABZ) wire breakage filter time

Description

Bit0–bit7: Fully closed-loop encoder (ABZ) pulse signal filter time
Bit8–bit15: Fully closed-loop encoder (ABZ) wire breakage filter time

H0A.32 Time threshold for locked motor overheat protection

Address:	200A-21h	Effective mode:	Real time
Min.:	10	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

10 ms–65535 ms

Description

Defines the overtemperature duration before E630.0 (Motor stall) is detected by the servo drive.
H0A.32 can be used to adjust the sensitivity of motor stall overtemperature detection.

H0A.33 Locked motor overheat protection

Address:	200A-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Disabled
1: Enabled

Description

Enables or disables the detection for E630.0 (Motor stall overtemperature protection).
0: Disabled
1: Enabled

H0A.36 Encoder multi-turn overflow fault selection

Address:	200A-25h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Not hide
1: Hide

Description

Defines whether to hide the encoder multi-turn overflow fault in the absolute position linear mode (H02.01 = 1).
0: Not hide
1: Hide

H0A.40 Compensation function selection

Address:	200A-29h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x1F	Data Type:	UInt16
Default:	0x6	Change:	At stop

Value Range:
bit0: Overtravel compensation
0: Enabled
1: Disabled
bit1: Touch probe rising edge compensation
0: Disabled
1: Enabled
bit2: Touch probe falling edge compensation
0: Disabled
1: Enabled
bit3: Touch probe scheme
0: New scheme
1: Old scheme (same as SV660N)
bit4: Probe 2 separate compensation time enable
0: Disabled
1: Enabled

Description
Select compensation.
Bit0: Overtravel compensation
0: Enabled
1: Disabled
Bit1: Probe rising edge compensation
0: Disabled
1: Enabled Bit2: Probe falling edge compensation
0: Disabled
1: Enabled Bit3: Probe scheme
0: New scheme
1: Old scheme (same as SV660N) Bit4: Probe 2 separate compensation time
0: Disabled
1: Enabled

H0A.41 Forward position of software position limit

Address:	200A-2Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	2147483647	Change:	At stop

Value Range:

-2147483648 to 2147483647

Description

When the absolute position counter (H0b.07) is larger than H0A.41, the servo drive reports E950.0 (Forward limit switch alarm) and executes stop at forward limit.

H0A.43 Reverse position of software position limit

Address:	200A-2Ch	Effective mode:	Real time
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	-2147483648	Change:	At stop

Value Range:

-2147483648 to 2147483647

Description

When the absolute position counter (H0b.07) is smaller than H0A.43, the servo drive reports alarm E952.0 (Reverse limit switch alarm) and executes stop at reverse limit.

H0A.50 Encoder communication fault tolerance threshold

Address:	200A-33h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	31	Change:	Real-time

Value Range:

0–31

Description

When the communication between the encoder and the drive fails continuously for more than H0A.50 times, it is considered as a communication failure with the encoder. When overspeed point mask is enabled, if the number of consecutive overspeed points exceed H0A.50, it is considered as a communication failure with the encoder.

H0A.51 Phase loss detection filter times

Address:	200A-34h	Effective mode:	Real time
Min.:	3	Unit:	55ms
Max.:	36	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:

3 ms–36 ms

Description

Phase loss fault is reported when phase loss keeps active for a period longer than H0A.51.

H0A.52 Encoder temperature protection threshold

Address:	200A-35h	Effective mode:	Real time
Min.:	0	Unit:	°C
Max.:	175	Data Type:	UInt16
Default:	120	Change:	Real-time

Value Range:

0°C–175°C

Description

Defines the temperature threshold for encoder overtemperature protection.

H0A.53 Probe DI ON compensation time

Address:	200A-36h	Effective mode:	Real time
Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16
Default:	200	Change:	Real-time

Value Range:

-3000 ns–3000 ns

Description

Used to compensate for the action time when the touch probe is switched on.

H0A.54 Probe DI OFF compensation time

Address:	200A-37h	Effective mode:	Real time
Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16
Default:	1512	Change:	Real-time

Value Range:

-3000 ns–3000 ns

Description

Used to compensate for the action time when the touch probe is switched off.

H0A.55 Runaway current threshold

Address:	200A-38h	Effective mode:	Real time
Min.:	100.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	200.0	Change:	Real-time

Value Range:

100.0% to 400.0%

Description

Defines the current threshold for runaway protection detection.

H0A.56 Fault reset delay

Address:	200A-39h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	60000	Data Type:	UInt16
Default:	10000	Change:	Real-time

Value Range:

0 ms–60000 ms

Description

Set the fault reset delay time.

H0A.57 Runaway speed threshold

Address:	200A-3Ah	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–1000[mm/s]/[rpm]

Description

Defines the overspeed threshold for runaway protection detection.

H0A.58 Runaway speed filter time

Address:	200A-3Bh	Effective mode:	Upon the next power-on
Min.:	0.1	Unit:	ms
Max.:	100.0	Data Type:	UInt16
Default:	2.0	Change:	Real-time

Value Range:

0.1 ms–100.0 ms

Description

Defines the speed feedback filter time for runaway protection detection.

H0A.59 Runaway protection detection time

Address:	200A-3Ch	Effective mode:	Real time
Min.:	10	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:
10 ms–1000 ms
Description
The runaway fault will be reported when runaway keeps active for a period longer than H0A.59.

H0A.60 Black box function mode

Address:	200A-3Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
0: Disable
1: Any fault
2: Designated fault
3: Triggered based on designated condition
Description
Defines the condition for triggering black box sampling.
0: Disable
1: Any fault
2: Designated fault
3: Triggered based on designated condition

H0A.61 Designated fault code

Address:	200A-3Eh	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0–6553.5
Description
Defines the fault code for triggering the black box function.

H0A.62 Trigger source

Address:	200A-3Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	27	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 27

Description

Defines the fault code for triggering the black box function through designated channel.

H0A.63 Trigger level

Address:	200A-40h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

Defines the trigger level for triggering the black box function through designated channel.

H0A.65 Trigger level selection

Address:	200A-42h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Rising edge
1: Equal
2: Falling edge
3: Edge-triggered

Description

Defines the trigger mode for triggering the black box function through H0A.63.

0: Rising edge
1: Equal
2: Falling edge
3: Edge-triggered

H0A.66 Trigger position

Address:	200A-43h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	100	Data Type:	UInt16
Default:	75	Change:	Real-time

Value Range:

0% to 100%

Description

Defines the pre-trigger position for triggering black box sampling.

H0A.67 **Sampling frequency**

Address:	200A-44h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Current loop

1: Position loop

2: Main cycle

Description

Defines the frequency sampling mode during black box sampling.

0: Current loop

1: Position loop

2: Main cycle

H0A.70 **Overspeed threshold 2**

Address:	200A-47h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	20000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–20000[mm/s]/[rpm]

Description

Defines the speed threshold for reporting E500.2 (Position feedback pulse overspeed).

H0A.71 **Internal function switch**

Address:	200A-48h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	4098	Change:	Real-time

Value Range:

0–65535

Description

bit	Function	Description
0	MS1 overload curve selection	0: New 1: Old
1	Power failure bleeder switch	0: Enabled 1: Disabled

2	Forced brake motor stop mode	0: Forced stop 1: Non-forced stop
3	New external characteristics switch of multi-speed DI mode	0: Old characteristics 1: New characteristics
4	E120.3 hide switch	0: Disabled 1: Disabled
5	Prohibit software reading parameters	0: Disabled 1: Enabled
6	E108.4 hide switch	0: Disabled 1: Disabled
7	CSV command interpolation	0: Sync interrupt interpolation 1: IRQ interrupt interpolation
8	Data type of motor rated current, inertia and back EMF coefficient	0: 16-bit 1: 32-bit
9	Wire breakage detection	0: Enabled 1: Disabled
10	Torque limit source	0: Auto switch acc. to H02.00 1: H07.09 and H07.10
11	Ultra-accurate speed feedback switch	0: Disable 1: Enabled
12	Power failure retention of homing completion flag	0: Disabled 1: Enabled
13	STO status word fallback switch	0: Switch on disable 1: Fault
14	Encoder adaptive function switch	0: Enabled 1: Disable
15	Interrupt positioning external characteristics	0: Old external characteristics, follows motor operation direction 1: New external characteristics, direction set by parameter

H0A.72 Maximum stop time in ramp-to-stop

Address:	200A-49h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10000	Change:	At stop

Value Range:

0 ms–65535 ms

Description

Defines the time for the motor to decelerate from the maximum speed to 0 [mm/s]/[rpm] during ramp-to-stop.

H0A.73 STO 24 V disconnection filter time

Address:	200A-4Ah	Effective mode:	Real time

Min.:	1	Unit:	ms
Max.:	5	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1 ms–5 ms

Description

Defines the delay from the moment when 24V is disconnected to the moment when the STO state applies.

H0A.74 Filter time for two inconsistent STO channels

Address:	200A-4Bh	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

1 ms–1000 ms

Description

Defines the delay from the moment the inconsistent 24V is input to the drive through two channels to the moment when the STO state applies.

H0A.75 Servo OFF delay after STO triggered

Address:	200A-4Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	25	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:

0 ms–25 ms

Description

Defines the delay from the moment the STO state is triggered to the moment the S-ON signal is switched off.

H0A.87 Hall state fault filtering count

Address:	200A-58h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1000	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0–1000

Description

Set the filtering times for Hall status monitoring. If the Hall status is continuously detected as 0 or 7 for the times set in H0A.57, then alarm A34.0 (abnormal Hall status) is raised.

H0A.88 Alarm enable

Address:	200A-59h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–3

Description

Bit0: Used to enable original BiSS-C data alarm function, which is only applicable to the encoder that adopts BiSS-C protocol.

bit1: Used to mask the undervoltage alarm for voltage drop protection (971.0)

H0A.89 Correct state of DDL BiSS-C data

Address:	200A-5Ah	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0–31

Description

Defines the fault bit state during normal operation of BiSS-C.

H0A.90 Speed display low-pass filter time

Address:	200A-5Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 ms–100 ms

Description

Defines the low-pass filter time constant for displayed speed values.

H0A.91 Moving average filter time for torque display values

Address:	200A-5Ch	Effective mode:	Real time

Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 ms–100 ms

Description

Defines the moving average filter time constant for torque display values.

H0A.92 Moving average filter time for position display values

Address:	200A-5Dh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 ms–100 ms

Description

Defines the moving average filter time constant for position display values.

H0A.93 Low-pass filter time for voltage display values

Address:	200A-5Eh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	250	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 ms–250 ms

Description

Defines the low-pass filter time constant for voltage display values.

H0A.94 Low-pass filter time for thermal display values

Address:	200A-5Fh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	250	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 ms–250 ms

Description

Defines the filter time constant for thermal display values.

23.12H0B Monitoring Parameters

H0b.00 Motor speed actual value

Address:	200b-01h	Effective mode:	-
Min.:	-32767	Unit:	[mm/s]/[rpm]
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]

Description

Indicates the actual motor speed after round-off, which is accurate to 1 [mm/s]/[rpm].

You can set the filter time constant for H0b.00 through H0A.25 (speed display DO low-pass filter time).

H0b.01 Speed reference

Address:	200b-02h	Effective mode:	-
Min.:	-32767	Unit:	[mm/s]/[rpm]
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]

Description

Indicates the present speed reference (accurate to 1 [mm/s]/[rpm]) of the drive in the position and speed control modes.

H0b.02 Internal torque reference

Address:	200b-03h	Effective mode:	-
Min.:	-3276.7	Unit:	%
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:

-3276.7% to 3276.7%

Description

Displays present torque reference (accurate to 0.1%). The value 100.0% corresponds to the rated torque of the motor.

H0b.03 Input (DI) signal monitoring

Address:	200b-04h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16

Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Displays the level status of 5 DI terminals without filtering.

Upper LED segments ON: high level (indicated by "1") Lower LED segments ON: low level (indicated by "0")

H0b.05 Output (DO) signal monitoring

Address:	200b-06h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Displays the level status of 2 DO terminals without filtering.

Upper LED segments ON: high level (indicated by "1") Lower LED segments ON: low level (indicated by "0")

H0b.07 Absolute position counter

Address:	200b-08h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Displays current absolute position of the motor (reference unit).

This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.09 Mechanical angle

Address:	200b-0Ah	Effective mode:	-
Min.:	0.0	Unit:	°
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0° to 360.0°

Description

Displays present mechanical angle (encoder unit) of the motor. The setpoint 0 indicates the mechanical angle is 0°.

Actual mechanical angle = 360° x H0b.09/(Maximum value of H0b.09 + 1)

Maximum value of H0b.09 for an absolute encoder is 65535.

H0b.10 Electrical angle

Address:	200b-0Bh	Effective mode:	-
Min.:	0.0	Unit:	°
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0° to 360.0°

Description

Indicates the present electrical angle of the motor, which is accurate to 0.1°. The electrical angle variation range is ±360.0° during rotation. If the motor has four pairs of poles, each revolution generates four rounds of angle change from 0° to 359°. Similarly, if the motor has five pairs of poles, each revolution generates five rounds of angle change from 0° to 359°.

H0b.12 Average load ratio

Address:	200b-0Dh	Effective mode:	-
Min.:	0.0	Unit:	%
Max.:	800.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0% to 800.0%

Description

Displays the percentage of the average load torque to the rated torque of the motor, which is accurate to 0.1%. The value 100.0% corresponds to the rated torque of the motor.

H0b.15 Position following error (encoder unit)

Address:	200b-10h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Used to count and display the position deviation value after being divided or multiplied by the electronic gear ratio in the position control mode.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.
Note:
H0b.15 can be clear when the condition defined in H05.16 (Clear action) is met.

H0b.17 Feedback pulse counter

Address:	200b-12h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Used to count the position pulses fed back by the encoder in any control mode.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.19 Total power-on time

Address:	200b-14h	Effective mode:	-
Min.:	0.0	Unit:	s
Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:
0.0s–429496729.5s
Description
Used to record the total operating time of the servo drive.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.
Note:
If the servo drive is switched on and off repeatedly within a short period of time, a deviation within 1h may be present in the total power-on time record.

H0b.21 Displayed AI1 voltage

Address:	200b-16h	Effective mode:	-
Min.:	-327.67	Unit:	V
Max.:	327.67	Data Type:	Int16
Default:	0.00	Change:	Unchangeable

Value Range:
-327.67 V–327.67 V

Description

Displays the actual sampling voltage of AI1.

H0b.22 Displayed AI2 voltage

Address:	200b-17h	Effective mode:	-
Min.:	-327.67	Unit:	V
Max.:	327.67	Data Type:	Int16
Default:	0.00	Change:	Unchangeable

Value Range:

-327.67 V–327.67 V

Description

Displays the actual sampling voltage of AI2.

H0b.24 Phase current RMS value

Address:	200b-19h	Effective mode:	-
Min.:	0.0	Unit:	A
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 A–6553.5 A

Description

Displays the RMS value of the phase current of the motor, accurate to 0.1 A.

H0b.25 Angle obtained upon voltage injection auto-tuning

Address:	200b-1Ah	Effective mode:	-
Min.:	0.0	Unit:	°
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0° to 360.0°

Description

Display the angle obtained upon voltage injection auto-tuning.

H0b.26 Bus voltage

Address:	200b-1Bh	Effective mode:	-
Min.:	0.0	Unit:	V
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0V–6553.5V

Description

Displays the DC bus voltage of the main circuit input voltage after rectification, which is accurate to 0.01 V.

H0b.27 Module temperature

Address:	200b-1Ch	Effective mode:	-
Min.:	-20	Unit:	°C
Max.:	200	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-20°C–200°C

Description

Indicates the temperature of the module inside the servo drive, which can be used as a reference for estimating the actual temperature of the drive.

H0b.28 Absolute encoder fault information given by FPGA

Address:	200b-1Dh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the absolute encoder fault information given by FPGA.

H0b.29 Axis status information given by FPGA

Address:	200b-1Eh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display axis status information given by FPGA.

H0b.30 Axis fault information given by FPGA

Address:	200b-1Fh	Effective mode:	-

Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display axis fault information given by FPGA.

H0b.31 Encoder fault information

Address:	200b-20h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display encoder internal fault information.

H0b.33 Fault log

Address:	200b-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	19	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Present fault
1: Last fault
2: 2nd to last fault
3: 3rd to last fault
4: 4th to last fault
5: 5th to last fault 6: 6th to last fault
7: 7th to last fault
8: 8th to last fault
9: 9th to last fault
10: 10th to last fault
11: 11th to last fault
12: 12th to last fault
13: 13th to last fault
14: 14th to last fault
15: 15th to last fault
16: 16th to last fault
17: 17th to last fault
18: 18th to last fault
19: 19th to last fault

Description

Used to view the latest 20 faults of the drive.

0: Present fault

1: Last fault

2: 2nd to last fault

3: 3rd to last fault

4: 4th to last fault

5: 5th to last fault 6: 6th to last fault

7: 7th to last fault

8: 8th to last fault

9: 9th to last fault

10: 10th to last fault

11: 11th to last fault

12: 12th to last fault

13: 13th to last fault

14: 14th to last fault

15: 15th to last fault

16: 16th to last fault

17: 17th to last fault

18: 18th to last fault

19: 19th to last fault

H0b.34 Fault code of the selected fault

Address:	200b-23h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the fault code of the selected fault.

H0b.35 Timestamp of the selected fault

Address:	200b-24h	Effective mode:	-
Min.:	0.0	Unit:	s
Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:

0.0s–429496729.5s

Description

Display timestamp of the selected fault.

H0b.37 Motor speed upon occurrence of the selected fault

Address:	200b-26h	Effective mode:	-
Min.:	-32767	Unit:	[mm/s]/[rpm]
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]

Description

Display motor speed upon occurrence of the selected fault.

H0b.38 Motor phase U current upon occurrence of the selected fault

Address:	200b-27h	Effective mode:	-
Min.:	-3276.7	Unit:	A
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:

-3276.7 A–3276.7 A

Description

Display the motor phase U current upon occurrence of the selected fault.

H0b.39 Motor phase V current upon occurrence of the selected fault

Address:	200b-28h	Effective mode:	-
Min.:	-3276.7	Unit:	A
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:

-3276.7 A–3276.7 A

Description

Display the motor phase V current upon occurrence of the selected fault.

H0b.40 Bus voltage upon occurrence of the selected fault

Address:	200b-29h	Effective mode:	-
Min.:	0.0	Unit:	V
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 V–6553.5 V

Description

Display the bus voltage upon occurrence of the selected fault.

H0b.41 Input terminal state on selected fault

Address:	200b-2Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display input terminal state on selected fault.

H0b.43 Output terminal status upon occurrence of the selected fault

Address:	200b-2Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display output terminal status upon occurrence of the selected fault.

H0b.45 Internal fault code

Address:	200b-2Eh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the internal fault code.

H0b.46 Absolute encoder fault information given by FPGA upon occurrence of the selected fault

Address:	200b-2Fh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the absolute encoder fault information given by FPGA upon occurrence of the selected fault.

H0b.47 System status information given by FPGA upon occurrence of the selected fault

Address:	200b-30h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the system status information given by FPGA upon occurrence of the selected fault.

H0b.48 System fault information given by FPGA upon occurrence of the selected fault

Address:	200b-31h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the system fault information given by FPGA upon occurrence of the selected fault.

H0b.49 Encoder fault information upon occurrence of the selected fault

Address:	200b-32h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the encoder fault information upon occurrence of the selected fault.

H0b.51 Internal fault code upon occurrence of the selected fault

Address:	200b-34h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description
Display internal fault code upon occurrence of the selected fault.

H0b.52 FPGA timeout fault standard bit upon occurrence of the selected fault

Address:	200b-35h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the FPGA timeout fault standard bit upon occurrence of the selected fault.

H0b.53 Position following error (reference unit)

Address:	200b-36h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Indicates the position deviation value which has not been divided or multiplied by the electronic gear ratio in the position control mode.
Position deviation (reference unit) is the value obtained after encoder position deviation calculation. The precision is compromised during division.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.55 Actual motor speed 2

Address:	200b-38h	Effective mode:	-
Min.:	-214748364.8	Unit:	[mm/s]/[rpm]
Max.:	214748364.7	Data Type:	Int32
Default:	0.0	Change:	Unchangeable

Value Range:
-214748364.8[mm/s]/[rpm]–214748364.7[mm/s]/[rpm]
Description
Displays the actual motor speed, accurate to 0.1 [mm/s]/[rpm].

This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.
H0A.25 (Filter time constant of speed feedback display) can be used to set the filter time constant of the speed feedback.

H0b.57 Control circuit bus voltage

Address:	200b-3Ah	Effective mode:	-
Min.:	0.0	Unit:	V
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0 V–6553.5 V
Description
Displays the bus voltage of the control circuit.

H0b.58 Mechanical absolute position (low 32 bits)

Address:	200b-3Bh	Effective mode:	-
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0 to 4294967295
Description
Displays the low 32-bit value (encoder unit) of the mechanical position feedback when the absolute encoder is used.

H0b.60 Mechanical absolute position (high 32 bits)

Address:	200b-3Dh	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Displays the high 32-bit value (encoder unit) of the mechanical position feedback when the absolute encoder is used.

H0b.63 NotRdy state

Address:	200b-40h	Effective mode:	-
Min.:	0	Unit:	-

Max.:	9	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0: Normal
1: Control circuit error
2: Main circuit power input error
3: Bus undervoltage
4: Soft start failed
5: Encoder initialization undone
6: Short circuit to ground failed
7: Others
9: Fully closed-loop encoder initialization not completed正常

Description

Displays the reason for the NRD state.
0: Normal
1: Control circuit error
2: Main circuit power input error
3: Bus undervoltage
4: Soft start failed
5: Encoder initialization undone
6: Short circuit to ground failed
7: Others
9: Fully closed-loop encoder initialization not completed

H0b.66 Encoder temperature

Address:	200b-43h	Effective mode:	-
Min.:	-32768	Unit:	°C
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32768°C–32767°C

Description

Indicates the encoder temperature value.

H0b.67 Load rate of braking resistor

Address:	200b-44h	Effective mode:	-
Min.:	0.0	Unit:	%
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0% to 200.0%

Description

Display load rate of the braking resistor.

H0b.70 Number of absolute encoder revolutions

Address:	200b-47h	Effective mode:	-
Min.:	-32768	Unit:	Rev
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32768Rev to 32767Rev

Description

Indicates the number of revolutions of the absolute encoder.

H0b.71 Single-turn position fed back by the absolute encoder

Address:	200b-48h	Effective mode:	-
Min.:	0	Unit:	Encoder unit
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0 to 2147483647

Description

Displays the position feedback of the absolute encoder within one turn.

H0b.74 System fault information given by FPGA

Address:	200b-4Bh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display system fault information given by FPGA.

H0b.77 Encoder position (low 32 bits)

Address:	200b-4Eh	Effective mode:	-
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0 to 4294967295

Description

Displays the low 32-bit value of the position feedback of the absolute encoder.

Description

Displays the low 32-bit value of the position feedback of the absolute encoder.

H0b.79 Encoder position (high 32 bits)

Address:	200b-50h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Displays the high 32-bit value of the position feedback of the absolute encoder.

H0b.81 Single-turn position of the rotary load (low 32 bits)

Address:	200b-52h	Effective mode:	-
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0 to 4294967295

Description

Displays the low 32-bit value of the position feedback of the rotary load when the absolute system works in the rotation mode.

H0b.83 Single-turn position of the rotary load (high 32 bits)

Address:	200b-54h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Displays the high 32-bit value of the position feedback of the rotary load when the absolute system works the rotation mode.

H0b.85 Single-turn position of the rotary load (reference unit)

Address:	200b-56h	Effective mode:	-
Min.:	0	Unit:	Reference unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0 to 4294967295
Description
Displays the high 32-bit value of the position feedback of the rotary load when the absolute system works the rotation mode.

H0b.87 IGBT junction temperature

Address:	200b-58h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	200	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–200
Description
Display IGBT junction temperature.

H0b.90 Group No. of the abnormal parameter

Address:	200b-5Bh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Set the group number of the abnormal parameter.

H0b.91 Offset within the group of the abnormal parameter

Address:	200b-5Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Display offset within the group of the abnormal parameter.

H0b.92 Hall state

Address:	200b-5Dh	Effective mode:	-
Min.:	0	Unit:	-

Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display Hall state.

H0b.93 Closed loop state

Address:	200b-5Eh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0: Half closed loop

1: Fully closed loop

Description

Displays the closed loop state in position control mode.

0: Half closed loop

1: Fully closed loop

H0b.94 Individual power-on time

Address:	200b-5Fh	Effective mode:	-
Min.:	0.0	Unit:	s
Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:

0.0s–429496729.5s

Description

Display the individual power-on time of the drive.

H0b.96 Individual power-on time upon occurrence of the selected fault

Address:	200b-61h	Effective mode:	-
Min.:	0.0	Unit:	s
Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:

0.0s–429496729.5s

Description

Display the individual power-on time upon occurrence of the selected fault.

H0b.98 Dynamic braking resistor load rate

Address:	200b-63h	Effective mode:	-
Min.:	0.0	Unit:	%
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0% to 200.0%

Description

Display dynamic braking resistor load rate.

23.13H0C Fault and Protection Parameters 2

H0C.53 Probe DI ON compensation time 2

Address:	200C-36h	Effective mode:	Real time
Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16
Default:	200	Change:	Real-time

Value Range:

-3000 ns–3000 ns

Description

Used to compensate for the action time when touch probe 2 is switched on. (Effective when H0A_40 bit4 = 1)

H0C.54 Probe DI OFF compensation time 2

Address:	200C-37h	Effective mode:	Real time
Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16
Default:	1512	Change:	Real-time

Value Range:

-3000 ns–3000 ns

Description

Used to compensate for the action time when touch probe 2 is switched off. (Effective when H0A_40 bit4 = 1)

H0C.71 Internal function switch 2

Address:	200C-48h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	512	Change:	Real-time

Value Range:

0–65535

Description

bit9: FPGA encoder feedback overspeed point hide switch

23.14H0D Auxiliary Parameters

H0d.00 **Software Reset**

Address:	200d-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enable

Description

0: No operation

1: Enabled

Programs in the drive are reset automatically (similar to the program reset upon power-on) after the software reset function is enabled, without the need for a power cycle.

H0d.01 **Fault reset**

Address:	200d-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enable

Description

0: No operation

1: Enable

Resettable faults of Level 1 and level 2 can be reset only when the servo drive is not in running state after the fault causes are eliminated. Then, the servo drive do not display the faults and enters the "rdy" state.

When a No. 3 alarm occurs, you can enable the fault reset function directly, regardless of the servo drive status.

H0d.02 **Inertia auto-tuning enable**

Address:	200d-03h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	65	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65

Description

Used to enable offline inertia auto-tuning through the keypad. In the parameter display mode, switch to H0d.02 and press the SET key to enable offline inertia auto-tuning.

H0d.04 Read/write in encoder ROM

Address:	200d-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Write ROM

2: Read ROM

3: ROM failure

Description

For Inovance encoders, the USB and control circuit need to be disconnected after writing in ROM to activate parameters. Also ensure that the drive is powered on during parameter writing.

0: No operation

1: Write ROM

2: Read ROM

3: ROM failure

H0d.05 Emergency stop

Address:	200d-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No operation

1: Emergency stop

Description

Trigger emergency stop.

The emergency stop mode corresponding to H0D.05 is defined by H02.05 or 605C.

H0d.06 Current loop auto-tuning test

Address:	200d-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	6	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enable current loop auto-tuning

2: Enable current loop step test (static)

3: Enable current loop step test

Description

0: No operation

1: Enable current loop auto-tuning

2: Enable current loop step test (static)

3: Enable current loop step test

H0d.10 Analog channel auto adjusting

Address:	200d-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Adjusted through AI1

2: Adjusted through AI2

Description

When automatic adjustment of the analog channel is enabled, the drive automatically corrects the zero drift voltage of the analog channel to improve signal detection accuracy.

0: No operation

1: Adjusted through AI1

2: Adjusted through AI2

H0d.12 Phase U/V current balance correction

Address:	200d-0Dh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Enable/disable phase U/V current balance correction.

0: Disabled

1: Enabled

H0d.17 Forced DI/DO enable switch

Address:	200d-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Forced DI enable switch

0: Disabled

1: Enabled

bit1: Forced DO enable switch

0: Disabled

1: Enabled

Description

Forced DI/DO selection.

Bit0: Forced DI enable switch

0: Disabled

1: Enabled

Bit1: Forced DO enable switch

0: Disabled

1: Enabled

H0d.18 Forced DI value

Address:	200d-13h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFF	Data Type:	UInt16
Default:	0xFF	Change:	Real-time

Value Range:

0x0 to 0xFF

Description

Defines whether the DI functions set in group H03 is active when forced DI is activated (H0d.17 = 1 or 3).

The value of H0d.18 is displayed as a hexadecimal on the keypad. When it is converted to a binary value, "bit(n) = 1" indicates the level logic of DI function is high level; "bit(n) = 0" indicates the level logic of the DI function is low level.

H0d.19 Forced DO value

Address:	200d-14h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0x3	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0x3

Description

Defines whether the DO functions assigned in group H04 are active when forced DO is active (H0d.17 = 2 or 3).

The value of H0d.19 is displayed as a hexadecimal on the keypad. When it is converted to a binary value, "bit(n) = 1" indicates the DO function is active; "bit (n) = 0" indicates the DO function is inactive.

H0d.20 Absolute encoder reset

Address:	200d-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Reset fault

2: Reset fault and multi-turn data

3: Reset Inovance 2nd encoder fault

4: Reset Inovance 2nd encoder fault and multi-turn data

Description

You can reset the encoder error or the multi-turn data fed back by the encoder by setting H0d.20.

0: No operation

1: Reset fault

2: Reset fault and multi-turn data

3: Reset Inovance 2nd encoder fault

4: Reset Inovance 2nd encoder fault and multi-turn data

H0d.21 Read error status bit of Nikon and EnDat2.2 encoders

Address:	200d-16h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Reading error status bit

Description

Used to read the error status bit of Nikon encoder and EnDat2.2 encoder.

0: No operation

1: Reading error status bit

H0d.29 Motor parameter auto-tuning

Address:	200d-1Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enabled

Description

Resistor inductance auto-tuning.

0: No operation

1: Enabled

23.15H0E Communication Function Parameters

H0E.00 Node address

Address:	200E-01h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	127	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

1–127

Description

CAN Indicates the slave node address. Ensure this parameter is consistent with the configuration of the host controller.

H0E.01 Save objects written through communication to EEPROM

Address:	200E-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	4	Change:	Real-time

Value Range:

0: Not save

1: Save parameters

2: Save object dictionaries

3: Save parameters and object dictionaries

4: Save object dictionaries written before communication (OP)
255: Determine through H0E03 and H0E04

Description

You can use this parameter to select a data saving operation when parameters and object dictionaries are written through a serial port or SDO.
0: Not save
1: Save parameters
2: Save object dictionaries
3: Save parameters and object dictionaries
4: Save object dictionaries written before communication (OP)
255: Determine through H0E03 and H0E04

H0E.03 Save objects written through software (commissioning protocol) to EEPROM

Address:	200E-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Do not save
1: Save

Description

Saves objects written through software (commissioning protocol) to EEPROM, including the parameter and object dictionary.
0: Do not save
1: Save

H0E.04 Save objects written through communication to EEPROM (excluding commissioning protocol)

Address:	200E-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Do not save
1: Save

Description

You can use this parameter to determine whether to save communication written data in EEPROM (excluding commissioning protocol) (CANOpen, CANLink, Ethernet COE, ModBus485). The data include the function code and object dictionary
0: Do not save
1: Save

H0E.07 Object dictionary unit selection

Address:	200E-08h	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Reference unit system (p/s, p/s^2)

1: User unit system (0.01 [mm/s]/[rpm], ms)

Description

Servo unit system switching:

0: Use reference unit system. The speed type dictionary unit is p/s, and the acceleration type object dictionary is p/s^2.

1: User unit system, 0.01 [mm/s]/[rpm] for speed type object dictionaries and ms (time taken for changing from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm]) for acceleration type object dictionaries.

H0E.20 EtherCAT slave name

Address:	200E-15h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Set EtherCAT slave name.

H0E.21 EtherCAT slave alias

Address:	200E-16h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set EtherCAT slave alias.

H0E.22 Number of synchronous loss events allowed by EtherCAT

Address:	200E-17h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	8	Change:	Real-time

Value Range:

1–20

Description

Set the number of synchronous loss events allowed by EtherCAT.

H0E.24 Sync loss count

Address:	200E-19h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Set Synchronization loss count.

H0E.25 Max. error value and invalid frames of EtherCAT port 0 per unit time

Address:	200E-1Ah	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Indicates the maximum error value and invalid frames of EtherCAT port 0 per unit time.

H0E.26 Max. error value and invalid frames of EtherCAT port 1 per unit time

Address:	200E-1Bh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Indicates the maximum error value and invalid frames of EtherCAT port 1 per unit time.

H0E.27 Max. transfer error of EtherCAT port per unit time

Address:	200E-1Ch	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Indicates the maximum EtherCAT port forwarding errors per unit time.

H0E.28 **Max. EtherCAT data frame processing unit error per unit time**

Address:	200E-1Dh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFF

Description

Indicates the maximum EtherCAT data frame processing unit errors per unit time.

H0E.29 **Max. link loss value of EtherCAT port 0 per unit time**

Address:	200E-1Eh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Indicates the maximum EtherCAT port 0 link losses per unit time.

H0E.31 **EtherCAT synchronization mode setting**

Address:	200E-20h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0–3

Description

Set EtherCAT synchronization mode setting.

H0E.32 **EtherCAT synchronization error threshold**

Address:	200E-21h	Effective mode:	Real time
Min.:	100	Unit:	ns
Max.:	8000	Data Type:	UInt16
Default:	4000	Change:	At stop

Value Range:

100 ns–8000 ns

Description

Set EtherCAT synchronization error threshold.

H0E.33 EtherCAT state machine status and port connection status

Address:	200E-22h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Set the EtherCAT state machine status and port connection status.

H0E.34 Excessive CSP position command increment count

Address:	200E-23h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	30	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:

1–30

Description

Set the excessive CSP position command increment count.

H0E.35 AL fault code

Address:	200E-24h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Displays the AL fault subcode.

H0E.36 EtherCAT enhanced link enable

Address:	200E-25h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

EtherCAT enhanced link enable
0: Disabled
1: Enabled

H0E.37 EtherCAT XML reset selection

Address:	200E-26h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Disabled
1: Enabled

Description
EtherCAT XML reset selection
0: Disabled
1: Enabled

H0E.73 EtherCAT port control mode and status display

Address:	200E-4Ah	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF

Description
EtherCAT port control mode and status display

H0E.80 Modbus baud rate

Address:	200E-51h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	9	Data Type:	UInt16
Default:	9	Change:	Real-time

Value Range:
0：300bps
1：600bps
2：1200bps
3：2400bps
4：4800bps
5：9600bps
6：19200bps
7：38400bps
8：57600bps

9: 115200 bps

Description

Defines the communication rate between the servo drive and the host controller. The baud rate set in the servo drive must be the same as that in the host controller. Otherwise, communication will fail.

0: 300 bps
1: 600 bps
2: 1200 bps
3: 2400 bps
4: 4800 bps
5: 9600 bps
6: 19200 bps
7: 38400 bps
8: 57600 bps
9: 115200 bps

H0E.81 **Modbus data format**

Address:	200E-52h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:

0: No parity, 2 stop bits (N-2)
1: Even parity, 1 stop bit (E-1)
2: Odd parity, 1 stop bit (O-1)
3: No parity, 1 stop bit (N-1)

Description

Defines the data check mode between the servo drive and the host controller during communication.

0: No parity, 2 stop bits
1: Even parity, 1 stop bit
2: Odd parity, 1 stop bit
3: No parity, 1 stop bit

The data format of the servo drive must be the same as that of the host controller. Otherwise, communication will fail.

H0E.82 **Modbus response delay**

Address:	200E-53h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	20	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–20 ms

Description

Defines the delay from the moment when the slave receives a command from the host controller to the moment when the slave returns a response.

H0E.83 Modbus communication timeout

Address:	200E-54h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	600	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–600 ms

Description

Set the Modbus communication timeout.

H0E.84 Sequence of Modbus communication data bits

Address:	200E-55h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: High bits before low bits

1: Low bits before high bits

H0E.90 Communication version

Address:	200E-5Bh	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:

0.00–655.35

Description

Display the communication version.

H0E.96 XML version information

Address:	200E-61h	Effective mode:	-

Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:

0.00–655.35

Description

Display XML version information.

23.16H0F Fully Closed-Loop

H0F.00 **Encoder feedback mode**

Address:	200F-01h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Internal encoder feedback

1: External encoder feedback

2: Inner/Outer loop switchover

Description

Defines the encoder feedback signal source in fully closed-loop control.

0: Internal encoder feedback. The position feedback signals come from the motor encoder.

1: External encoder feedback. The position feedback signals come from the fully closed-loop external encoder and electronic gear ratio 1 is used.

2: Inner/Outer loop switchover: The DI assigned with FunIN.24 (GEAR_SEL, electronic gear ratio switchover) is switch between inner and outer position closed loops.

DI function disabled: internal encoder feedback and electronic gear ratio 1 are used.

DI function enabled: external encoder feedback and electronic gear ratio 2 are used.

H0F.01 **Fully closed-loop encoder application mode**

Address:	200F-02h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Standard operating direction
1: Reverse operating direction

Description

Defines the feedback pulse counting direction of internal and external encoders when the motor rotates in the fully closed-loop mode.

0: Standard operating direction: The pulse feedback counter of the internal encoder (H0F.18) is in the same direction as that of the external encoder (H0F.20) during rotation of the motor.

1: Reverse operating direction: The pulse feedback counter of the internal encoder (H0F.18) is in the opposite direction as that of the external encoder (H0F.20) during rotation of the motor.

H0F.02 Fully closed-loop encoder absolute value

Address:	200F-03h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Incremental mode
1: Absolute linear mode

Description

Set fully closed-loop encoder absolute value

0: Incremental mode
1: Absolute linear mode

H0F.03 Fully closed-loop encoder feedback type

Address:	200F-04h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Quadrature pulse
1: Inovance
2: BiSS-C
3: EnDat2.2
4: SSI

Description

Set the fully closed-loop encoder feedback type
0: Quadrature pulse
1: Inovance
2: BiSS-C
3: EnDat2.2
4: SSI

H0F.04 Number of fully closed-loop encoder pulses per revolution

Address:	200F-05h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	10000	Change:	At stop

Value Range:
1–2147483647

Description
Defines the pulses fed back by the external encoder per revolution of the motor. It defines the quantity relation between feedback pulses from the external encoder and those from the internal encoder.
Calculate the value of this parameter through analyzing mechanical parameters. When rigid connection is applied between the motor and the external encoder (scale), you can also set this parameter using the following method:
1: Manually rotate the motor and observe H0F.18 (Feedback pulse counter of internal encoder) in the meantime. After ensuring that the motor has rotated for a full turn (H0F.18 = Motor resolution), calculate the change of H0F.20 (Feedback pulse counter of external encoder) and use the absolute value of the change as the value of H0F.04.
2: Assume values of H0F.18 and H0F.20 are X1 and Y1 before the motor rotates and X2 and Y2 after the motor rotates, then the following formula applies: H0F.04 = Motor resolution x (Y2 - Y1)/(X2 - X1) The calculated result must be positive; if not, perform step 1 again.
For non-rigid connection, an error may exist in the calculation result.
Note:
Ensure H0F.04 is set properly. Otherwise, EB02.0 (Position deviation too large in fully closed loop) may occur after the drive operates.

H0F.06 Fully closed-loop encoder interface

Address:	200F-07h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0: CN2 1: CN7

Description
Used to set the drive interface used by the fully closed-loop encoder.

H0F.08 **Excessive deviation threshold in compound control mode**

Address:	200F-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	1000	Change:	Real-time

Value Range:

0–2147483647

Description

Defines the position deviation threshold at which the servo drive reports EB02.0 (Position deviation too large in fully closed-loop mode).

When H0F.08 is set to 0, the drive does not detect EB02.0 and always clears the fully closed-loop position deviation.

H0F.10 **Clear deviation in compound control mode**

Address:	200F-0Bh	Effective mode:	Real time
Min.:	0	Unit:	Rev
Max.:	100	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0 Rev to 100 Rev

Description

Defines the number of revolutions rotated by the motor per a clear of the fully closed-loop position deviation during operation. The number of revolutions is reflected by H0F.18 (Feedback pulse counter of internal encoder). The number of motor revolutions will not be cleared when the drive is not in the operational state.

H0F.13 **Compound vibration suppression filter time**

Address:	200F-0Eh	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0 ms–6553.5 ms

Description

Defines the time constant for compound vibration suppression in fully closed-loop control when external encoder feedback (H0F.00 = 1 or 2) is used.

Increase the setpoint gradually and check the response change.
When the stiffness of the transmission mechanism between fully closed loop and internal loop is insufficient, set H0F.13 properly to improve system stability, which is to generate the effect of internal loop temporarily and form a fully closed loop again after the system is stabilized. When the stiffness is sufficient, there is no need to adjust this parameter.

H0F.16 Pulse deviation display in compound control mode

Address:	200F-11h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Used to count and display the position deviation absolute value in fully closed loop control.
Pulse deviation in compound control = Absolute position feedback of external encoder - Absolute position feedback conversion value of internal encoder.
The alignment of inner and outer loop feedbacks is performed each time the deviation is cleared.

H0F.18 Internal position pulse feedback display

Address:	200F-13h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Used to count and display the number of feedback pulses of the internal encoder (after being divided or multiplied by electronic gear ratio, in internal encoder unit).

H0F.20 Fully closed-loop encoder position pulse feedback display

Address:	200F-15h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Used to count and display the number of feedback pulses of the internal encoder (after being divided or multiplied by electronic gear ratio, in internal encoder unit).

H0F.22 Quadrature pulse phase Z detection invalid in fully closed-loop mode

Address:	200F-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Detected

1: Not detected

H0F.23 BiSS-C/SSI/EDNAT2.2 fully closed-loop encoder absolute homing offset

Address:	200F-18h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

The homing offset is automatically updated after homing is completed, and is automatically aligned with H05.36. It is only necessary to write this value manually when you replace the drive. When the full closed-loop encoder is in absolute linear mode, the power-on initial position = Encoder position feedback original value + Homing offset – Absolute feedback offset

H0F.25 Set the source of touch probe Z signal in fully closed-loop mode.

Address:	200F-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Motor Z signal

1: External feedback Z signal

Description

Set the source of touch probe Z signal in fully closed-loop mode.
0: Motor Z signal
1: External feedback Z signal

H0F.26 BiSS-C/SSI/EDNAT2.2 fully closed-loop encoder absolute feedback offset

Address:	200F-1Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
When the full closed-loop encoder is in absolute linear mode, the absolute feedback offset is updated after homing is completed. It is only necessary to write this value manually when you replace the drive.

H0F.28 Index value of BiSS-C/SSI communication alarm

Address:	200F-1Dh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Set the index value of BiSS-C/SSI communication alarm.

H0F.29 CRC of BiSS-C/SSI fully closed-loop encoder feedback

Address:	200F-1Eh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
0: Positive
1: Negative
Description
Set the CRC of BiSS-C/SSI fully closed-loop encoder feedback.
0: Positive
1: Negative

H0F.30 BiSS-C/SSI/EDNAT2.2 valid bits of encoder communication position feedback in full closed-loop mode

Address:	200F-1Fh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	127	Data Type:	UInt16

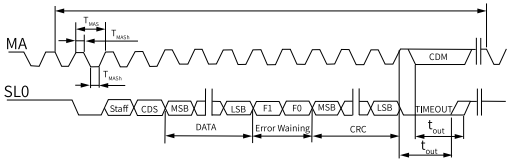
Default: 29 Change: At stop

Value Range:

0~127

Description

Set the BiSS-C/SSI/EDNAT2.2 valid bits of encoder communication position feedback in full closed-loop mode.



- DATA: position data CRC:6-bit CRC code
- 100ns≤T_{MAS}≤2t_{out} 25ns≤T_{MASh}≤t_{out} 25ns≤T_{MASh}≤t_{out}
- t_{out}=1.5MA clock period
- MA : master clock output; SL0: slave data output transmission speed up to 10 Mbps.
- CDM: register communication master transmit bit; CDS: register communication slave return bit
- Error Warning: error and warning bits index (F1 low level indicates an error, F0 low level indicates an alarm)
- Scale input and output complies with RS-422A The differencital line drive and line receiver are required.
- CRC generator polynomial: X6+X1+1, initial value 0, range "DATA", "Error Warning".

In the figure, $\overline{MA}$ $\overline{SL0}$ are not shown.

H0F.30 is the valid bits of position feedback. For details, see the user manual of any third-party BiSS-C encoder.

H0F.31 Valid bit of BiSS-C/SSI encoder communication alarm index in full closedloop mode

Address: 200F-20h
Min.: 0
Max.: 31
Default: 2

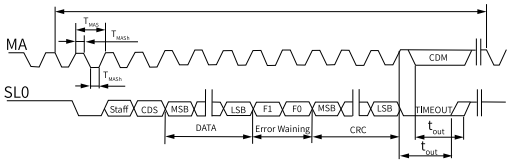
Effective mode: Upon next power-on
Unit: -
Data Type: UInt16
Change: At stop

Value Range:

0–1

Description

Set the valid bit of BiSS-C/SSI encoder communication alarm index in full closed-loop mode.



- DATA: position data CRC:6-bit CRC code
- 100ns≤T_{MAS}≤2t_{out} 25ns≤T_{MASh}≤t_{out} 25ns≤T_{MASh}≤t_{out}
- t_{out}=1.5MA clock period
- MA : master clock output; SL0: slave data output transmission speed up to 10 Mbps.
- CDM: register communication master transmit bit; CDS: register communication slave return bit
- Error Warning: error and warning bits index (F1 low level indicates an error, F0 low level indicates an alarm)
- Scale input and output complies with RS-422A The differencital line drive and line receiver are required.
- CRC generator polynomial: X6+X1+1, initial value 0, range "DATA", "Error Warning".

In the figure, $\overline{MA}$ $\overline{SL0}$ are not shown.

H0F.31: Error alarm set bit, error and alarm bit index. Its value is the difference between DATA and CRC.

H0F.32 BiSS-C/SSI/ENDAT encoder communication frequency in fully closed-loop mode

Address:	200F-21h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	kHz
Max.:	10000	Data Type:	UInt16
Default:	2000	Change:	Real-time

Value Range:

0 kHz–10000 kHz

Description

Set the BiSS-C/SSI/ENDAT encoder communication frequency in fully closed-loop mode.

H0F.33 SSI/ENDAT encoder recovery time in fully closed-loop mode

Address:	200F-22h	Effective mode:	Upon the next power-on
Min.:	0.000	Unit:	μs
Max.:	40.000	Data Type:	UInt16
Default:	0.500	Change:	Real-time

Value Range:

0.000μs to 40.000μs

Description

Set the SSI/ENDAT encoder recovery time in fully closed-loop mode.

H0F.35 BiSS-C error detection enable in fully closed-loop mode

Address:	200F-24h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Detection on error bits of BiSS-C protocol by FPGA software.

0: Disabled

1: Enabled

H0F.36 BiSS-C error bit polarity in fully closed-loop mode

Address:	200F-25h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-

Value Range:
0: Positive
1: Negative

Description
BiSS-C error bit polarity
0: Positive
1: Negative

H0F.40 Fully closed-loop communication encoder fault info

Address:	200F-29h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535

Description
Display fault information of the fully closed-loop communication encoder.

Table 23–1 Inovance encoder

bit	Name
0	Full closed-loop serial encoder communication timeout (RX side[1])
1	Full closed-loop serial encoder frame stop bit error (RX side)
2	Full closed-loop serial encoder CRC error (RX side)[2]
3	Full closed-loop serial encoder data field error (RX side)
4	Full closed-loop serial encoder position count error (TX side[1])
5	Full closed-loop serial encoder frame overspeed (TX side)
6	Full closed-loop serial encoder over-temperature (TX side)
7	Full closed-loop serial encoder single-turn count error (TX side)
8	Full closed-loop serial encoder multi-turn count error (TX side)
9	Full closed-loop serial encoder battery alarm (TX side)
10	Full closed-loop serial encoder battery failure (TX side)
11–12	Undefined
13[3]	Full closed-loop serial encoder count increment error (algorithm[1])
14–15	Undefined
16–23	Full closed-loop serial encoder expansion data 1
24–31	Full closed-loop serial encoder expansion data 2

Table 23–2 EnDat encoder

bit	Name
0	EnDat encoder communication timeout (RX side)
1	EnDat level 1 fault (RX side)
2	EnDat encoder CRC error (RX side)[2]
3	EnDat level 2 fault (RX side)
4	EnDat fault information 1 (TX side)
5	EnDat fault information 2 (TX side)
6–8	Undefined
9	EnDat additional data 1 CRC error
10	EnDat additional data 2 CRC error
11–12	Undefined
13[3]	Full closed-loop serial encoder count increment error (algorithm)
14	EnDat level 3 fault (RX side)
15	EnDat level 3 fault (RX side)
16–23	Full closed-loop serial encoder expansion data 1
24–31	Full closed-loop serial encoder expansion data 2

Table 23–3 BiSS-C and SSI encoders

bit	Name
0	Full closed-loop serial encoder communication timeout (RX side)
1	Undefined
2	Full closed-loop serial encoder CRC error (RX side)[2]
3–10	Undefined
7	Full closed-loop serial encoder single-turn count error (TX side)
11–12	Undefined
13[3]	Full closed-loop serial encoder count increment error (algorithm)
14–15	Undefined
16 to 23[4]	Full closed-loop serial encoder expansion data 1
24 to 31[4]	Full closed-loop serial encoder expansion data 2

Note

[1]: In the above table, the RX side refers to the drive and the TX side refers to the motor encoder. The algorithm refers to the type of the indirect error caused by a direct error on the RX or TX side.

[2]: When a BiSS-C encoder is used: 1-CRC error; 0-CRC is normal. When an SSI encoder is used: 1-Parity error; 0-Parity is normal.

[3]: When H0A.50 or more data transmission errors occur continuously, bit13 will be set to 1 and the drive must be stopped. For other error types, you can stop the drive as needed.

[4]: Full closed-loop serial encoder extended data 1/2 (when a BiSS-C encoder is used): This part is the status word of BiSS-C and SSI encoders.

H0F.41 Inovance fully closed-loop encoder version

Address:	200F-2Ah	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0–6553.5

Description

Display the version number of the Inovance fully closed-loop encoder.

H0F.42 Inovance fully closed-loop encoder resolution

Address:	200F-2Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0–4294967295

Description

Display the resolution of the Inovance fully closed-loop encoder.

H0F.45 Positioning completed/Position deviation threshold in fully closed-loop mode

Address:	200F-2Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16

Default:	0	Change:	At stop

Value Range:

0: Threshold scaled to outer loop unit

1: Same threshold used for inner and outer loops

Description

0: Fully closed-loop positioning completed threshold 6067/Excessive position deviation threshold 6065 (scaled to outer loop unit)

1: Same threshold used for inner and outer loops

H0F.51 SSI encoder check bit selection in fully closed-loop mode

Address:	200F-34h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: No check

1: Check applied

Description

Select the SSI encoder check bit in full closed-loop mode.

0: No check

1: Check applied

H0F.52 SSI encoder code system in full closed-loop mode

Address:	200F-35h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Binary

1: Gray code

Description

Select the SSI encoder code system in full closed-loop mode.

0: Binary

1: Gray code

H0F.53 SSI encoder state word code system in fully closed-loop mode

Address:	200F-36h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type	UInt16
Default:	1	Change:	At stop

Value Range:
0: Binary
1: Gray code
Description
Select the SSI encoder status word code system in full closed-loop mode.
0: Binary
1: Gray code

H0F.54 **SSI encoder parity check in fully closed-loop mode**

Address:	200F-37h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Disabled
1: Enabled
Description
Enable/disable the SSI encoder parity check in fully closed-loop mode.
0: Disabled
1: Enabled

H0F.55 **Fully closed-loop encoder communication timeout error count**

Address:	200F-38h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Fully closed-loop encoder communication timeout error count

H0F.56 **Encoder CRC error count in fully closed-loop mode**

Address:	200F-39h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Encoder CRC error count in fully closed-loop mode

H0F.57 **Fully closed-loop encoder communication frame stop bit error count.**

Address:	200F-3Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Fully closed-loop encoder communication frame stop bit error count.

23.17H11 Multi-position

H11.00 **Multi-position running mode**

Address:	2011-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	5	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Single run (number of displacements selected in H11.01)

1: Cyclic operation (number of displacement selected in H11.01)

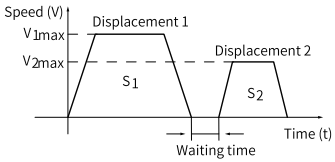
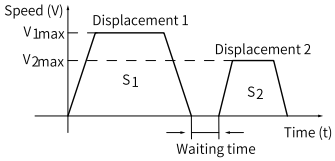
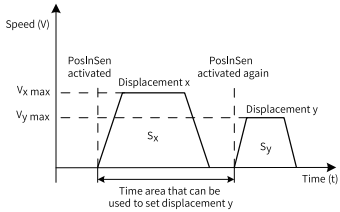
2: DI-based operation (selected by DI)

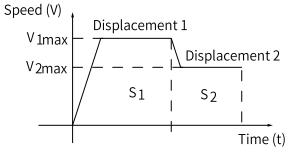
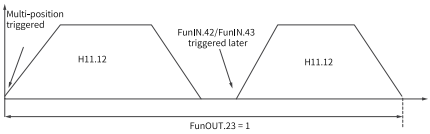
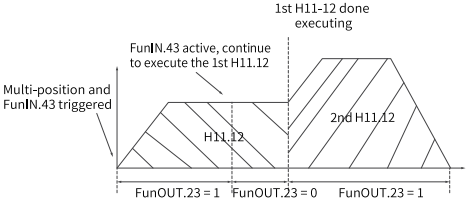
3: Sequential operation

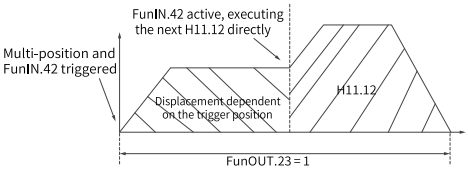
5: Axis-controlled continuous operation

Description

Defines the multi-position operation mode when the main position reference source is multi-position references (H05.00 = 2) in the position control mode.

Value	Operation Mode	Remarks	Operation Curve
0	Individual operation	The drive stops after one cycle of operation. The drive automatically switches to the next speed. You can set the interval time between displacements. The multi-position reference is level-triggered.	 V 1max , V 2max : maximum operating speeds in displacement 1 and displacement 2 S 1 , S 2 : displacement 1 and displacement 2
1	Cyclic operation	The starting displacement after the first cycle is displacement 1. The drive automatically switches to the next speed. You can set the interval time between displacements. The multi-position reference is level-triggered.	 V 1max , V 2max : maximum operating speeds in displacement 1 and displacement 2 S 1 , S 2 : displacement 1 and displacement 2
2	DI-based operation	The drive continues operating when the displacement No. is updated. The speed No. is determined by the DI logic. The interval time between displacements is determined by the command delay of the host controller. The multi-position reference is edge-triggered.	 V xmax , V ymax : maximum operating speeds in displacement x and displacement y S x , S y : displacement x and displacement y

Value	Operation Mode	Remarks	Operation Curve
3	Sequential operation	The drive stops after one cycle of operation. (H11.05 = 0 or H11.05 > H11.01). When H11.05 is greater than H11.01, the software will set H11.05 to 0. The starting displacement after the first cycle is defined by H11.05. The drive automatically switches to the next speed. There is no interval time between displacements. The multi-position reference is level-triggered.	 V_{1max} , V_{2max} : maximum operating speeds in displacement 1 and displacement 2 S_1 , S_2 : displacement 1 and displacement 2
5	Axis-controlled continuous operation	The drives executes one displacement only. The individual operation mode, sequential operation mode, and interrupted operation mode are included. The PosInSen (multi-position reference enable) signal is level-triggered.	• Individual operation  The PosInSen (multi-position reference enable) signal is triggered only once (FunIN.43/42 triggered later). The drive stops after executing the distance defined by H11.12. • Sequential operation  The PosInSen (multi-position reference enable) signal is triggered only once. Write H11.12 again and activate FunIN.43 when the distance defined by the first H11.12 is still in progress.After receiving the new distance (or speed), which is the second H11.12, the drive continues executing the first H11.12 until the distance defined by the first H11.12 is done. Then it starts to execute the second H11.12 directly. The travel distance therefore is the sum of the first H11.12 and the second H11.12. • Interrupted operation

Value	Operation Mode	Remarks	Operation Curve
			 The PosInSen (Multi-position reference enable) signal is triggered only once. Write H11.12 (such as 1000000) again and activate FunIN.42 when the first H11.12 (such as 9000000) is still in progress. After receiving the new distance (or speed), which is the second H11.12, the drive stops executing the first H11.12 and turns to executing the second H11.12.

To use the multi-position function, assign FunIN.28 (PosInSen, multi-position reference enable) to a DI first. See "Group H03: Terminal input parameters" for the setting mode.

The positioning completed (COIN) signal is activated each time upon completion of a displacement. To determine whether a certain displacement is done executing, use FunOUT.5 (COIN, positioning completed). See "Group H04: Terminal output parameters" for details.

Ensure the S-ON signal is active during operation of each displacement. Otherwise, the drive stops immediately as defined by H02.05 (Stop mode at S-ON OFF) and the positioning completed (COIN) signal in inactive. In modes other than DI-based operation, if the S-ON signal is active but multi-position is disabled during operation of a certain displacement, the drive abandons the unsent displacement reference and stops, with the positioning completed (COIN) signal being active. If the multi-position function is enabled again, the displacement to be executed is defined by H11.02.

H11.01 Number of displacement references in multi-position mode

Address:	2011-02h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	16	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

1–16

Description

Defines the total number of displacement references in the multi-position mode. You can set different displacements, operating speeds, and acceleration/deceleration time for each displacement.

H11.00 ≠ 2: Displacements are switched automatically in a sequence from 1, 2... H11.01.
H11.00 is 2: Assign four DIs (Hardware DI or VDI) with DI functions 6 to 9 (FunIN.6: CMD1 to FunIN.9: CMD4) and control the DI logic through the host controller to switch between different speeds. The segment No. is a 4-bit binary value. Bits 0 to 3 correspond to CMD1 to CMD4.
The displacement No. is a 4-bit binary value. The relationship between the displacement numbers and CMD1...CMD4 is shown in the following table.

FunIN.9	FunIN.8	FunIN.7	FunIN.6	Segment No.
CMD4	CMD3	CMD2	CMD1	
0	0	0	0	1
0	0	0	1	2
...				
1	1	1	1	16

H11.02 **Starting displacement No. after pause**

Address:	2011-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Continue to execute the unexecuted displacements

1: Start from displacement 1

Description

Defines the starting displacement No. when the multi-position operation recovers from a pause.

Pause:

1. The servo drive switches to another control mode or the interrupt positioning function is enabled during multi-position operation.
2. The internal multi-position enable signal (FunIN.28:PosInSen) changes from "active" to "inactive".

0: Continue to execute the unexecuted displacements: For example, if H11.01 is set to 16 and the drive pauses at displacement 2, after the drive recovers from the pause, it will start from displacement 3.

1: Start from displacement 1: For example, if H11.01 is set to 16 and the drive pauses at displacement 2, after the drive recovers from the pause, it will start from displacement 1.

H11.03 **Interval time unit**

Address:	2011-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: ms 1: s

Description

Defines the unit of acceleration/deceleration time and the interval time during multi-position operation. Acceleration/Deceleration time: Indicates the time taken for the motor to change from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed. Interval time: interval time that starts from the end of the last reference to the beginning of the next reference

H11.04 Displacement reference type

Address:	2011-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Relative displacement reference

1: Absolute displacement reference

Description

Relative displacement: position increment of the target position relative to the current motor position

Absolute displacement: position increment of the target position relative to the motor home.

H11.05 Starting displacement No. in sequential operation

Address:	2011-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	16	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–16

Description

Defines whether to perform cyclic operation and the starting displacement No. after the first cycle of operation in the sequential operation mode (H11.00 = 3).

0: The drive executes the displacements defined by H11.01 only once and then stops. The motor is in the locked state.

1 to 16: The drive operates cyclically, with the starting displacement No. defined by H11.05 after the first cycle of operation. The value of H11.05 should be lower than or equal to H11.01.

H11.09 Deceleration upon axis control OFF

Address:	2011-0Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	65535	Change:	Real-time

Value Range:

0 ms–65535 ms

Description
Set deceleration upon axis control OFF.

H11.10 Starting speed of displacement 1

Address:	2011-0Bh	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	6000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0[mm/s]/[rpm]–6000[mm/s]/[rpm]
Description
Set starting speed of displacement 1.

H11.11 Stop speed of displacement 1

Address:	2011-0Ch	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	6000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0[mm/s]/[rpm]–6000[mm/s]/[rpm]
Description
Set stop speed of displacement 1.

H11.12 Displacement 1

Address:	2011-0Dh	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:
-1073741824 to 1073741824
Description
Defines displacement 1 (reference unit) in multi-position operation.

H11.14 Max. speed of displacement 1

Address:	2011-0Fh	Effective mode:	Real time
Min.:	1		
Max.:	10000	Unit:	[mm/s]/[rpm]
		Data Type:	UInt16

Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the maximum speed of displacement 1 in multi-position operation. The maximum speed is the average operating speed when the motor is not in the acceleration/deceleration process. If H11.12 is set to a too low value, the actual motor speed will be lower than H11.14.

H11.15 Acc/Dec time of displacement 1

Address:	2011-10h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Defines the time for the motor to change from 0 [mm/s]/[rpm] to 1000 rpm[mm/s]/[rpm] at a constant speed during displacement 1.

Actual time needed for accelerating to H11.14 (Max. speed of displacement 1):

$$t = \frac{(H11.14) \times (H11.15)}{1000}$$

Note: The rigidity must be good, and the speed loop can follow the position command.

H11.16 Interval time after displacement 1

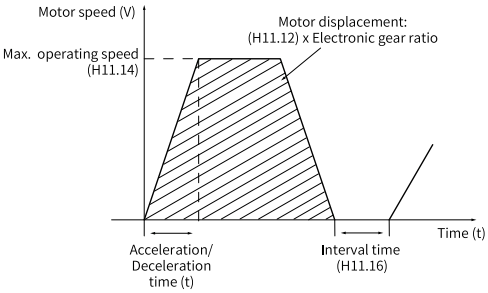
Address:	2011-11h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

Defines the interval time that starts from the end of displacement 1 to the beginning of the next displacement.



H11.17 Displacement 2

Address:	2011-12h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.19 Max. speed of displacement 2

Address:	2011-14h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.20 Acc/Dec time of displacement 2

Address:	2011-15h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.21 Interval time after displacement 2

Address:	2011-16h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.22 Displacement 3

Address:	2011-17h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.24 Max. speed of displacement 3

Address:	2011-19h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.25 Acc/Dec time of displacement 3

Address:	2011-1Ah	Effective mode:	Real time
Min.:	0		
Max.:	65535	Unit:	ms
		Data Type:	UInt16

Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.26 Interval time after displacement 3

Address:	2011-1Bh	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.27 Displacement 4

Address:	2011-1Ch	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.29 Max. speed of displacement 4

Address:	2011-1Eh	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.30 Acc/Dec time of displacement 4

Address:	2011-1Fh	Effective mode:	Real time
Min.:	0	Unit:	ms

Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.31 Interval time after displacement 4

Address:	2011-20h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.32 Displacement 5

Address:	2011-21h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.34 Max. speed of displacement 5

Address:	2011-23h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.35 Acc/Dec time of displacement 5

Address:	2011-24h	Effective mode:	Real time

Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.35 Acc/Dec time of displacement 5

Address:	2011-24h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.37 Displacement 6

Address:	2011-26h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.39 Max. speed of displacement 6

Address:	2011-28h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.40 Acc/Dec time of displacement 6

Address:	2011-29h	Effective mode:	Real time

Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.41 Interval time after displacement 6

Address:	2011-2Ah	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.42 Displacement 7

Address:	2011-2Bh	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.44 Max. speed of displacement 7

Address:	2011-2Dh	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.45 Acc/Dec time of displacement 7

Address:	2011-2Eh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.46 Interval time after displacement 7

Address:	2011-2Fh	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.47 Displacement 8

Address:	2011-30h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.49 Max. speed of displacement 8

Address:	2011-32h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.50 Acc/Dec time of displacement 8

Address:	2011-33h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See acc/dec time of displacement 1.

H11.51 Interval time after displacement 8

Address:	2011-34h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms(s) to 10000 ms(s)
Description
See interval time after displacement 1.

H11.52 Displacement 9

Address:	2011-35h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:
-1073741824 to 1073741824
Description
See displacement 1.

H11.54 Max. speed of displacement 9

Address:	2011-37h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:
1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description
See max. speed of displacement 1.

H11.55 Acc/Dec time of displacement 9

Address:	2011-38h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See acc/dec time of displacement 1.

H11.56 Interval time after displacement 9

Address:	2011-39h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms(s) to 10000 ms(s)
Description
See interval time after displacement 1.

H11.57 Displacement 10

Address:	2011-3Ah	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:
-1073741824 to 1073741824
Description
See displacement 1.

H11.59 Max. speed of displacement 10

Address:	2011-3Ch	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.60 Acc/Dec time of displacement 10

Address:	2011-3Dh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.61 Interval time after displacement 10

Address:	2011-3Eh	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.62 Displacement 11

Address:	2011-3Fh	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.64 Max. speed of displacement 11

Address:	2011-41h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description
See max. speed of displacement 1.

H11.65 Acc/Dec time of displacement 11

Address:	2011-42h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See acc/dec time of displacement 1.

H11.66 Interval time after displacement 11

Address:	2011-43h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms(s) to 10000 ms(s)
Description
See interval time after displacement 1.

H11.67 Displacement 12

Address:	2011-44h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:
-1073741824 to 1073741824
Description
See displacement 1.

H11.69 Max. speed of displacement 12

Address:	2011-46h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:
1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description
See max. speed of displacement 1.

H11.70 Acc/Dec time of displacement 12

Address:	2011-47h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See acc/dec time of displacement 1.

H11.71 Interval time after displacement 12

Address:	2011-48h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms(s) to 10000 ms(s)
Description
See interval time after displacement 1.

H11.72 Displacement 13

Address:	2011-49h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:
-1073741824 to 1073741824
Description
See displacement 1.

H11.74 Max. speed of displacement 13

Address:	2011-4Bh	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16

Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.75 Acc/Dec time of displacement 13

Address:	2011-4Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.76 Interval time after displacement 13

Address:	2011-4Dh	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.77 Displacement 14

Address:	2011-4Eh	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.79 Max. speed of displacement 14

Address:	2011-50h	Effective mode:	Real time

Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.80 Acc/Dec time of displacement 14

Address:	2011-51h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.81 Interval time after displacement 14

Address:	2011-52h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.82 Displacement 15

Address:	2011-53h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.84 Max. speed of displacement 15

Address:	2011-55h	Effective mode:	Real time

Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.85 Acc/Dec time of displacement 15

Address:	2011-56h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.86 Interval time after displacement 15

Address:	2011-57h	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

H11.87 Displacement 16

Address:	2011-58h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Reference unit
Max.:	1073741824	Data Type:	Int32
Default:	10000	Change:	Real-time

Value Range:

-1073741824 to 1073741824

Description

See displacement 1.

H11.89 **Max. speed of displacement 16**

Address:	2011-5Ah	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See max. speed of displacement 1.

H11.90 **Acc/Dec time of displacement 16**

Address:	2011-5Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See acc/dec time of displacement 1.

H11.91 **Interval time after displacement 16**

Address:	2011-5Ch	Effective mode:	Real time
Min.:	0	Unit:	ms (s)
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms(s) to 10000 ms(s)

Description

See interval time after displacement 1.

23.18H12 Multi-Speed

H12.00 **Multi-speed operation mode**

Address:	2012-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Individual operation (number of speeds selected in H12.01)
1: Cyclic operation (number of speeds selected in H12.01)
2: DI-based operation

Description

Defines the multi-speed operation mode when the speed reference source is multi-speed reference (H06.01 = 5, H06.02 = 1/2/3) in the speed control mode.
0: Stop after one run, and the segment No. is auto incremented and switched
1: Cyclic. The starting segment number of each run is 1, and the segment number is auto incremented and switched. If the servo drive is enabled, the cyclic operation state is maintained all the time.
2. The drive can run continuously when it is enabled. The segment number is determined by DI terminal logic. The running time of each speed reference is only determined by the interval time of segment number switching. FunIN.5 (DlR-SEL) can be used to switch the direction of the speed reference.
The S-ON signal must be active during running of each speed reference; otherwise, the servo drive will stop immediately as defined by H02.05 (Stop mode at S-ON off).
Speed arrival (FunOUT.19: V-Arr) signal is valid when a certain speed reference reaches the set value.

H12.01 Number of speed references in multi-speed mode

Address:	2012-02h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	16	Data Type:	UInt16
Default:	16	Change:	At stop

Value Range:

1–16

Description

Defines the total number of speed references in the multi-speed mode. Different speed references, operating time, and acceleration/deceleration time (four groups optional) can be set for each speed.
H12.00 ≠ 2: Speeds are switched automatically in a sequence from 1, 2... H12.01.
H12.00 is 2: Assign four DIs (Hardware DI or VDI) with DI functions 6 to 9 (FunIN.6: CMD1 to FunIN.9: CMD4) and control the DI logic through the host controller to switch between different speeds. The segment No. is a 4-bit binary value. Bits 0 to 3 correspond to CMD1 to CMD4.

H12.02 Operating time unit

Address:	2012-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: s
1: min
Description
Defines the time unit of multi-speed operation.
0: s
1: min

H12.03 **Acceleration time 1**

Address:	2012-04h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Four groups of acceleration/deceleration time can be set for each speed reference.
Acceleration time: time for the motor to accelerate from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed.

H12.04 **Deceleration time 1**

Address:	2012-05h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Four groups of acceleration/deceleration time can be set for each speed reference.
Deceleration time: time for the motor to decelerate from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm] at a constant speed.

H12.05 **Acceleration time 2**

Address:	2012-06h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Four groups of acceleration/deceleration time can be set for each speed reference.

Acceleration time: time for the motor to accelerate from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed.

H12.06 Deceleration time 2

Address:	2012-07h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Four groups of acceleration/deceleration time can be set for each speed reference.

Deceleration time: time for the motor to decelerate from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm] at a constant speed.

H12.07 Acceleration time 3

Address:	2012-08h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Four groups of acceleration/deceleration time can be set for each speed reference.

Acceleration time: time for the motor to accelerate from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed.

H12.08 Deceleration time 3

Address:	2012-09h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Four groups of acceleration/deceleration time can be set for each speed reference.

Deceleration time: time for the motor to decelerate from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm] at a constant speed.

H12.09 **Acceleration time 4**

Address:	2012-0Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	150	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Four groups of acceleration/deceleration time can be set for each speed reference.

Acceleration time: time for the motor to accelerate from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed.

H12.10 **Deceleration time 4**

Address:	2012-0Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	150	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Four groups of acceleration/deceleration time can be set for each speed reference.

Deceleration time: time for the motor to decelerate from 1000 [mm/s]/[rpm] to 0 [mm/s]/[rpm] at a constant speed.

H12.20 **1st speed reference**

Address:	2012-15h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Set the first speed reference.

H12.21 **Operating time of speed 1**

Address:	2012-16h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

Defines the operating time of speed 1.

The operating time is the sum of the speed variation time from previous speed reference to present speed reference plus the average operating time of present speed reference.

If the operating time is set to 0, the drive skips this speed reference automatically.

As long as H12.00 (Multi-speed operation mode) is set to 2 (DI-based operation) and the speed No. determined by the external DI does not change, the drive continues operating at the speed defined by this speed reference, without being affected by the reference operating time.

H12.22 1st speed rise/drop and curve smoothing parameter time

Address:	2012-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time

0: Zero acc and dec time

1: Acc and dec time 1

2: Acc and dec time 2

3: Acc and dec time 3

4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1

2: Smoothing parameter 2

3: Smoothing parameter 3

4: Smoothing parameter 4

5: Smoothing parameter 5

6: Smoothing parameter 6

7: Smoothing parameter 7

8: Smoothing parameter 8

Description

Bit0–bit7: Acc./dec. time of speed 6

Defines the acceleration/deceleration time of speed 1.

0: Zero acc./dec. time Acceleration time: 0

Deceleration time: 0

1: Acc./dec. Time 1 Acceleration time: H12.03

Deceleration time: H12.04

2: Acc./dec. Time 2 Acceleration time: H12.05

Deceleration time: H12.06
3: Acc./dec. Time 3 Acceleration time: H12.07
Deceleration time: H12.08
4: Acc./dec. Time 4 Acceleration time: H12.09
Deceleration time: H12.10
Bit8–bit15: S curve smoothing parameter
1. Smoothing parameter 1 increasing acceleration time of acceleration segment: H06.51
Decreasing acceleration time of acceleration segment: H06.52
Decreasing deceleration time of deceleration segment: H06.53
Decreasing acceleration time of acceleration segment: H06.54
2. Smoothing parameter 2 increasing acceleration time of acceleration segment: H06.55
Decreasing acceleration time of acceleration segment: H06.56
Decreasing deceleration time of deceleration segment: H06.57
Decreasing acceleration time of acceleration segment: H06.58
3. Smoothing parameter 3 increasing acceleration time of acceleration segment: H06.59
Decreasing acceleration time of acceleration segment: H06.60
Decreasing deceleration time of deceleration segment: H06.61
Decreasing acceleration time of acceleration segment: H06.62
4. Smoothing parameter 4 increasing acceleration time of acceleration segment: H06.63
Decreasing acceleration time of acceleration segment: H06.64
Decreasing deceleration time of deceleration segment: H06.65
Decreasing acceleration time of acceleration segment: H06.66
5. Smoothing parameter 5 increasing acceleration time of acceleration segment: H06.67
Decreasing acceleration time of acceleration segment: H06.68
Decreasing deceleration time of deceleration segment: H06.69
Decreasing acceleration time of acceleration segment: H06.70
6. Smoothing parameter 6 increasing acceleration time of acceleration segment: H06.71
Decreasing acceleration time of acceleration segment: H06.72
Decreasing deceleration time of deceleration segment: H06.73
Decreasing acceleration time of acceleration segment: H06.74
7. Smoothing parameter 7 increasing acceleration time of acceleration segment: H06.75
Decreasing acceleration time of acceleration segment: H06.76
Decreasing deceleration time of deceleration segment: H06.77
Decreasing acceleration time of acceleration segment: H06.78
8. Smoothing parameter 8 increasing acceleration time of acceleration segment: H06.79
Decreasing acceleration time of acceleration segment: H06.80
Decreasing deceleration time of deceleration segment: H06.81
Decreasing acceleration time of acceleration segment: H06.82

H12.23 Reference 2

Address:	2012-18h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16

Default:	100	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.24 Operating time of speed 2

Address:	2012-19h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.25 2nd speed rise/drop time and curve smoothing parameter time

Address:	2012-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time

0: Zero acc and dec time

1: Acc and dec time 1

2: Acc and dec time 2

3: Acc and dec time 3

4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1

2: Smoothing parameter 2

3: Smoothing parameter 3

4: Smoothing parameter 4

5: Smoothing parameter 5

6: Smoothing parameter 6

7: Smoothing parameter 7

8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.26 **Reference 3**

Address:	2012-1Bh	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	300	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.27 **Operating time of speed 3**

Address:	2012-1Ch	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.28 **3nd speed rise/drop time and curve smoothing parameter time**

Address:	2012-1Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time

0: Zero acc and dec time

1: Acc and dec time 1

2: Acc and dec time 2

3: Acc and dec time 3

4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1

2: Smoothing parameter 2

3: Smoothing parameter 3

4: Smoothing parameter 4

5: Smoothing parameter 5

6: Smoothing parameter 6

7: Smoothing parameter 7

8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.29 Reference 4

Address:	2012-1Eh	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	500	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.30 Operating time of speed 4

Address:	2012-1Fh	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.31 4th speed rise/drop time and curve smoothing parameter time

Address:	2012-20h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5

6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.32 **Reference 5**

Address:	2012-21h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	700	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.33 **Operating time of speed 5**

Address:	2012-22h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.34 **5th speed rise/drop time and curve smoothing parameter time**

Address:	2012-23h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2

4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.35 Reference 6

Address:	2012-24h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	900	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.36 Operating time of speed 6

Address:	2012-25h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.37 6th speed rise/drop time and curve smoothing parameter time

Address:	2012-26h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2

3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.38 Reference 7

Address:	2012-27h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	600	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.39 Operating time of speed 7

Address:	2012-28h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.40 7th speed rise/drop time and curve smoothing parameter time

Address:	2012-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time

0: Zero acc and dec time

1: Acc and dec time 1

2: Acc and dec time 2

3: Acc and dec time 3

4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1

2: Smoothing parameter 2

3: Smoothing parameter 3

4: Smoothing parameter 4

5: Smoothing parameter 5

6: Smoothing parameter 6

7: Smoothing parameter 7

8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.41 **Reference 8**

Address:	2012-2Ah	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	300	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.42 **Operating time of speed 8**

Address:	2012-2Bh	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.43 **8th speed rise/drop time and curve smoothing parameter time**

Address:	2012-2Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time

0: Zero acc and dec time

1: Acc and dec time 1

2: Acc and dec time 2

3: Acc and dec time 3

4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1

2: Smoothing parameter 2

3: Smoothing parameter 3

4: Smoothing parameter 4

5: Smoothing parameter 5

6: Smoothing parameter 6

7: Smoothing parameter 7

8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.44 **Reference 9**

Address:	2012-2Dh	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	100	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.45 **Operating time of speed 9**

Address:	2012-2Eh	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.46 9th speed rise/drop time and curve smoothing parameter time

Address:	2012-2Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time

0: Zero acc and dec time

1: Acc and dec time 1

2: Acc and dec time 2

3: Acc and dec time 3

4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1

2: Smoothing parameter 2

3: Smoothing parameter 3

4: Smoothing parameter 4

5: Smoothing parameter 5

6: Smoothing parameter 6

7: Smoothing parameter 7

8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.47 Reference 10

Address:	2012-30h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-100	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.48 **Operating time of speed 10**

Address:	2012-31h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.49 **10th speed rise/drop time and curve smoothing parameter time**

Address:	2012-32h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time

0: Zero acc and dec time

1: Acc and dec time 1

2: Acc and dec time 2

3: Acc and dec time 3

4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1

2: Smoothing parameter 2

3: Smoothing parameter 3

4: Smoothing parameter 4

5: Smoothing parameter 5

6: Smoothing parameter 6

7: Smoothing parameter 7

8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.50 **Reference 11**

Address:	2012-33h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-300	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.51 Operating time of speed 11

Address:	2012-34h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.52 11th speed rise/drop time and curve smoothing parameter time

Address:	2012-35h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.53 Reference 12

Address:	2012-36h	Effective mode:	Real time

Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-500	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.54 Operating time of speed 12

Address:	2012-37h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.55 12th speed rise/drop time and curve smoothing parameter time

Address:	2012-38h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time

0: Zero acc and dec time

1: Acc and dec time 1

2: Acc and dec time 2

3: Acc and dec time 3

4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1

2: Smoothing parameter 2

3: Smoothing parameter 3

4: Smoothing parameter 4

5: Smoothing parameter 5

6: Smoothing parameter 6

7: Smoothing parameter 7

8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.56 Reference 13

Address:	2012-39h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-700	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.57 Operating time of speed 13

Address:	2012-3Ah	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.58 13th speed rise/drop time and curve smoothing parameter time

Address:	2012-3Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time

0: Zero acc and dec time

1: Acc and dec time 1

2: Acc and dec time 2

3: Acc and dec time 3

4: Acc and dec time 4

bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1

2: Smoothing parameter 2

3: Smoothing parameter 3

4: Smoothing parameter 4

5: Smoothing parameter 5

6: Smoothing parameter 6

7: Smoothing parameter 7

8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.59 **Reference 14**

Address:	2012-3Ch	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-900	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.60 **Operating time of speed 14**

Address:	2012-3Dh	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.61 **14th speed rise/drop time and curve smoothing parameter time**

Address:	2012-3Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6

7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.62 **Reference 15**

Address:	2012-3Fh	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-600	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.63 **Operating time of speed 15**

Address:	2012-40h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.64 **15th speed rise/drop time and curve smoothing parameter time**

Address:	2012-41h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter
1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4

5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

H12.65 **Reference 16**

Address:	2012-42h	Effective mode:	Real time
Min.:	-10000	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	Int16
Default:	-300	Change:	Real-time

Value Range:

-10000[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

See reference 1.

H12.66 **Operating time of speed 16**

Address:	2012-43h	Effective mode:	Real time
Min.:	0.0	Unit:	s (m)
Max.:	6553.5	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0s(m) to 6553.5s(m)

Description

See operating time of speed 1.

H12.67 **16th speed rise/drop time and curve smoothing parameter time**

Address:	2012-44h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	256	Change:	Real-time

Value Range:

bit0-bit7: Speed rise and drop time
0: Zero acc and dec time
1: Acc and dec time 1
2: Acc and dec time 2
3: Acc and dec time 3
4: Acc and dec time 4
bit8-bit15: S curve smoothing parameter

1: Smoothing parameter 1
2: Smoothing parameter 2
3: Smoothing parameter 3
4: Smoothing parameter 4
5: Smoothing parameter 5
6: Smoothing parameter 6
7: Smoothing parameter 7
8: Smoothing parameter 8

Description

See acc./dec. time of speed 1.

23.19H13 Application Safety Parameters

H13.00 Auto-tuned scheme 2 runaway distance threshold

Address:	2013-01h	Effective mode:	-
Min.:	0.00	Unit:	[mm]/[Rev]
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:

0.00[mm]/[Rev]–655.35[mm]/[Rev]

Description

-

H13.01 Scheme 2 runaway distance threshold

Address:	2013-02h	Effective mode:	Real time
Min.:	0.00	Unit:	[mm]/[Rev]
Max.:	15.00	Data Type:	UInt16
Default:	0.50	Change:	At stop

Value Range:

0.00[mm]/[Rev]–15.00[mm]/[Rev]

Description

-

H13.02 Scheme 2 runaway current threshold

Address:	2013-03h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	50.0	Change:	At stop

Value Range:

0.0% to 400.0%

Description

-

H13.03 **Runaway speed threshold in scheme 2 speed or position mode**

Address:	2013-04h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	6000	Data Type:	UInt16
Default:	50	Change:	At stop

Value Range:

1[mm/s]/[rpm]–6000[mm/s]/[rpm]

Description

-

H13.04 **Runaway speed threshold in scheme 2 torque mode**

Address:	2013-05h	Effective mode:	Real time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	6000	Data Type:	UInt16
Default:	500	Change:	At stop

Value Range:

1[mm/s]/[rpm]–6000[mm/s]/[rpm]

Description

-

H13.05 **Scheme 2 runaway inspection window time**

Address:	2013-06h	Effective mode:	Real time
Min.:	10	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	30	Change:	At stop

Value Range:

10 ms–100 ms

Description

-

23.20H14 Gantry Synchronization

H14.00 **Gantry communication state**

Address:	2014-01h	Effective mode:	-
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–1

Description

Used to judge whether both axes have established communication after the gantry function is enabled.

H14.01 Gantry alignment state

Address:	2014-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–1

Description

After the gantry alignment is completed, the gantry alignment state will be set to 1 to determine whether the gantry alignment is completed.

H14.02 Gantry function selection

Address:	2014-03h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: None

1: Gantry synchronization

Description

Gantry function selection.

0: Disabled

1: Enabled

H14.03 Gantry axis attribute (master-slave)

Address:	2014-04h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Slave axis

1: Master axis

Description

Selects the gantry axis attribute.

0: Slave axis

1: Master axis

H14.04 Gantry mechanical attribute

Address:	2014-05h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Rigid gantry scheme 1-Two-axis position control

1: Flexible gantry scheme 1-Two-axis position control

2: Rigid gantry scheme 2-Master axis position control and slave axis torque control

Description

The gantry mechanical attribute is related to the mechanical structure type of the gantry, which can be divided into rigid crossbeam frame connection and flexible crossbeam frame connection.

0: Rigid crossbeam frame, "axis sticking" may occur if both axes deviate too much

1: Flexible crossbeam frame, sync deviation is allowed between both axes

2: Rigid crossbeam frame, suitable for applications do not require high accuracy

H14.05 Current axis position sync direction

Address:	2014-06h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Forward

1: Reverse

Description

The synchronous direction of the two axes is related to the installation direction of the motor and the rotation direction of H02.02.

0: Forward

1: Reverse

H14.07 Gantry sync enable

Address:	2014-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

2: DI-enabled

Description

Selects the gantry synchronization enable mode to adjust the gain of gantry slave axis compensation. When it is enabled, H14.08–H14.11 will take effect.
0: Disabled
1: Enabled
2: DI-enabled

H14.08 Gantry sync position loop proportional gain

Address:	2014-09h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0% to 300.0%
Description
It is only effective for the slave axis.

H14.09 Gantry sync position loop integral time constant

Address:	2014-0Ah	Effective mode:	Real time
Min.:	0.5	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	1000.0	Change:	Real-time

Value Range:
0.5 ms–1000.0 ms
Description
It is only effective for the slave axis.

H14.10 Gantry sync speed loop proportional gain

Address:	2014-0Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0% to 300.0%
Description
It is only effective for the slave axis.

H14.11 Gantry sync speed loop integral time constant

Address:	2014-0Ch	Effective mode:	Real time

Min.:	0.5	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	1000.0	Change:	Real-time

Value Range:
0.5 ms–1000.0 ms
Description
It is only effective for the slave axis.

H14.12 Gantry sync speed limit

Address:	2014-0Dh	Effective mode:	Real time
Min.:	0.0	Unit:	rpm
Max.:	6000.0	Data Type:	UInt16
Default:	50.0	Change:	Real-time

Value Range:
0.0rpm to 6000.0rpm
Description
Gantry sync speed limit.

H14.13 Gantry alignment speed

Address:	2014-0Eh	Effective mode:	Real time
Min.:	0.0	Unit:	rpm
Max.:	3000.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:
0.0rpm to 3000.0rpm
Description
Gantry alignment speed

H14.14 Gantry alignment acc./dec. time

Address:	2014-0Fh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
0 ms–1000 ms
Description
Gantry alignment acc./dec. time

H14.18 Torque pre-alignment before gantry homing

Address:	2014-13h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Enables/disables torque pre-alignment before gantry homing.

0: Disabled

1: Enabled

H14.20 Gantry aligned by default upon power-on

Address:	2014-15h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: No operation

1: Align at first power-on

Description

Sets whether gantry alignment is performed by default upon power-on.

0: No operation

1: Aligned by default upon initial power-on of two axes

H14.21 Gantry alignment mode

Address:	2014-16h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Gantry homing alignment

2: Gantry torque alignment

3: Gantry enable alignment

4: Gantry DI alignment

Description

Gantry axis alignment mode

0: Gantry homing alignment

2: Gantry torque alignment

3: Gantry enable alignment

4: Gantry DI alignment

H14.25 Flexible gantry homing - Master/slave home deviation auto-tuning

Address:	2014-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Torque alignment auto-tuning

2: Position auto-tuning

Description

Sets whether to perform master/slave home deviation auto-tuning when H14.04 is set to flexible gantry.

0: Disabled

1: Torque alignment auto-tuning

2: Position auto-tuning

H14.26 Gantry torque alignment enable

Address:	2014-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

2: DI-enabled

3: Enabled at power-on

Description

Selects gantry torque alignment enable mode in gantry alignment mode.

0: Disabled

1: Enabled

2: DI-enabled

3: Enabled at power-on

H14.27 Gantry torque alignment torque

Address:	2014-1Ch	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:

0.0% to 300.0%

Description

Torque value in gantry torque alignment mode.

H14.28 Gantry torque alignment count

Address:	2014-1Dh	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
1–2
Description
The number of alignments in gantry torque alignment mode.

H14.29 Gantry torque alignment speed

Address:	2014-1Eh	Effective mode:	Real time
Min.:	0.0	Unit:	rpm
Max.:	3000.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:
0.0rpm to 3000.0rpm
Description
The speed in gantry torque alignment mode.

H14.30 Gantry torque alignment timeout alarm time

Address:	2014-1Fh	Effective mode:	Real time
Min.:	1	Unit:	s
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
1s to 65535s
Description
Gantry torque alignment timeout alarm time

H14.31 Gantry torque alignment acc./dec. time

Address:	2014-20h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
0 ms–1000 ms

Description

Gantry torque alignment acc./dec. time

H14.32 Gantry torque alignment zero speed threshold

Address:	2014-21h	Effective mode:	Real time
Min.:	0.0	Unit:	rpm
Max.:	100.0	Data Type:	UInt16
Default:	2.0	Change:	Real-time

Value Range:

0.0rpm to 100.0rpm

Description

The zero speed threshold for gantry torque alignment.

H14.33 Gantry torque alignment mechanical limit evaluation position loop period count

Address:	2014-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	5	Change:	Real-time

Value Range:

0–65535

Description

Gantry torque alignment mechanical limit evaluation position loop period count

H14.35 2-axis position deviation (encoder unit)

Address:	2014-24h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

The position deviation (encoder unit) between the active axis and the paired axis in gantry mode. It is related to H0B.17 of the two axes.

H14.37 2-axis speed deviation

Address:	2014-26h	Effective mode:	-
Min.:	-32767	Unit:	rpm
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32767rpm to 32767rpm

Description

It is the speed difference between the active axis and paired axis in gantry mode.

H14.38 Torque reference of active axis

Address:	2014-27h	Effective mode:	-
Min.:	-3276.7	Unit:	%
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:

-3276.7% to 3276.7%

Description

Torque reference of active axis

H14.39 Torque reference of paired axis

Address:	2014-28h	Effective mode:	-
Min.:	-3276.7	Unit:	%
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:

-3276.7% to 3276.7%

Description

Torque reference of paired axis

H14.40 Motor speed of active axis

Address:	2014-29h	Effective mode:	-
Min.:	-32767	Unit:	rpm
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32767rpm to 32767rpm

Description

Motor speed of active axis

H14.41 Motor speed of paired axis

Address:	2014-2Ah	Effective mode:	-
Min.:	-32767	Unit:	rpm
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32767rpm to 32767rpm

Description
Motor speed of paired axis

H14.44 Alarm time threshold of large gantry deviation

Address:	2014-2Dh	Effective mode:	Real time
Min.:	0.5	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	3.0	Change:	Real-time

Value Range:
0.5 ms–1000.0 ms
Description
The alarm time threshold of large gantry deviation.

H14.45 Gantry position alarm threshold

Address:	2014-2Eh	Effective mode:	Real time
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	50000	Change:	At stop

Value Range:
0 to 4294967295
Description
Gantry position alarm threshold.

H14.47 Large gantry position deviation alarm enable

Address:	2014-30h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
0: Disabled
1: Enabled
Description
Large gantry position deviation alarm enable
0: Disabled
1: Enabled

H14.48 Alarm time threshold of large gantry torque deviation

Address:	2014-31h	Effective mode:	Real time
Min.:	0.5	Unit:	ms
Max.:	1000.0	Data Type:	UInt16

Default:	3.0	Change:	Real-time

Value Range:

0.5 ms–1000.0 ms

Description

The alarm time threshold of large gantry torque deviation.

H14.49 Gantry torque deviation alarm threshold

Address:	2014-32h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	800.0	Data Type:	UInt16
Default:	300.0	Change:	At stop

Value Range:

0.0% to 800.0%

Description

The alarm threshold for large gantry torque deviation.

H14.50 Large gantry torque deviation alarm enable

Address:	2014-33h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

Enables/disables large gantry torque deviation alarm.

0: Disabled

1: Enabled

H14.52 Gantry mismatch

Address:	2014-35h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1451	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–1451

Description

If the parameters of the two axes of the gantry do not match, they will be displayed.

H14.71 **Flexible gantry homing - Enable aligning slave axis homing position to home offset**

Address:	2014-48h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No operation

1: Enabled

Description

Flexible gantry homing - Enable aligning slave axis homing position to home offset

0: No operation

1: Enabled

H14.74 **Gantry scheme 2 slave axis enable**

Address:	2014-4Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enabled

Description

0: Slave axis not respond to position references in gantry scheme 2

1: Slave axis respond to position references in gantry scheme 2

23.21H17 Virtual DI/DO

H17.90 **Communication VDI enable**

Address:	2017-5Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

To use the VDI function:

1. Set H17.90 to enable VDI.
2. Set the default level after power-on through H17.91.
3. Set the DI function of the VDI terminal through parameters in group H17.
4. Set VDI output through H31.00.

H17.91 VDI default value after power-on

Address:	2017-5Ch	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: VDI1
bit1: VDI2
bit2: VDI3
bit3: VDI4
bit4: VDI5
bit5: VDI6
bit6: VDI7
bit7: VDI8
bit8: VDI9
bit9: VDI10
bit10: VDI11
bit11: VDI12
bit12: VDI13
bit13: VDI14
bit14: VDI15
bit15: VDI16

Description

Configures the initial value of VDI upon power-on.
Bit 0 corresponds to VDI1.
Bit 1 corresponds to VDI2.
…
Bit 15 corresponds to VDI16.

H17.00 VDI1 function

Address:	2017-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3

9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI1.

H17.01 VDI1 logic level selection

Address:	2017-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

Set VDI1 active level

H17.02 VDI2 function

Address:	2017-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI2.

H17.03 **VDI2 logic level selection**

Address:	2017-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI2 active level

H17.04 **VDI3 function**

Address:	2017-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2

49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI3.

H17.05 VDI3 logic level selection

Address:	2017-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

Set VDI3 active level

H17.06 VDI4 function

Address:	2017-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch

16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI4.

H17.07 VDI4 logic level selection

Address:	2017-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

Set VDI4 active level

H17.08 VDI5 function

Address:	2017-09h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI5.

H17.09 **VDI5 logic level selection**

Address:	2017-0Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI5 active level

H17.10 **VDI6 function**

Address:	2017-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2

49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI6.

H17.11 **VDI6 logic level selection**

Address:	2017-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

Set VDI6 active level.

H17.12 **VDI7 function**

Address:	2017-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit

17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable
Description
Defines the function of VDI7.

H17.13 VDI7 logic level selection

Address:	2017-0Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Active when the written value is 1
1: Active when the written value changes from 0 to 1
Description
Set VDI7 active level

H17.14 VDI8 function

Address:	2017-0Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI7.

H17.15 VDI8 logic level selection

Address:	2017-10h	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI8 active level

H17.16 VDI9 function

Address:	2017-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear

Description

Defines the function of VDI9.

H17.17 **VDI9 logic level selection**

Address:	2017-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI9 active level

H17.18 **VDI10 function**

Address:	2017-13h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment

1: Servo ON

2: Alarm reset signal

5: Multi-reference direction

6: Multi-reference switchover CMD1

7: Multi-reference switchover CMD2

8: Multi-reference switchover CMD3

9: Multi-reference switchover CMD4

14: Positive limit switch

15: Negative limit switch

16: Positive external torque limit

17: Negative external torque limit

18: Forward jog

19: Reverse jog

24: Electronic gear

28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI10.

H17.19 VDI10 logic level selection

Address:	2017-14h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

Set VDI10 active level

H17.20 VDI11 function

Address:	2017-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal

5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI11.

H17.21 VDI11 logic level selection

Address:	2017-16h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

Set VDI11 active level

H17.22 **VDI12 function**

Address:	2017-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable

58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI12.

H17.23 VDI12 logic level selection

Address:	2017-18h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

Set VDI12 active level

H17.24 VDI13 function

Address:	2017-19h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable

46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI13.

H17.25 VDI13 logic level selection

Address:	2017-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

Set VDI13 active level

H17.26 VDI14 function

Address:	2017-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3

9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI14.

H17.27 **VDI14 logic level selection**

Address:	2017-1Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

Set VDI14 active level

H17.28 **VDI15 function**

Address:	2017-1Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable
47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI15.

H17.29 VDI15 logic level selection

Address:	2017-1Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI15 active level

H17.30 VDI16 function

Address:	2017-1Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	59	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment
1: Servo ON
2: Alarm reset signal
5: Multi-reference direction
6: Multi-reference switchover CMD1
7: Multi-reference switchover CMD2
8: Multi-reference switchover CMD3
9: Multi-reference switchover CMD4
14: Positive limit switch
15: Negative limit switch
16: Positive external torque limit
17: Negative external torque limit
18: Forward jog
19: Reverse jog
24: Electronic gear
28: Multi-position reference enable
31: Home switch
34: Emergency stop
36: Internal speed limit source
40: Multi-speed enable
46: Process segment enable

47: Process segment command switchover 1
48: Process segment command switchover 2
49: Process segment command switchover 3
50: Process segment command switchover 4
51: Event trigger process segment 1
52: Event trigger process segment 2
53: Event trigger process segment 3
54: Event trigger process segment 4
55: Process segment pause
56: Gantry torque alignment
57: Gantry DI alignment enable
58: Gantry DI alignment clear
59: Gantry synchronization enable

Description

Defines the function of VDI16.

H17.31 VDI16 logic level selection

Address:	2017-20h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1
1: Active when the written value changes from 0 to 1

Description

Set VDI16 active level

H17.92 Communication VDO enable

Address:	2017-5Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled
1: Enabled

Description

To use the VDO function:
1. Set H17.92 to enable VDO.
2. Set the default level after power-on through H17.93.
3. Set the DO function of the VDO terminal through parameters in group H17.
4: Read the output level of the VDO in H17.32.

H17.93 **VDO default value after power-on**

Address:	2017-5Eh	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	At stop

Value Range:

bit0: VDO1
bit1: VDO2
bit2: VDO3
bit3: VDO4
bit4: VDO5
bit5: VDO6
bit6: VDO7
bit7: VDO8
bit8: VDO9
bit9: VDO10
bit10: VDO11
bit11: VDO12
bit12: VDO13
bit13: VDO14
bit14: VDO15
bit15: VDO16

Description

Configures the initial value of VDO upon power-on.
Bit 0 corresponds to VDO1.
Bit 1 corresponds to VDO2.
…
Bit 15 corresponds to VDO16.

H17.32 **VDO virtual level**

Address:	2017-21h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the VDO virtual level.

H17.33 **VDO1 function**

Address:	2017-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking
10: Alarm
11: Failure
22: Internal command completed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description

Set the function of VDO1.

H17.34 **VDO1 logic level selection**

Address:	2017-23h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

Set VDO1 active level.

H17.35 **VDO2 function**

Address:	2017-24h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking
10: Alarm
11: Failure
22: Internal command completed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description

See H17.33.

H17.36 VDO2 logic level selection

Address:	2017-25h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.37 VDO3 function

Address:	2017-26h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near

9: Braking

10: Warning
11: Failure
22: Internal command completed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description

See H17.33.

H17.38 VDO3 logic level selection

Address:	2017-27h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.39 VDO4 function

Address:	2017-28h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking

10: Warning
11: Failure
22: Internal command completed

24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description

See H17.33.

H17.40 VDO4 logic level selection

Address:	2017-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.41 VDO5 function

Address:	2017-2Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking
10: Alarm
11: Failure
22: Internal command completed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description

See H17.33.

H17.42 **VDO5 logic level selection**

Address:	2017-2Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.43 **VDO6 function**

Address:	2017-2Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking
10: Alarm
11: Failure
22: Internal command completed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description

See H17.33.

H17.44 **VDO6 logic level selection**

Address:	2017-2Dh	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.45 VDO7 function

Address:	2017-2Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined

1: Servo ready

2: Motor rotation signal

5: Positioning completed

6: Positioning near

9: Braking

10: Alarm

11: Failure

22: Internal command completed

24: Internal motion completed

26: Closed-loop state

27: Left limit

28: Right limit

33: Gantry alignment

Description

See H17.33.

H17.46 VDO7 logic level selection

Address:	2017-2Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description
See H17.34.

H17.47 VDO8 function

Address:	2017-30h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking

10: Warning
11: Failure
22: Internal command completed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description
See H17.33.

H17.48 VDO8 logic level selection

Address:	2017-31h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Output 1 upon active logic
1: Output 0 upon active logic

Description
See H17.34.

H17.49 VDO9 function

Address:	2017-32h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking
10: Alarm
11: Failure
22: Internal command completed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description

See H17.33.

H17.50 VDO9 logic level selection

Address:	2017-33h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.51 VDO10 function

Address:	2017-34h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready

2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking

10: Warning
11: Failure
22: Internal command completed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description

See H17.33.

H17.52 VDO10 logic level selection

Address:	2017-35h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.53 VDO11 function

Address:	2017-36h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking
10: Alarm
11: Failure
22: Internal command completed

24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description

See H17.33.

H17.54 VDO11 logic level selection

Address:	2017-37h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.55 VDO12 function

Address:	2017-38h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking
10: Alarm
11: Failure
22: Internal command completed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description

See H17.33.

H17.56 VDO12 logic level selection

Address:	2017-39h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.57 VDO13 function

Address:	2017-3Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined

1: Servo ready

2: Motor rotation signal

5: Positioning completed

6: Positioning near

9: Braking

10: Alarm

11: Failure

22: Internal command completed

24: Internal motion completed

26: Closed-loop state

27: Left limit

28: Right limit

33: Gantry alignment

Description

See H17.33.

H17.58 VDO13 logic level selection

Address:	2017-3Bh	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.59 VDO14 function

Address:	2017-3Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Undefined

1: Servo ready

2: Motor rotation signal

5: Positioning completed

6: Positioning near

9: Braking

10: Warning

11: Failure

22: Internal command completed

24: Internal motion completed

26: Closed-loop state

27: Left limit

28: Right limit

33: Gantry alignment

Description

See H17.33.

H17.60 VDO14 logic level selection

Address:	2017-3Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description
See H17.34.

H17.61 VDO15 function

Address:	2017-3Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking
10: Alarm
11: Failure
22: Internal command completed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description
See H17.33.

H17.62 VDO15 logic level selection

Address:	2017-3Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Output 1 upon active logic
1: Output 0 upon active logic

Description
See H17.34.

H17.63 VDO16 function

Address:	2017-40h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	33	Data Type:	UInt16

Default: 0 Change: Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation signal
5: Positioning completed
6: Positioning near
9: Braking
10: Alarm
11: Failure
22: Internal command completed
24: Internal motion completed
26: Closed-loop state
27: Left limit
28: Right limit
33: Gantry alignment

Description

See H17.33.

H17.64 VDO16 logic level selection

Address:	2017-41h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

23.22H18 Position Comparison Output

H18.00 Position comparison output selection

Address:	2018-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disable

1: Enable (rising edge-triggered)

Description

0: Disable

1: Enable (rising edge-triggered)

H18.01 Position comparison output feedback source

Address:	2018-02h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Motor encoder feedback

1: Fully closed-loop position feedback

Description

Select position comparison output feedback source.

0: Motor encoder feedback

1: Fully closed-loop position feedback

H18.02 Position comparison resolution

Address:	2018-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: 24-bit

1: 23-bit

2: 22-bit

3: 21-bit

4: 20-bit

5: 19-bit

6: 18-bit

7: 17-bit

Description

Set position comparison resolution
0: 24-bit
1: 23-bit
2: 22-bit
3: 21-bit
4: 20-bit
5: 19-bit
6: 18-bit
7: 17-bit

H18.03 Position comparison mode

Address:	2018-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Individual comparison mode
1: Cyclic comparison mode
2: Fixed cyclic comparison mode

Description
Set position comparison mode
0: Individual comparison mode
1: Cyclic comparison mode
2: Fixed cyclic comparison mode

H18.04 Current position as zero

Address:	2018-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Disable
1: Enable (rising edge-triggered)

Description
Current position as zero

H18.05 Position comparison output width

Address:	2018-06h	Effective mode:	Real time
Min.:	0.1	Unit:	ms
Max.:	204.7	Data Type:	UInt16
Default:	0.1	Change:	Real-time

Value Range:
0.1 ms–204.7 ms
Description
Defines the active pulse width of the DO when the comparison point is reached. The value range is 0 to 204.7 (unit: 1 ms).

H18.06 **Position comparison output ABZ port polarity**

Address:	2018-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Bit 0: OCZ output logic
0: Positive, output high level upon active logic
1: Negative, output low level upon active logic
Bit 1: Z port output logic
0: Positive, output high level upon active logic
1: Negative, output low level upon active logic
bit2: A/B output logic
0: Positive, output high level upon active logic
1: Negative, output low level upon active logic
Description
0: Positive (output high level upon active logic) 1: Negative (output high level upon active logic)
bit0: OCZ output logic
Bit1: Z output logic
Bit2: A/B output logic

H18.07 **Position comparison start point**

Address:	2018-08h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
1–40
Description
Set position comparison start point.

H18.08 **Position comparison end point**

Address:	2018-09h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
1–40
Description
Set position comparison end point.

H18.09 **Current state of position comparison**

Address:	2018-0Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1024	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–1024
Description
Display current state of position comparison.

H18.10 **Real-time position of position comparison**

Address:	2018-0Bh	Effective mode:	-
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648–2147483647
Description
Display the real-time position of position comparison.

H18.12 **Zero offset of position comparison**

Address:	2018-0Dh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
Set the zero offset of position comparison.

H18.14 **Position comparison output delay compensation**

Address:	2018-0Fh	Effective mode:	Upon the next power-on
Min.:	-12.00	Unit:	μs
Max.:	12.00	Data Type:	Int16
Default:	0.00	Change:	Real-time

Value Range:

-12.00μs to 12.00μs

Description

Compensates the delay caused by hardware signal output.

H18.15 Fixed cyclic comparison

Address:	2018-10h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1–65535

Description

Set fixed cyclic comparison.

H18.16 ABZ output function setting

Address:	2018-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: OCZ output function
0: Frequency-division output
1: Position comparison
bit1: Z port output function
0: Frequency-division output
1: Position comparison
bit2: A/B port output function
0: Frequency-division output
1: Position comparison

Description

Set ABZ output function.
bit0: OCZ (0: Frequency-division output; 1: Position comparison)
bit1: Z (0: Frequency-division output; 1: Position comparison)
bit2: A/B (0: Frequency-division output; 1: Position comparison)

H18.17 Number of fixed mode cycles

Address:	2018-12h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Set the number of fixed mode cycles.

23.23H19 Target Position Parameters

H19.00 **Target value of position comparison 1**

Address:	2019-01h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
Set the target value of position comparison 1.

H19.02 **Attribute value of position comparison 1**

Address:	2019-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output

bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

Attribute setting of position comparison point 1
Bit0: 1: Current position changes from "less than" to "more than" the comparison point; 0: N/A
Bit0: 1: Current position changes from "more than" to "less than" the comparison point; 0: N/A
bit2 to bit6: NA
Bit7: 1: DO1 output enabled; 0: N/A
Bit8: 1: DO2 output enabled; 0: N/A
Bit9 to bit11: N/A
Bit12: 1: Frequency-division A output enabled; 0: N/A
Bit13: 1: Frequency-division B output enabled; 0: N/A
Bit14: 1: Frequency-division C output enabled; 0: N/A
Bit15: 1: Frequency-division OCZ output enabled; 0: N/A

H19.03 Target value of position comparison 2

Address:	2019-04h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.05 Attribute value of position comparison 2

Address:	2019-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A

bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.06 **Target value of position comparison 3**

Address:	2019-07h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.08 **Attribute value of position comparison 3**

Address:	2019-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:

bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.09 Target value of position comparison 4

Address:	2019-0Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.11 Attribute value of position comparison 4

Address:	2019-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output

bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.12 Target value of position comparison 5

Address:	2019-0Dh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.14 Attribute value of position comparison 5

Address:	2019-0Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.15 Target value of position comparison 6

Address:	2019-10h	Effective mode:	Real time

Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.17 Attribute value of position comparison 6

Address:	2019-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point

bit2: N/A

bit3: N/A

bit4: N/A

bit5: N/A

bit6: N/A

bit7: DO1 output

bit8: DO2 output

bit9: Nabit10:

bit10: N/A

bit11: N/A

bit12: Frequency-division A output

bit13: Frequency-division B output

bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

H19.18 Target value of position comparison 7

Address:	2019-13h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.20 Attribute value of position comparison 7

Address:	2019-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point

bit2: N/A

bit3: N/A

bit4: N/A

bit5: N/A

bit6: N/A

bit7: DO1 output

bit8: DO2 output

bit9: Nabit10:

bit10: N/A

bit11: N/A

bit12: Frequency-division A output

bit13: Frequency-division B output

bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

H19.21 Target value of position comparison 8

Address:	2019-16h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.23 Attribute value of position comparison 8

Address:	2019-18h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.24 Target value of position comparison 9

Address:	2019-19h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.26 Attribute value of position comparison 9

Address:	2019-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.27 Target value of position comparison 10

Address:	2019-1Ch	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.29 Attribute value of position comparison 10

Address:	2019-1Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A

bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.30 Target value of position comparison 11

Address:	2019-1Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.32 Attribute value of position comparison 11

Address:	2019-21h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output

bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.33 Target value of position comparison 12

Address:	2019-22h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.35 Attribute value of position comparison 12

Address:	2019-24h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

H19.36 Target value of position comparison 13

Address:	2019-25h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.38 Attribute value of position comparison 13

Address:	2019-27h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point

bit2: N/A

bit3: N/A

bit4: N/A

bit5: N/A

bit6: N/A

bit7: DO1 output

bit8: DO2 output

bit9: Nabit10:

bit10: N/A

bit11: N/A

bit12: Frequency-division A output

bit13: Frequency-division B output

bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

H19.39 Target value of position comparison 14

Address:	2019-28h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.41 Attribute value of position comparison 14

Address:	2019-2Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point

bit2: N/A

bit3: N/A

bit4: N/A

bit5: N/A

bit6: N/A

bit7: DO1 output

bit8: DO2 output

bit9: Nabit10:

bit10: N/A

bit11: N/A

bit12: Frequency-division A output

bit13: Frequency-division B output

bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

H19.42 Target value of position comparison 15

Address:	2019-2Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.44 Attribute value of position comparison 15

Address:	2019-2Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point

bit2: N/A

bit3: N/A

bit4: N/A

bit5: N/A

bit6: N/A

bit7: DO1 output

bit8: DO2 output

bit9: Nabit10:

bit10: N/A

bit11: N/A

bit12: Frequency-division A output

bit13: Frequency-division B output

bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

H19.45 Target value of position comparison 16

Address:	2019-2Eh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.47 Attribute value of position comparison 16

Address:	2019-30h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.48 Target value of position comparison 17

Address:	2019-31h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.50 Attribute value of position comparison 17

Address:	2019-33h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.51 Target value of position comparison 18

Address:	2019-34h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.53 Attribute value of position comparison 18

Address:	2019-36h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A

bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.54 Target value of position comparison 19

Address:	2019-37h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.56 Attribute value of position comparison 19

Address:	2019-39h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:

bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.57 Target value of position comparison 20

Address:	2019-3Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.59 Attribute value of position comparison 20

Address:	2019-3Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output

bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.60 Target value of position comparison 21

Address:	2019-3Dh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.62 Attribute value of position comparison 21

Address:	2019-3Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.63 Target value of position comparison 22

Address:	2019-40h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.65 Attribute value of position comparison 22

Address:	2019-42h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.66 Target value of position comparison 23

Address:	2019-43h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.68 Attribute value of position comparison 23

Address:	2019-45h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point

bit2: N/A

bit3: N/A

bit4: N/A

bit5: N/A

bit6: N/A

bit7: DO1 output

bit8: DO2 output

bit9: Nabit10:

bit10: N/A

bit11: N/A

bit12: Frequency-division A output

bit13: Frequency-division B output

bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

H19.69 Target value of position comparison 24

Address:	2019-46h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.71 **Attribute value of position comparison 24**

Address:	2019-48h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.72 **Target value of position comparison 25**

Address:	2019-49h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.74 **Attribute value of position comparison 25**

Address:	2019-4Bh	Effective mode:	Real time
Min.:	0	Unit:	-

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.75 Target value of position comparison 26

Address:	2019-4Ch	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.77 Attribute value of position comparison 26

Address:	2019-4Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.78 Target value of position comparison 27

Address:	2019-4Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.80 Attribute value of position comparison 27

Address:	2019-51h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0：Current position changes from "less than" to "more than" the comparison point
bit1：Current position changes from "more than" to "less than" the comparison point
bit2：NA
bit3：NA
bit4：NA
bit5：NA

bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.81 Target value of position comparison 28

Address:	2019-52h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.83 Attribute value of position comparison 28

Address:	2019-54h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:

bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.84 Target value of position comparison 29

Address:	2019-55h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.86 Attribute value of position comparison 29

Address:	2019-57h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output

bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.87 Target value of position comparison 30

Address:	2019-58h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.89 Attribute value of position comparison 30

Address:	2019-5Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.00.

H19.90 **Target value of position comparison 31**

Address:	2019-5Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.92 **Attribute value of position comparison 31**

Address:	2019-5Dh	Effective mode:	Real time
Min:	0		
Max:	65535	Unit:	-
Default:	0	Data Type:	Int32
		Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

Same as H19.02

H19.93 **Target value of position comparison 32**

Address:	2019-5Eh	Effective mode:	Real time
Min:	-2147483648		
Max:	2147483647	Unit:	-
Default:	0	Data Type:	Int32
Value Range:		Change:	Real-time

-2147483648–2147483647

Description

Same as H19.00

H19.95 **Attribute value of position comparison 32**

Address:	2019-60h	Effective mode:	Real time
Min.:	0		
Max.:	65535	Unit:	-
Default:	0	Data Type:	UInt16
		Change:	Real-time

Value Range:

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

Same as H19.02

H19.96 **Target value of position comparison 33**

Address:	2019-61h	Effective mode:	Real time
Min.:	-2147483648		
Max.:	2147483647	Unit:	-
Default:	0	Data Type:	UInt32
Value Range:		Change:	Real-time

-2147483648–2147483647

Description

Same as H19.00

H19.98 **Attribute value of position comparison 33**

Address:	2019-63h	Effective mode:	Real time
Min.:	0		
		Unit:	-

Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range：

bit0：Current position changes from "less than" to "more than" the comparison point
bit1：Current position changes from "more than" to "less than" the comparison point
bit2：NA
bit3：NA
bit4：NA
bit5：NA
bit6：NA
bit7：DO1 output
bit8：DO2 output
bit9：N/A
bit10：N/A
bit11：N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

Same as H19.02

H19.99 Target value of position comparison 34

Address:	2019-64h	Effective mode:	Real time
Min.:	-2147483648		
Max.:	2147483647	Unit:	-
Default:	0	Data Type:	Int32
Value Range:		Change:	Real-time

-2147483648–2147483647

Description

Same as H19.00

H19.101 Attribute value of position comparison 34

Address:	2019-66h	Effective mode:	Real time
Min.:	0		
Max.:	65535	Unit:	-
Default:	0	Data Type:	UInt16
Value Range:		Change:	Real-time

bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A

bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.102 Target value of position comparison 35

Address:	2019-67h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.104 Attribute value of position comparison 35

Address:	2019-69h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output

bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.105 Target value of position comparison 36

Address:	2019-6Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See H19.00.

H19.107 Attribute value of position comparison 36

Address:	2019-6Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description
Same as H19.02

H19.108 Target value of position comparison 37

Address:	2019-6Dh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See H19.00.

H19.110 Attribute value of position comparison 37

Address:	2019-6Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output
Description
See H19.02.

H19.111 Target value of position comparison 38

Address:	2019-70h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647

Description
See H19.00.

H19.113 Attribute value of position comparison 38

Address::	2019-72h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description
See H19.02

H19.114 Target value of position comparison 39

Address:	2019-73h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See H19.00.

H19.116 Attribute value of position comparison 39

Address:	2019-75h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: Nabit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output
Description
See H19.02.

H19.117 Target value of position comparison 40

Address:	2019-76h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See H19.00

H19.119 Attribute value of position comparison 40

Address:	2019-78h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point

bit2: N/A

bit3: N/A

bit4: N/A

bit5: N/A

bit6: N/A

bit7: DO1 output

bit8: DO2 output

bit9: Nabit10:

bit10: N/A

bit11: N/A

bit12: Frequency-division A output

bit13: Frequency-division B output

bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

23.24H1F Software Parameters

H1F.90 DI function status 1 read through communication

Address:	201F-5Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Bit 0 corresponds to DI function 1.

Bit 1 corresponds to DI function 2.

Bit 2 corresponds to DI function 3.
…
By analogy

H1F.91 DI function status 2 read through communication

Address:	201F-5Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Bit 0 corresponds to DI function 17.
Bit 1 corresponds to DI function 18.
Bit 2 corresponds to DI function 19.
…
By analogy

H1F.92 DI function status 3 read through communication

Address:	201F-5Dh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Bit 0 corresponds to DI function 33.
Bit 1 corresponds to DI function 34.
Bit 2 corresponds to DI function 35.
…
By analogy

H1F.93 DI function status 4 read through communication

Address:	201F-5Eh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Bit 0 corresponds to DI function 49.

Bit 1 corresponds to DI function 50.

Bit 2 corresponds to DI function 51.

…

By analogy

H1F.94 DO function status 1 read through communication

Address:	201F-5Fh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Bit 0 corresponds to DO function 1.

Bit 1 corresponds to DO function 2.

Bit 2 corresponds to DO function 3.

…

By analogy

H1F.95 DO function status 2 read through communication

Address:	201F-60h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Bit 0 corresponds to DO function 17.

Bit 1 corresponds to DO function 18.

Bit 2 corresponds to DO function 19.

…

By analogy

23.25H21 Current Loop Gain Switchover Parameters

H21.00 Current loop gain switchover

Address:	2021-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No operation

1: Enabled

Description

Used to enable or disable the current loop gain switchover function.

0: No operation, turned off

1: Enabled, turned on

23.26H22 Technology Segment Parameters

H22.00 Process segment command trigger

Address:	2022-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–1000

Description

Used to trigger the process segment. The process segment can be triggered through the keypad or communication.

The homing function is triggered when 0 is written to H22.00.

Process segments 1 to 15 are triggered when 1 to 15 are written to H22.00.

The process segment pauses when 1000 is written to H22.00.

E126.0 (Process segment number error) will be reported when 16 to 999 are written to H22.00.

H22.01 Process segment triggered by the event rising edge

Address:	2022-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

DI: ProceEvTri (OFF to ON, rising edge-triggered).

0–3bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri1 rising edge. When its value is 1–15, DI is triggered: Process segment 1–15 is executed during ProceEvTri1 rising edge.

4–7bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri2 rising edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri2 rising edge.

8–11bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri3 rising edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri3 rising edge.

12–15bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri4 rising edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri4 rising edge.

H22.02 Process segment triggered by the event falling edge

Address:	2022-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

DI: ProceEvTri (ON to OFF, falling edge-triggered).

0–3bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri1 falling edge. When its value is 1–15, DI is triggered: Process segment 1–15 is executed during ProceEvTri1 falling edge.

4–7bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri2 falling edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri2 falling edge.

8–11bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri3 falling edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri3 falling edge.

12–15bit: When its value is 0, DI is triggered: The motor does not operate during ProceEvTri4 falling edge. When its value is 1–15, DI is triggered: Process segments 1–15 are executed during ProceEvTri4 falling edge.

H22.03 Acceleration/Deceleration time upon technology segment pause

Address:	2022-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Acceleration/Deceleration time
1: Acceleration/Deceleration time 1
2: Acceleration/Deceleration time 2
3: Acceleration/Deceleration time 3
4: Acceleration/Deceleration time 4
5: Acceleration/Deceleration time 5
6: Acceleration/Deceleration time 6
7: Acceleration/Deceleration time 7

Description

When the process segment is paused, the motor ramps to stop based on the deceleration time defined by H22.03. Setpoints 0 to 7 correspond to parameters H22.35 to H22.42.

H22.04 Positive software position limit

Address:	2022-05h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	2147483647	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

E956.0 can occur when the motor operates forwardly with position reference exceeding the setpoint of H22.04 during positioning in the process segment mode.

H22.06 Negative software position limit

Address:	2022-07h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	-2147483648	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

E958.0 can occur when the motor operates reversely with position reference exceeding the setpoint of H22.06 during positioning in the process segment mode.

H22.08 Process segment number

Address:	2022-09h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Indicates the process segment number in progress in the process segment mode.

H22.09 Process segment function switch

Address:	2022-0Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
bit0:
0: Keep interrupt positioning state
1: Exit interrupt positioning state when triggering technology segment

H22.10 Process segment state

Address:	2022-0Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Used for process segment state feedback.
The process segment number will be read back when commands in the positioning mode are not done executing.
The process segment number + 10000 will be read back when commands in the positioning mode are done executing.
The process segment number + 20000 will be read back when commands in the positioning mode are done executing and positioning has been completed.

H22.19 Target speed

Address:	2022-14h	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	50.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

Eight groups of target speed are available for each process segment command. Target speed refers to the constant operating speed when the motor is not in the acceleration/deceleration process. If the displacement is too small in the positioning mode, the actual motor speed will be lower than the setpoint of H22.19.

H22.20 Target speed 1

Address:	2022-15h	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	200.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.21 Target speed 2

Address:	2022-16h	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	500.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.22 Target speed 3

Address:	2022-17h	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	1000.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.23 Target speed 4

Address:	2022-18h	Effective mode:	Real time

Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	1500.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.24 Target speed 5

Address:	2022-19h	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	2000.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.25 Target speed 6

Address:	2022-1Ah	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	2500.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.26 Target speed 7

Address:	2022-1Bh	Effective mode:	Real time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	6000.0	Data Type:	UInt16
Default:	3000.0	Change:	Real-time

Value Range:

0.1[mm/s]/[rpm]–6000.0[mm/s]/[rpm]

Description

See H22.19.

H22.35 Accel/Decel time

Address:	2022-24h	Effective mode:	Real time

Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Eight groups of acceleration/deceleration time are available for each process segment command.

Acceleration/Deceleration time refers to the time for the motor to change from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed.

H22.36 Acceleration/Deceleration time 1

Address:	2022-25h	Effective	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See H22.35.

H22.37 Acceleration/Deceleration time 2

Address:	2022-26h	Effective	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See H22.35.

H22.38 Acceleration/Deceleration time 3

Address:	2022-27h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	1000	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See H22.35.

H22.39 Acceleration/Deceleration time 4

Address:	2022-28h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	1500	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.35.

H22.40 Acceleration/Deceleration time 5

Address:	2022-29h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	2000	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.35.

H22.41 Acceleration/Deceleration time 6

Address:	2022-2Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	2500	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.35.

H22.42 Acceleration/Deceleration time 7

Address:	2022-2Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.35.

H22.51 Delay after completion of the process segment

Address:	2022-34h	Effective mode: Real time	
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Eight groups of delay time are available for each process segment command. The delay time refers to the delay that starts from the end of current command to the operation of the next command in the process segment. See section 2.2 Process Segment Function.

H22.52 Delay time 1 after completion of the process segment

Address:	2022-35h	Effective mode: Real time	
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See H22.51.

H22.53 Delay time 2 after completion of the process segment

Address:	2022-36h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See H22.51.

H22.54 Delay time 3 after completion of the process segment

Address:	2022-37h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

See H22.51.

H22.55 Delay time 4 after completion of the process segment

Address:	2022-38h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	1000	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.51.

H22.56 Delay time 5 after completion of the process segment

Address:	2022-39h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	1500	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.51.

H22.57 Delay time 6 after completion of the process segment

Address:	2022-3Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	2000	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.51.

H22.58 Delay time 7 after completion of the process segment

Address:	2022-3Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
See H22.51.

H22.70 Process segment homing mode

Address:	2022-47h	Effective mode:	Real time
Min.:	-32768	Unit:	-
Max.:	32767	Data Type:	Int16
Default:	-2	Change:	Real-time

Value Range:

-32768–32767

Description

Defines the default motor direction of rotation, deceleration point, and home during homing.

When H22.70 is set to a value from -2 to 35, 402 homing is used (6098h = -2...35). See section "Homing Function" in SV680P Series Servo Drive Function Guide for details.

When H22.70 is set to a value lower than or equal to -200, local homing is used (H22.70 = -200 + H05.31). See section "Homing Function" in SV680P Series Servo Drive Function Guide for details.

H22.71 Speed of high-speed search for home switch signal

Address:	2022-48h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	3000	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–3000[mm/s]/[rpm]

Description

Defines the motor speed for searching for the deceleration point signal during homing.

H22.72 Speed of low-speed search for home switch signal

Address:	2022-49h	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–1000[mm/s]/[rpm]

Description

Defines the motor speed for searching for the home signal during homing.

H22.73 Acceleration/Deceleration time during homing

Address:	2022-4Ah	Effective mode:	Real time
Min.:	0	Unit:	ms

Max.:	1000	Data Type:	UInt16
Default:	1000	Change:	Real-time

Value Range:

0 ms–1000 ms

Description

Defines the time for the motor to accelerate from 0 [mm/s]/[rpm] to 1000 [mm/s]/[rpm] at a constant speed during homing.

H22.74 Home search time limit

Address:	2022-4Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10000	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Defines the maximum homing time.

H22.75 Mechanical home offset

Address:	2022-4Ch	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the absolute position of the motor after homing.

H22.79 Relative/Absolute homing

Address:	2022-50h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

Defines the offset relationship between the mechanical home and mechanical zero point, and the action upon overtravel during homing.

When H22.79 is set to 0, the value of H05.40 is 2.

When H22.79 is set to 1, the value of H05.40 is 3.

H22.83 Jump count threshold

Address:	2022-54h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–65534
Description
Eight jump count thresholds are provided for each process segment command. Jump count threshold: There are two jump process segments for the jump command. When the cumulative number of jumps executed by the jump command is lower than the jump count threshold, you will jump to process segment A, otherwise jump to process segment B. For details, see section 2.2.

H22.84 Jump count threshold 1

Address:	2022-55h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

H22.85 Jump count threshold 2

Address:	2022-56h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	40	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

H22.86 Jump count threshold 3

Address:	2022-57h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	80	Change:	Real-time

Value Range:
0–65534

Description
See H22.83.

H22.87 Jump count threshold 4

Address:	2022-58h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	160	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

H22.88 Jump count threshold 5

Address:	2022-59h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	320	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

H22.89 Jump count threshold 6

Address:	2022-5Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	640	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

H22.90 Jump count threshold 7

Address:	2022-5Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65534	Data Type:	UInt16
Default:	1280	Change:	Real-time

Value Range:
0–65534
Description
See H22.83.

23.27H23 Technology Segment

H23.00 Definition of homing

Address:	2023-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
For details about this parameter, see section 2.2.3 Homing Mode in SV680N Series Servo Drive Function Guide.

H23.02 Homing data

Address:	2023-03h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
Not used.

H23.04 Definition of process segment 1

Address:	2023-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
bit0 to bit3: Mode (process segment operation mode option)

Mode = 1: The fixed speed mode applies.Mode = 2: The positioning mode applies, which stops after positioning is done. Mode = 3: The next segment is executed automatically after positioning is done. Mode = 7: The jump mode applies, which is used to jump to the designated process segment. Mode = 8: The parameter-write mode applies, which allows you to write specific parameters.

For details on each mode, see section 2.2.4 in the SV680P Series Servo Drive Function Guide.

H23.06 Data of process segment 1

Address:	2023-07h	Effective	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

Different modes selected in process segment 1 correspond to different segment data. For details on each mode, see section 2.2.4 of the SV680P Servo Drive Function Guide.

H23.08 Definition of process segment 2

Address:	2023-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0–4294967295

Description

See definition of technology segment 1.

H23.10 Data of process segment 2

Address:	2023-0Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See definition of technology segment 1.

H23.12 Definition of process segment 3

Address:	2023-0Dh	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.14 Data of process segment 3

Address:	2023-0Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.16 Definition of process segment 4

Address:	2023-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.18 Data of process segment 4

Address:	2023-13h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.20 Definition of process segment 5

Address:	2023-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0–4294967295

Description

See definition of technology segment 1.

H23.22 Data of process segment 5

Address:	2023-17h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See that of technology segment 1.

H23.24 Definition of process segment 6

Address:	2023-19h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0–4294967295

Description

See definition of technology segment 1.

H23.26 Data of process segment 6

Address:	2023-1Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648–2147483647

Description

See that of technology segment 1.

H23.28 Definition of process segment 7

Address:	2023-1Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.30 Data of process segment 7

Address:	2023-1Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.32 Definition of process segment 8

Address:	2023-21h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.34 Data of process segment 8

Address:	2023-23h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.36 Definition of process segment 9

Address:	2023-25h	Effective mode:	Real time

		mode:	
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.38 Data of process segment 9

Address:	2023-27h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.40 Definition of process segment 10

Address:	2023-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.42 Data of process segment 10

Address:	2023-2Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.44 Definition of process segment 11

Address:	2023-2Dh	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.46 **Data of process segment 11**

Address:	2023-2Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.48 **Definition of process segment 12**

Address:	2023-31h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.50 **Data of process segment 12**

Address:	2023-33h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.52 **Definition of process segment 13**

Address:	2023-35h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.54 **Data of process segment 13**

Address:	2023-37h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.56 **Definition of process segment 14**

Address:	2023-39h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.58 **Data of process segment 14**

Address:	2023-3Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

H23.60 Definition of process segment 15

Address:	2023-3Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0–4294967295
Description
See definition of technology segment 1.

H23.62 Data of process segment 15

Address:	2023-3Fh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648–2147483647
Description
See that of technology segment 1.

23.28H30 Related Variables Read through Communication

H30.00 Servo state read via communication

Address:	2030-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Displays the current running state of the drive to be communicated to the software.

H30.01 DO function status 1 read through communication

Address:	2030-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535
Description
Bit 0 corresponds to DO function 1.
Bit 1 corresponds to DO function 2.
Bit 2 corresponds to DO function 3.
…
By analogy

H30.02 DO function status 2 read through communication

Address:	2030-03h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Bit 0 corresponds to DO function 17.
Bit 1 corresponds to DO function 18.
Bit 2 corresponds to DO function 19.
…
By analogy

H30.16 1st encoder communication timeout count

Address:	2030-11h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
It indicates the total number of communication timeout errors of the first encoder after the latest power-on.

H30.17 1st encoder communication CRC error count

Address:	2030-12h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535

Description

It indicates the total number of communication CRC errors of the first encoder after the latest power-on.

H30.18 1st encoder communication frame stop bit error count

Address:	2030-13h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

It indicates the total number of communication frame stop bit errors of the encoder after the latest power-on.

23.29H31 Communication Setting

H31.00 VDI virtual level set through communication

Address:	2031-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

When H17.90 is set to 1, the VDI state is defined by this parameter.

The VDI logic is determined by H17.91 (Default VDI virtual level value upon power-on) upon initial power-on. Then, H31.00 is determined by the VDI logic. "bit(n) = 1" of H31.00 indicates the logic of VDI (n+1) is "1". "bit(n)=0" indicates the logic of VDI (n+1) is "0".

H31.01 Frequency-division output frequency set through communication

Address:	2031-02h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	16000000	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 Hz–16000000 Hz

Description

When H05.38 is set to 4, H31.01 sets the frequency of the frequency division output port.

H31.04 DO status set through communication

Address:	2031-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0–65535
Description
Sets DO output status.

H31.05 AO status set through communication

Address:	2031-06h	Effective mode:	Real time
Min.:	-10000	Unit:	mV
Max.:	10000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:
-10000 mV–10000 mV
Description
Set H04.50 to 10 to define AO through H31.05 (in mV).

H31.09 Speed reference set through communication

Address:	2031-0Ah	Effective mode:	Real time
Min.:	-9999.000	Unit:	[mm/s]/[rpm]
Max.:	9999.000	Data Type:	Int32
Default:	0.000	Change:	Real-time

Value Range:
-9999.000[mm/s]/[rpm]–9999.000[mm/s]/[rpm]
Description
Set H06.02 to 4 to define the speed reference in the speed control mode (unit: 0.001 [mm/s]/[rpm]).

H31.11 Torque reference set through communication

Address:	2031-0Ch	Effective mode:	Real time
Min.:	-100.000	Unit:	%
Max.:	100.000	Data Type:	Int32
Default:	0.000	Change:	Real-time

Value Range:
-100.000% to 100.000%
Description
Set H07.02 to 4 to define the torque reference in the torque control mode through this parameter (unit: 0.001%). The setpoint 100.000% corresponds to the rated torque of the motor.

23.30H32 Direct Drive Parameters

H32.00 **Encoder interpolator mismatch alarm (E124)**

Address:	2032-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

The T2 interpolator matches the HipeFace encoder. The power-on check switch is turned on by default.

0: Disabled

1: Enabled

H32.01 **Encoder interface switchover switch**

Address:	2032-02h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Default encoder interface

1: Switching encoder interface

Description

Encoder interface

0: Default encoder interface

1: Switching encoder interface

H32.02 **Angle auto-tuning upon power-on**

Address:	2032-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Angle auto-tuning starts after the drive switches to the rdy state and the time (in seconds) defined by H32.41 elapses.
0: Disabled
1: Enabled

H32.03 Angle auto-tuning switch controlled by control word

Address:	2032-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Disabled
1: Control word 6
2: Control word 7

Description
Used to enable the angle auto-tuning switchover switch through the control word.
0: Disabled
1: Control word 6
2: Control word 7

H32.04 Angle auto-tuning state

Address:	2032-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
bit0: bit7 of 6041
bit1: E602.9

Description
Display an alarm or status bit when the incremental encoder is not angle auto-tuned.
Bit0: bit7 of 6041
Bit1: E602.9

H32.05 Pre-positioning retract selection

Address:	2032-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Disabled
1: Enabled

Description

Used to retract by a certain distance after auto-tuning through pre-positioning is done.

0: Disabled

1: Enabled

H32.06 Position feedback

Address:	2032-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Used to align the position feedback to the position before angle auto-tuning for incremental encoders.

0: Disabled

1: Enabled

H32.07 Incremental homing method

Address:	2032-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	9	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Z Signal short circuit

1: Only first short circuit

Description

Set Z signal of the increment encoder during Z signal homing.

0: Z Signal short circuit

1: Only first short circuit

Note: The width of the Z signal is set based on H32.08.

H32.08 Homing signal width

Address:	2032-09h	Effective mode:	Real time
Min.:	100	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	800	Change:	At stop

Value Range:

100–65535

Description

The setpoint is active after the position is latched by Z signal.

H32.10 Max. reference current in angle auto-tuning through inching

Address:	2032-0Bh	Effective mode:	At stop
Min.:	10.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:

10.0% to 300.0%

Description

Defines the maximum reference current during auto-tuning.

H32.13 Motor operation threshold (ROT/DDR) in angle auto-tuning through inching

Address:	2032-0Eh	Effective mode:	At stop
Min.:	0.001	Unit:	deg
Max.:	20.000	Data Type:	UInt16
Default:	0.200	Change:	At stop

Value Range:

0.001deg to 20.000deg

Description

Sets motor operation threshold for position lock angle auto-tuning.
Usually no change is required. If you have special requirements for the operation range, you can adjust this parameter accordingly. The smaller the value, the smaller the operation range during auto-tuning, but the greater the auto-tuning error.

H32.14 Motor standstill threshold (ROT/DDR) in angle auto-tuning through inching

Address:	2032-0Fh	Effective mode:	At stop
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:

0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.15 Motor operation threshold (DDL) in angle auto-tuning through inching

Address:	2032-10h	Effective mode:	At stop
Min.:	0.001	Unit:	mm
Max.:	20.000	Data Type:	UInt16
Default:	0.200	Change:	At stop

Value Range:

0.001 millimeters–20.000 millimeters

Description

Sets motor operation threshold for position lock angle auto-tuning.

Usually no change is required. If you have special requirements for the operation range, you can adjust this parameter accordingly. The smaller the value, the smaller the operation range during auto-tuning, but the greater the auto-tuning error.

H32.16 Motor standstill threshold (DDL) in angle auto-tuning through inching

Address:	2032-11h	Effective mode:	At stop
Min.:	0.1	Unit:	mm/s
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:

0.1 mm/s–100.0 mm/s

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.18 Motor standstill threshold for inching angle auto-tuning

Address:	2032-13h	Effective mode:	At stop
Min.:	0.1	Unit:	s
Max.:	10.0	Data Type:	UInt16
Default:	0.5	Change:	At stop

Value Range:

0.1s to 10.0s

Description

Sets motor standstill threshold for auto-tuning. Usually no change is required.

H32.20 Max. reference current in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-15h	Effective mode:	At stop
Min.:	10.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:

10.0% to 300.0%

Description

Defines the maximum reference current during auto-tuning.

H32.22 Electrical angle reference in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-17h	Effective mode:	At stop
Min.:	0.0	Unit:	deg
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0deg to 360.0deg

Description

Defines the electrical angle during auto-tuning through pre-positioning.

H32.23 Electrical angle reference change range in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-18h	Effective mode:	At stop
Min.:	10.0	Unit:	deg
Max.:	170.0	Data Type:	UInt16
Default:	90.0	Change:	At stop

Value Range:

10.0deg to 170.0deg

Description

Defines the electrical angle change range during auto-tuning.

H32.24 Motor stop threshold (ROT/DDR) in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-19h	Effective mode:	At stop
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:

0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.25 Motor stop threshold (DDL) in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-1Ah	Effective mode:	At stop
Min.:	0.1	Unit:	mm/s
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:

0.1 mm/s–100.0 mm/s

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.26 Damping in angle auto-tuning through pre-positioning (closed-loop)

Address:	2032-1Bh	Effective mode:	At stop
Min.:	0.00	Unit:	[N/(m/s)]/[N · m/rpm]
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	At stop

Value Range:

0.00[N/(m/s)]/[N · m/rpm]–655.35[N/(m/s)]/[N · m/rpm]

Description

Sets the damping coefficient for motor auto-tuning. The appropriate coefficient ensures a smooth and impact-free operation.

(1) This coefficient is usually related to the load characteristics. Larger load requires a larger coefficient.

(2) When the coefficient is too small, the auto-tuning process may be prone to strong impact, which is normal. When it is too large, motor operation may be sluggish or even stops, which is also normal and a timeout alarm will be raised.

H32.29 Motor standstill threshold for close-loop pre-positioning angle auto-tuning

Address:	2032-1Eh	Effective mode:	At stop
Min.:	0.1	Unit:	s
Max.:	10.0	Data Type:	UInt16
Default:	0.5	Change:	At stop

Value Range:

0.1s to 10.0s

Description

Sets motor standstill threshold for auto-tuning. Usually no change is required.

H32.30 Max. reference current in angle auto-tuning through position lock

Address:	2032-1Fh	Effective mode:	At stop
Min.:	10.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:

10.0% to 300.0%

Description

Defines the maximum reference current during auto-tuning.

H32.33 Motor operation threshold (ROT/DDR) in angle auto-tuning through position lock

Address:	2032-22h	Effective mode:	At stop
Min.:	0.001	Unit:	deg
Max.:	20.000	Data Type:	UInt16
Default:	0.200	Change:	At stop

Value Range:

0.001deg to 20.000deg

Description

Sets motor operation threshold for position lock angle auto-tuning.

Usually no change is required. If you have special requirements for the operation range, you can adjust this parameter accordingly. The smaller the value, the smaller the operation range during auto-tuning, but the greater auto-tuning error.

H32.34 Motor standstill threshold (ROT/DDR) in angle auto-tuning through position lock

Address:	2032-23h	Effective mode:	At stop
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:

0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.35 Motor operation threshold (DDL) in angle auto-tuning through position lock

Address:	2032-24h	Effective mode:	At stop
Min.:	0.001	Unit:	mm
Max.:	20.000	Data Type:	UInt16
Default:	0.200	Change:	At stop

Value Range:

0.001 millimeters–20.000 millimeters

Description

Sets motor operation threshold for position lock angle auto-tuning.
Usually no change is required. If you have special requirements for the operation range, you can adjust this parameter accordingly. The smaller the value, the smaller the operation range during auto-tuning, but the greater the auto-tuning error.

H32.36 Motor standstill threshold (DDL) in angle auto-tuning through position lock

Address:	2032-25h	Effective mode:	At stop
Min.:	0.1	Unit:	mm/s
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:

0.1 mm/s–100.0 mm/s

Description

Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.37 Angle gain in angle auto-tuning through position lock

Address:	2032-26h	Effective mode:	At stop
Min.:	0	Unit:	deg/(p/s)
Max.:	10000	Data Type:	UInt16
Default:	1000	Change:	At stop

Value Range:

0deg/(p/s)–10000deg/(p/s)

Description

Defines the angle gain during auto-tuning. A proper setpoint improves the auto-tuning angle accuracy. The default value applies to most of applications.

H32.38 Inertia ratio in angle auto-tuning through position lock

Address:	2032-27h	Effective mode:	At stop
Min.:	0.00	Unit:	-
Max.:	120.00	Data Type:	UInt16
Default:	0.00	Change:	At stop

Value Range:

0.00–120.00

Description

Sets the inertia ratio gain for auto-tuning. A proper value can ensure smooth and jitter-free operation and reduce the operation range.

(1) This coefficient is usually related to the load characteristics. You can just set it to the actual inertia ratio.

(2) A small value may lead to long movement during auto-tuning, which is a normal phenomenon. A large value may lead to gain mismatch oscillation.

H32.39 Gain class in angle auto-tuning through position lock

Address:	2032-28h	Effective mode:	At stop
Min.:	4	Unit:	level
Max.:	31	Data Type:	UInt16

Default:	16	Change:	At stop

Value Range:

4level to 31level

Description

Defines the loop stiffness level gain for auto-tuning. A proper value can ensure smooth and jitter-free operation and reduce the operation range.

(1) A small value may lead to long movement during auto-tuning, which is a normal phenomenon. A large value may lead to gain mismatch oscillation.

H32.40 Left/Right limit function

Address:	2032-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

1. Left limit being positive
2. Left limit being negative

Description

Enables the left and right limit function for the motor.

1. Left limit being positive
2. Left limit being negative

H32.41 Angle auto-tuning delay after power-on

Address:	2032-2Ah	Effective mode:	Real time
Min.:	0	Unit:	s
Max.:	65535	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:

0s to 65535s

Description

Used to set automatic angle auto-tuning delay upon power-on.

H32.45 Black box channel 26 function

Address:	2032-2Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Real-time target speed (60Ffh)

1: Electric angle

Description

Select the black box channel 21 function.
0: Real-time target speed (607Ah)
1: Electric angle

H32.50 32-bit range compatibility

Address:	2032-33h	Effective	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0–99

Description

32-bit range compatibility.

H32.53 Motor standstill threshold for position lock angle auto-tuning

Address:	2032-36h	Effective mode:	At stop
Min.:	0.1	Unit:	s
Max.:	10.0	Data Type:	UInt16
Default:	0.5	Change:	At stop

Value Range:

0.1s to 10.0s

Description

Sets motor standstill threshold for auto-tuning. Usually no change is required.

H32.54 Hall auto-tuning selection

Address:	2032-37h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

When this parameter is enabled, the Hall auto-tuning will be started automatically after basic angle auto-tuning is done.

H32.55 Hall signal UVW manual adjustment

Address:	2032-38h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–7

Description
Set Hall level state.

H32.56 UVW filter time of Hall signal

Address:	2032-39h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	10	Data Type:	UInt16
Default:	5	Change:	Real-time

Value Range:
0 ms–10 ms
Description
Set UVW filter time of Hall signal.

H32.57 Hall closed-loop locked-rotor speed

Address:	2032-3Ah	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	65535	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:
0[mm/s]/[rpm]–65535[mm/s]/[rpm]
Description
Set the Hall closed loop angle auto-tuning locked-rotor speed.

H32.58 Hall closed-loop locked-rotor current

Address:	2032-3Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	120.0	Change:	At stop

Value Range:
0.0% to 300.0%
Description
Set the Hall closed loop angle auto-tuning locked-rotor current.

H32.59 Hall closed-loop locked-rotor window time

Address:	2032-3Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	2000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:
0 ms–2000 ms

Description

Set the Hall closed loop angle auto-tuning locked-rotor window time.

H32.60 Hall closed-loop inertia ratio

Address:	2032-3Dh	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	120.00	Data Type:	UInt16
Default:	0.00	Change:	At stop

Value Range:

0.00–120.00

Description

Set the Hall closed loop angle auto-tuning Inertia ratio.

H32.61 Hall closed-loop rigidity

Address:	2032-3Eh	Effective mode:	Real time
Min.:	4	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	16	Change:	At stop

Value Range:

4–31

Description

Set the Hall closed loop angle auto-tuning rigidity level.

H32.62 Electrical angle save flag

Address:	2032-3Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0–65535

Description

Automatic reset will be performed after the electrical angle is saved when dynamic Hall auto-tuning is done.

H32.63 Hall1 electric angle

Address:	2032-40h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16

Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall1 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.64 Hall2 electric angle

Address:	2032-41h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall2 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.65 Hall3 electric angle

Address:	2032-42h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall3 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.66 Hall4 electric angle

Address:	2032-43h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall4 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.67 Hall5 electric angle

Address:	2032-44h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall5 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.68 Hall6 electric angle

Address:	2032-45h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

The hall6 electrical angle corresponding to the Hall three-phase state after Hall auto-tuning is completed.

H32.70 Motor overload protection mode

Address:	2032-47h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Internal motor overload curve

1: External motor overload curve

2: Current limit overload protection

3: Hide motor overload protection

Description

Set motor overload protection mode
0: Internal motor overload curve
1: External motor overload curve
2: Current limit overload protection
3: Hide motor overload protection

H32.73 Thermal threshold current of overload current limit

Address:	2032-4Ah	Effective mode:	Upon the next power-on
Min.:	10.0	Unit:	%

Max.:	750.0	Data Type:	UInt16
Default:	115.0	Change:	At stop

Value Range:

10.0% to 750.0%

Description

Thermal limit current is a percentage of motor rated current defaulted to 100%, above which the motor starts to heat continuously. The motor current will be finally maintained at this value.

H32.74 Peak current of overload current limit

Address:	2032-4Bh	Effective mode:	Upon the next power-on
Min.:	100.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	300.0	Change:	At stop

Value Range:

100.0% to 750.0%

Description

Defines the ratio of the peak current that can be reached by the motor to the rated current of the motor.

H32.75 Max. current duration of overload protection

Address:	2032-4Ch	Effective mode:	Real time
Min.:	0.01	Unit:	s
Max.:	655.35	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:

0.01s to 655.35s

Description

Calculate the maximum heat that can be reached by the motor based on the maximum current continuous time, and take this value as the motor overload alarm threshold.

H32.76 Current limit time constant of overload protection

Address:	2032-4Dh	Effective mode:	Real time
Min.:	0.01	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:

0.01–655.35

Description

It is related to the maximum current continuous time. The higher the setpoint, the longer the maximum current continuous time will be.

H32.77 Current limit alarm threshold of overload protection

Address:	2032-4Eh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0% to 750.0%

Description

If current limit protection is effective, and the limited current is lower than this value, the drive will raise an alarm.

H32.78 Current limit fault threshold of overload protection

Address:	2032-4Fh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0% to 750.0%

Description

If current limit protection is effective, and the limited current is lower than this value, the drive will report an error.

H32.79 Thermal threshold current of overload

Address:	2032-50h	Effective mode:	Upon the next power-on
Min.:	10.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	115.0	Change:	At stop

Value Range:

10.0% to 750.0%

Description

Set thermal threshold current of overload.

H32.80 Thermal current interval of overload

Address:	2032-51h	Effective mode:	Upon the next power-on
Min.:	0.1	Unit:	%
Max.:	204.8	Data Type:	UInt16
Default:	6.4	Change:	At stop

Value Range:
0.1% to 204.8%
Description
Set the thermal current interval of overload.

H32.81 Overload heat dissipation current interval

Address:	2032-52h	Effective mode:	Upon the next power-on
Min.:	0.1	Unit:	%
Max.:	204.8	Data Type:	UInt16
Default:	6.4	Change:	At stop

Value Range:
0.1% to 204.8%
Description
Set the overload heat dissipation current interval.

H32.82 Length of overload heat dissipation curve

Address:	2032-53h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	-
Max.:	200	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1–200
Description
Set the length of overload heat dissipation curve.

H32.83 Length of overload heat dissipation curve

Address:	2032-54h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	-
Max.:	200	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1–200
Description
Set the length of overload heat dissipation curve.

23.31H33 Compensation Parameters

H33.00 Compensation data BUFFER0

Address:	2033-01h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER0.

H33.01 Compensation data BUFFER1

Address:	2033-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER1.

H33.02 Compensation data BUFFER2

Address:	2033-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER2.

H33.03 Compensation data BUFFER3

Address:	2033-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER3.

H33.04 Compensation data BUFFER4

Address:	2033-05h	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER4.

H33.05 **Compensation data BUFFER5**

Address:	2033-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER5.

H33.06 **Compensation data BUFFER6**

Address:	2033-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER6.

H33.07 **Compensation data BUFFER7**

Address:	2033-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER7.

H33.08 **Compensation data BUFFER8**

Address:	2033-09h	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER8.

H33.09 Compensation data BUFFER9

Address:	2033-0Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER9.

H33.10 Compensation data BUFFER10

Address:	2033-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER10.

H33.11 Compensation data BUFFER11

Address:	2033-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER11.

H33.12 Compensation data BUFFER12

Address:	2033-0Dh	Effective	Real time

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER12.

H33.13 Compensation data BUFFER13

Address:	2033-0Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER13.

H33.14 Compensation data BUFFER14

Address:	2033-0Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER14.

H33.15 Compensation data BUFFER15

Address:	2033-10h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER15.

H33.16 **Compensation data BUFFER16**

Address:	2033-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER16.

H33.17 **Compensation data BUFFER17**

Address:	2033-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER17.

H33.18 **Compensation data BUFFER18**

Address:	2033-13h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER18.

H33.19 **Compensation data BUFFER19**

Address:	2033-14h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER19.

H33.20 **Compensation data BUFFER20**

Address:	2033-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER20.

H33.21 **Compensation data BUFFER21**

Address:	2033-16h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER21.

H33.22 **Compensation data BUFFER22**

Address:	2033-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER22.

H33.23 **Compensation data BUFFER23**

Address:	2033-18h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Set compensation data BUFFER23.

H33.24 **Compensation data BUFFER24**

Address:	2033-19h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER24.

H33.25 **Compensation data BUFFER25**

Address:	2033-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER25.

H33.26 **Compensation data BUFFER26**

Address:	2033-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER26.

H33.27 **Compensation data BUFFER27**

Address:	2033-1Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER27.

H33.28 Compensation data BUFFER28

Address:	2033-1Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER28.

H33.29 Compensation data BUFFER29

Address:	2033-1Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER29.

H33.30 Compensation data BUFFER30

Address:	2033-1Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER30.

H33.31 Compensation data BUFFER31

Address:	2033-20h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER31.

H33.32 Compensation data BUFFER32

Address:	2033-21h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER32.

H33.33 Compensation data BUFFER33

Address:	2033-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER33.

H33.34 Compensation data BUFFER34

Address:	2033-23h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER34.

H33.35 Compensation data BUFFER35

Address:	2033-24h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER35.

H33.36 Compensation data BUFFER36

Address:	2033-25h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER36.

H33.37 Compensation data BUFFER37

Address:	2033-26h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER37.

H33.38 Compensation data BUFFER38

Address:	2033-27h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER38.

H33.39 Compensation data BUFFER39

Address:	2033-28h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–65535
Description
Set compensation data BUFFER39.

H33.40 Current Compensation BUFFER group number

Address:	2033-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–65535

Description

Current Compensation BUFFER group number

H33.41 Compensation data sum

Address:	2033-2Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	32767	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–32767

Description

Set compensation data sum.

H33.44 Data command

Address:	2033-2Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0–1

Description

Data command.

H33.45 Data storage position

Address:	2033-2Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Servo RAM

1: Servo FLASH

2: Encoder FLASH

Description

Set data storage position
0: Servo RAM
1: Servo FLASH
2: Encoder FLASH

H33.46 Data clear

Address:	2033-2Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–3
Description
Data clear.

H33.47 Software tool write status

Address:	2033-30h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0–2
Description
Display software write status: 0 - Idle; 1 - Writing BUFFER; 2 - Writing BUFFER completed

H33.48 Servo read status

Address:	2033-31h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0–65535
Description
Display servo read status: 0 - Idle; 1 - Reading BUFFER; 2 - Reading BUFFER completed

H33.49 Software tool read status

Address:	2033-32h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–2

Description

Display software read status: 0 - Idle; 1 - Reading BUFFER; 2 - Reading BUFFER completed

H33.50 Servo write status

Address:	2033-33h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Display servo write status: 0 - Idle; 1 - Writing BUFFER; 2 - Writing BUFFER completed

H33.51 Data transmission completed flag

Address:	2033-34h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–1

Description

Data transmission completed flag.

H33.52 Servo data transfer completed flag

Address:	2033-35h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Servo data transfer completed flag: 0: Uncompleted; 1: Completed

H33.60 Accuracy compensation function

Address:	2033-3Dh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–1

Description

Used to enable accuracy compensation.

H33.61 Accuracy compensation sum

Address:	2033-3Eh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	count
Max.:	2048	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0count to 2048count

Description

Total accuracy compensation points.

H33.62 Starting offset address of accuracy compensation

Address:	2033-3Fh	Effective mode:	Upon the next power-on
Min.:	-21474836.48	Unit:	[mm]/[deg]
Max.:	21474836.47	Data Type:	Int32
Default:	0.00	Change:	At stop

Value Range:

-21474836.48[mm]/[deg]–21474836.47[mm]/[deg]

Description

The direct-drive motor compensation home of incremental encoder is the home of the mechanical system coordinate.

H33.64 Accuracy compensation data interval

Address:	2033-41h	Effective mode:	Upon the next power-on
Min.:	-327.67	Unit:	[mm]/[deg]
Max.:	327.67	Data Type:	Int16
Default:	0.00	Change:	At stop

Value Range:

-327.67[mm]/[deg]–327.67[mm]/[deg]

Description

Interval of adjacent compensation points of accuracy compensation.

H33.65 Accuracy compensation dial phase sequence

Address:	2033-42h	Effective mode:	Upon the next power-on
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	At stop

Value Range:

0x0 to 0xFFFF

Description

Phase sequence record of accuracy compensation dial stage.

H33.66 Accuracy compensation dial reference direction

Address:	2033-43h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–1

Description

Reference direction record of accuracy compensation dial stage.

H33.67 Servo homing completed

Address:	2033-44h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Accuracy compensation homing completion signal.

H33.68 Current acting index of accuracy compensation

Address:	2033-45h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0–65535

Description

Current compensation position of accuracy compensation.

H33.69 Forced homing start

Address:	2033-46h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0–1

Description

Enables accuracy compensation forced homing.

H33.70 Forced homing mode

Address:	2033-47h	Effective mode:	Upon the next power-on
Min.:	-32768	Unit:	-
Max.:	32767	Data Type:	Int16
Default:	-2	Change:	At stop

Value Range:

-32768–32767

Description

Homing mode record of accuracy compensation dial stage.

H33.71 Forced homing at low speed

Address:	2033-48h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

0[mm/s]/[rpm]–1000[mm/s]/[rpm]

Description

Homing speed record of accuracy compensation dial stage.

H33.72 Single-turn absolute position of accuracy compensation home of absolute encoder

Address:	2033-49h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	At stop

Value Range:

0 to 4294967295

Description

Single-turn absolute value of direct-drive motor compensation home of absolute encoder.

H33.74 Min.pulse width of frequency-division output accuracy compensation

Address:	2033-4Bh	Effective mode:	Upon the next power-on
Min.:	2	Unit:	count
Max.:	7	Data Type:	UInt16
Default:	3	Change:	At stop

Value Range:

2count to 7count

Description

Defines the minimum pulse width of accuracy compensation frequency-division output.

H33.75 Accuracy compensation data unit

Address:	2033-4Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: [um]/[arcsec]

1: [mm]/[mrad]

Description

Defines the accuracy compensation data unit.

For DDL: 0-um; 1-mm;

For DDR: 0-arcsec; 2-mrad

H33.81 Motor cogging torque ripple compensation sum

Address:	2033-52h	Effective mode:	Real time
Min.:	0	Unit:	count
Max.:	65535	Data Type:	UInt16
Default:	2000	Change:	At stop

Value Range:

0count to 65535count

Description

Motor cogging torque ripple compensation sum

23.32H34 Servo Motor Parameters 2

H34.12 **Error type supported by Endat2.2 encoder**

Address:	2034-0Dh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

bit0: Light source; bit1: Signal amplitude; bit2: Position; bit3: Overvoltage; bit4: Undervoltage; bit5: Overcurrent; bit6: Battery

H34.13 **Alarm types supported by EnDat2.2 encoders**

Address:	2034-0Eh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

bit0: Transmission rate too high, bit1: Overtemperature, bit2: Interior light source approaching limit position, bit3: Battery voltage low, bit4: Reference point not reached, bit5: Reserved, bit6: Approaching limit position, bit7: Probe not at position, bit8: Value change too small

H34.14 **Error value output by EnDat2.2 encoder**

Address:	2034-0Fh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

bit0: Light source; bit1: Signal amplitude; bit2: Position; bit3: Overvoltage; bit4: Undervoltage; bit5: Overcurrent; bit6: Battery

H34.15 **Alarm value output by EnDat2.2 encoder**

Address:	2034-10h	Effective mode:	-

Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
bit0: Transmission rate too high, bit1: Overtemperature, bit2: Interior light source approaching limit position, bit3: Battery voltage low, bit4: Reference point not reached, bit5: Reserved, bit6: Approaching limit position, bit7: Probe not at position, bit8: Value change too small

23.331000h Object Dictionary

1000.00h Device type

Address:	1000-00h	Effective mode:	-
Min.:	0x0		
Max.:	0xFFFFFFFF	Unit:	-
Default:	0x0	Data Type:	UInt32
Value range:		Change:	Unchangeable

0x0–0xFFFFFFFF
Description
Device type

1001.00h Error Register

Address:	1001-00h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFF	Data Type:	UInt8
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFF
Description
Error Register

1018.01h Vendor ID

Address:	1018-01h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFFFFFF
Description
Vendor ID

1018.02h Product Code

Address:	1018-02h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Product Code

1018.03h Revision

Address:	1018-03h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Revision

1018.04h Serial number

Address:	1018-04h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
Serial number

1600.00h Number of valid mapped objects in RPDO1

Address:	1600-00h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt8
Default:	0	Change:	Unchangeable

Value Range:
0–20
Description
This object can be modified only when PDO is inactive. When 0 is written, the mapping objects of other sub-indexes are cleared.

1600.01h Mapped object 1 in RPDO1

Address:	1600-01h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
The total length of a mapping object cannot exceed 64 bits. Mapping based on bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.
Sub-indexes are written in the following format:
bit31 to bit16: index
bit15 to bit8:
Object Length
bit7 to bit0:
Sub-index

1600.02h Mapped object in RPDO1

Address:	1600-02h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
See 1600.01h

1600.03h Mapped object 3 in RPDO1

Address:	1600-03h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1600.01h.

1600.04h Mapped object 4 in RPDO1

Address:	1600-04h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1600.01h.

1600.05h Mapped object 5 in RPDO1

Address:	1600-05h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
Same as 1600.01h

1600.06h Mapped object 6 in RPDO1

Address:	1600-06h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1600.01h.

1600.07h Mapped object 7 in RPDO1

Address:	1600-07h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32

Default: 0x0 Change: Unchangeable

Value Range:

0x0 to 0xFFFFFFFF

Description

Same as 1600.01h.

1600.08h Mapped object 8 in RPDO1

Address: 1600-08h Effective mode: -

Min.: 0x0 Unit: -

Max.: 0xFFFFFFFF Data Type: UInt32

Default: 0x0 Change: Unchangeable

Value range:

0x0–0xFFFFFFFF

Description

Same as 1600.01h

1600.09h Mapped object 9 in RPDO1

Address: 1600-09h Effective mode: -

Min.: 0x0 Unit: -

Max.: 0xFFFFFFFF Data Type: UInt32

Default: 0x0 Change: Unchangeable

Value Range:

0x0 to 0xFFFFFFFF

Description

Same as 1600.01h.

1600.0Ah Mapped object in RPDO1

Address: 1600-0Ah Effective mode: -

Min.: 0x0 Unit: -

Max.: 0xFFFFFFFF Data Type: UInt32

Default: 0x0 Change: Unchangeable

Value range:

0x0–0xFFFFFFFF

Description

Same as 1600.01h

1600.0Bh Mapped object 11 in RPDO1

Address: 1600-0Bh Effective mode: -

Min.: 0x0 Unit: -

Max.: 0xFFFFFFFF Data Type: UInt32

Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1600.01h.

1600.0Ch Mapped object 12 in RPDO1

Address:	1600-0Ch	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1600.01h.

1600.0Dh Mapped object 13 in RPDO1

Address:	1600-0Dh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
Same as 1600.01h.

1600.0Eh Mapped object 14 in RPDO1

Address:	1600-0Eh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1600.01h.

1600.0Fh Mapped object 15 in RPDO1

Address:	1600-0Fh	Effective mode:	-

Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1600.01h.

1600.10h Mapped object 16 in RPDO1

Address:	1600-10h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1600.01h.

1600.11h Mapped object 17 in RPDO1

Address:	1600-11h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1600.01h.

1600.12h Mapped object 18 in RPDO1

Address:	1600-12h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range：
0x0–0xFFFFFFFF
Description
Same as 1600.01h.

1600.13h Mapped object 19 in RPDO1

Address:	1600-13h	Effective mode:	-

Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
Same as 1600.01h.

1600.14h Mapped object 20 in RPDO1

Address:	1600-14h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1600.01h.

1A00.00h Number of valid mapped objects in TPDO1

Address:	1A00-00h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt8
Default:	0	Change:	Unchangeable

Value range:
0–20
Description
This object can be modified only when PDO is invalid. The other mapped objects of the sub-index are cleared when 0 is written.

1A00.01h Mapped object 1 in TPDO1

Address:	1A00-01h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
The total length of a mapping object cannot exceed 64 bits. Mapping based on bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.

Sub-indexes are written in the following format:
bit31 to bit16: index
bit15 to bit8:
Object Length
bit7 to bit0:
Sub-index

1A00.02h Mapped object 2 in TPDO1

Address:	1A00-02h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.03h Mapped object 3 in TPDO1

Address:	1A00-03h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.04h Mapped object 4 in TPDO1

Address:	1A00-04h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.05h Mapped object 5 in TPDO1

Address:	1A00-05h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
Same as 1A00.01h

1A00.06h Mapped object 6 in TPDO1

Address:	1A00-06h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.07h Mapped object 7 in TPDO1

Address:	1A00-07h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.08h Mapped object 8 in TPDO1

Address:	1A00-08h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.09h Mapped object 9 in TPDO1

Address:	1A00-09h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.0Ah Mapped object 10 in TPDO1

Address:	1A00-0Ah	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.0Bh Mapped object 11 in TPDO1

Address:	1A00-0Bh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.0Ch Mapped object 12 in TPDO1

Address:	1A00-0Ch	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.0Dh Mapped object 13 in TPDO1

Address:	1A00-0Dh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.0Eh Mapped object 14 in TPDO1

Address:	1A00-0Eh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.0Fh Mapped object 15 in TPDO1

Address:	1A00-0Fh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.10h Mapped object 16 in TPDO1

Address:	1A00-10h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:
0x0–0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.11h Mapped object 17 in TPDO1

Address:	1A00-11h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.12h Mapped object 18 in TPDO1

Address:	1A00-12h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range：
0x0~0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.13h Mapped object 19 in TPDO1

Address:	1A00-13h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1A00.01h.

1A00.14h Mapped object 20 in TPDO1

Address:	1A00-14h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Same as 1A00.01h.

1C12.00h Number of assigned PDOs

Address:	1C12-00h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0x2	Data Type:	UInt8
Default:	0x2	Change:	Unchangeable

Value Range:
0x0 to 0x2
Description
Number of PDOs assigned.

1C12.01h PDO mapping object index of assigned RxPDO1

Address:	1C12-01h	Effective mode:	-
Min.:	0x1600	Unit:	-
Max.:	0x17FF	Data Type:	UInt16
Default:	0x1701	Change:	Unchangeable

Value Range:
0x1600 to 0x17FF
Description
The PDO mapping object of assigned RxPDO1.

1C12.02h PDO mapping object index of assigned RxPDO2

Address:	1C12-02h	Effective mode:	-
Min.:	0x1600	Unit:	-
Max.:	0x17FF	Data Type:	UInt16
Default:	0x170A	Change:	Unchangeable

Value Range:
0x1600 to 0x17FF
Description
The PDO mapping object of assigned RxPDO2.

1C13.00h Number of assigned PDOs

Address:	1C13-00h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0x2	Data Type:	UInt8
Default:	0x2	Change:	Unchangeable

Value range:
0x0–0x2

Description
Indicates the number of assigned PDOs.

1C13.01h PDO mapping object index of assigned TxPDO1

Address:	1C13-01h	Effective mode:	-
Min.:	0x1A00	Unit:	-
Max.:	0x1BFF	Data Type:	UInt16
Default:	0x1B01	Change:	Unchangeable

Value Range:
0x1A00 to 0x1BFF
Description
The PDO mapping object of assigned TxPDO1.

1C13.02h PDO mapping object index of assigned TxPDO2

Address:	1C13-02h	Effective mode:	-
Min.:	0x1A00	Unit:	-
Max.:	0x1BFF	Data Type:	UInt16
Default:	0x1B0A	Change:	Unchangeable

Value Range:
0x1A00 to 0x1BFF
Description
The PDO mapping object of assigned TxPDO2.

1C32.01h Sync mode

Address:	1C32-01h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Synchronization mode.

1C32.02h Cycle time

Address:	1C32-02h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32

Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFFFFFF

Description

Cycle time

1C32.04h Sync modes supported

Address:	1C32-04h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

The synchronization modes that are supported.

1C32.05h Minimum cycle time

Address:	1C32-05h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value range:

0x0–0xFFFFFFFF

Description

Defines the minimum cycle time.

1C33.01h Sync mode

Address:	1C33-01h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value range:

0x0–0xFFFF

Description

Defines the synchronization mode.

1C33.02h Cycle time

Address:	1C33-02h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32

Default: 0x0 Change: Unchangeable

Value Range:
0x0–0xFFFFFFFF

Description
Defines the cycle time.

1C33.04h Sync modes supported

Address: 1C33-04h
Min.: 0x0
Max.: 0xFFFF
Default: 0x0
Effective mode: -
Unit: -
Data Type: UInt16
Change: Unchangeable

Value Range:
0x0–0xFFFF

Description
Defines the synchronization mode supported.

1C33.05h Minimum cycle time

Address: 1C33-05h
Min.: 0x0
Max.: 0xFFFFFFFF
Default: 0x0
Effective mode: -
Unit: -
Data Type: UInt32
Change: Unchangeable

Value Range:
0x0–0xFFFFFFFF

Description
Defines the minimum cycle time.

23.346000h Object Dictionary

603Fh Error code

Address: 603Fh
Min.: 0x0
Max.: 0xFFFF
Default: 0x0
Effective mode: -
Unit: -
Data Type: UInt16
Change: Unchangeable

Value Range:
0x0 to 0xFFFF

Description
When an error described in the DSP402 profile occurs on the servo drive, 603Fh is as described in DSP402.
When an error specified by the user occurs on the servo drive, 603Fh is 0xFF00.
The value of 603Fh is in hexadecimal.
In addition, the object dictionary 203Fh displays auxiliary bytes of fault codes in hexadecimal.
203Fh is a UInt32 value, in which the high 16 bits indicate the internal fault code of the manufacturer, and the low 16 bits indicate the external fault code of the manufacturer.

6040h **Control word**

Address:	6040h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value range:
0x0–0xFFFF
Description
For details, see the communication guide.

6041h **Status word**

Address:	6041h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
For details on the control word, see the Communication Guide.

605Ah **Quick stop mode**

Address:	605Ah	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	7	Data Type:	Int16
Default:	2	Change:	Real-time

Value Range:
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state
2: Ramp to stop as defined by 6085h, keeping de-energized state
3: Stop at emergency stop torque, keeping de-energized state
5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state
6: Ramp to stop as defined by 6085h, keeping position lock state
7: Stop at emergency stop torque, keeping position lock state
Description

Defines the deceleration mode of the motor for stopping rotating upon quick stop and the motor status after stop.
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state

2: Ramp to stop as defined by 6085h, keeping de-energized state
3: Stop at emergency stop torque, keeping de-energized state
5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state
6: Ramp to stop as defined by 6085h, keeping position lock state
7: Stop at emergency stop torque, keeping position lock state
Note: When the brake function is enabled and the value of 605Ah is lower than 4, the stop mode is forcibly set to "2: Ramp to stop as defined by 6085h, keeping de-energized state".

605Ch Stop mode at S-OFF

Address:	605Ch	Effective mode:	At stop
Min.:	-4	Unit:	-
Max.:	2	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:
–4: Ramp to stop as defined by 6085h, keeping dynamic braking state
–3: at zero speed, keeping dynamic braking state
–2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state
–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state
2: Dynamic braking stop, keeping de-energized state
Description
Defines the deceleration mode of the motor for stopping rotating upon S-ON OFF and the motor status after stop.
–4: Ramp to stop as defined by 6085h, keeping dynamic braking state
–3: Stop at zero speed, keeping dynamic braking state
–2: Ramp to stop as defined by 6084h/609Ah, keeping dynamic braking state
–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah, keeping de-energized status
2: Dynamic braking stop, keeping de-energized state
Note: After the brake is enabled, 605Ch is forced to "4: Ramp to stop as defined by 6085h, keeping dynamic braking state".

605Dh Halt mode

Address:	605Dh	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	3	Data Type:	Int16
Default:	1	Change:	Real-time

Value Range:

1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping position lock state
2: Ramp to stop as defined by 6085h, keeping position lock state
3: Stop at emergency stop torque, keeping position lock state

Description

Defines the deceleration mode of the motor for stopping rotating upon S-ON pause and the motor status after stop.
1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping position lock state
2: Ramp to stop as defined by 6085h, keeping position lock state
3: Stop at emergency stop torque, keeping position lock state

605Eh Stop mode at No. 2 fault

Address:	605Eh	Effective mode:	At stop
Min.:	-5	Unit:	-
Max.:	4	Data Type:	Int16
Default:	2	Change:	Real-time

Value Range:

–5: Stop at zero speed, keeping dynamic braking state
–4: Stop at emergency stop torque, keeping dynamic braking state
–3: Ramp to stop as defined by 6085h, keeping dynamic braking state
–2: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping dynamic braking state
–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping de-energized state
2: Ramp to stop as defined by 6085h, keeping de-energized state
3: Stop at emergency stop torque, keeping de-energized state
4: Dynamic braking stop, keeping de-energized state

Description

Defines the deceleration mode of the servo motor for stopping rotating and the servo motor status when a No. 2 fault occurs.
–5: Stop at zero speed, keeping dynamic braking state
–4: Stop at emergency stop torque, keeping dynamic braking state
–3: Ramp to stop as defined by 6085h, keeping dynamic braking state

–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state
2: Ramp to stop as defined by 6085h, keeping de-energized stat
3: Stop at emergency stop torque, keeping de-energized state
4: Dynamic braking stop, keeping de-energized state
Note: If the brake is enabled, 605Eh is forced to "3: Ramp to stop as defined by 6085h, keeping dynamic braking state".

6060h Servo drive mode

Address:	6060h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
1: Profile position (PP) mode
3: Profile velocity (PV) mode
4: Profile torque (PT) mode
6: Homing (HM) mode
8: CSP mode
9: CSV mode
10: CST mode

Description
It defines the operation mode of the servo drive.
1: Profile position (PP) mode
3: Profile velocity (PV) mode
4: Profile torque (PT) mode
6: Homing (HM) mode
8: CSP mode
9: CSV mode
10: CST mode
An SDO error will be returned if you have selected an unsupported servo mode through SDO.
If an unsupported operation mode is selected through a PDO, the change of the operation mode will be invalid.

6061h Operation mode display

Address:	6061h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
1: Profile position (PP) mode
3: Profile velocity (PV) mode
4: Profile torque (PT) mode

6: Homing (HM) mode
8: CSP mode
9: CSV mode
10: CST mode

Description

Indicates the actual operation mode.
1: Profile position (PP) mode
3: Profile velocity (PV) mode
4: Profile torque (PT) mode
6: Homing (HM) mode
8: CSP mode
9: CSV mode
10: CST mode

6062h **Position reference**

Address:	6062h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the real-time position reference (reference unit).

6063h **Position actual value**

Address:	6063h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the absolute position feedback (encoder unit) of the motor in real time.

6064h **Position actual value**

Address:	6064h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the absolute position feedback (reference unit) in real time.

Position actual value in user-defined unit (6064h) x Gear ratio (6091h) = Position actual value in encoder unit (6063h)

6065h Following error window

Address:	6065h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit
Max.:	4294967295	Data Type:	UInt32
Default:	219895614	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the threshold of excessive position deviation (reference unit).

When the difference value between position demand value (6062h) and position actual value (6064h) keeps exceeding ±6065h after the time defined by 6066h elapses, B00.0 (Position deviation too large) occurs.

6066h Defines the time lapse to trigger excessive position deviation (EB00.0).

Address:	6066h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Defines the time lapse to trigger excessive position deviation (EB00.0), which must be used together with 6065h.

6067h Position window

Address:	6067h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit
Max.:	4294967295	Data Type:	UInt32
Default:	46976	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the threshold for position reach.

If the difference between 6062h and 6064h is within ±6067h and the time reaches 6068h, the position is reached. In this case, bit 10 of 6041h is set to 1 in the profile position mode.
This flag bit is valid only when the S-ON signal is valid in profile position control mode.

6068h **Position window time**

Address:	6068h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Defines the window time for position reach, which must be used together with 6067h.

606Ch **Actual speed**

Address:	606Ch	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit/s
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
–2147483648 to +2147483647
Description
It indicates the velocity actual value.

606Dh **Velocity window**

Address:	606Dh	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0[mm/s]/[rpm]–65535[mm/s]/[rpm]
Description
Defines the threshold for speed reach.
If the difference value between the target speed 60FFh and the actual speed 606Ch is within ±606Dh and the time reaches 606Eh, the speed is reached and bit 10 of the status word 6041h is set to 1 in the profile velocity (PV) mode.
This flag bit is meaningful only when the servo drive is enabled in PV mode.

606Eh Velocity window time

Address:	606Eh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Defines the time window for speed reach, which must be used together with 606Dh.

606Fh Zero speed signal threshold

Address:	606Fh	Effective mode:	Real time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–65535[mm/s]/[rpm]

Description

Defines the threshold for determining whether the user velocity is 0.

When 606Ch is within ±606Fh and the time reaches the value set by 6070h, the user velocity is 0. When either condition is not met, the user velocity is not 0.

This flag bit is valid only in PV mode.

This flag bit is unrelated to the enable/disable state of the servo drive.

6070h Velocity threshold time

Address:	6070h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Defines the time window for determining whether the user velocity is 0, which must be used together with 606Fh.

6071h Target torque

Address:	6071h	Effective mode:	Real time
Min.:	-4000	Unit:	0.10%
Max.:	4000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-4000.%–4000.%

Description

Defines the target torque of the servo drive in the profile torque mode.

The value 1000 corresponds to the rated torque of the motor.

6072h Max. torque reference

Address:	6072h	Effective mode:	Real time
Min.:	0	Unit:	0.10%
Max.:	4000	Data Type:	UInt16
Default:	3500	Change:	Real-time

Value Range:

0.%–4000.%

Description

Defines the maximum torque reference limit.

The value 1000 corresponds to the rated torque of the motor.

6074h Torque reference

Address:	6074h	Effective mode:	-
Min.:	-4000	Unit:	0.10%
Max.:	4000	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-4000.%–4000.%

Description

Defines the target torque value.

The value 1000 corresponds to the rated torque of the motor.

6077h Actual torque

Address:	6077h	Effective mode:	-
Min.:	-4000	Unit:	0.10%
Max.:	4000	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-4000.%–4000.%

Description

It displays the internal actual torque of the servo drive.

The value 1000 corresponds to the rated torque of the motor.

607Ah Target position

Address:	607Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the target position of the servo drive in the profile position mode.

When bit 6 of 6040h is set to 0, 607Ah indicates the absolute target position of current segment.

After positioning of current segment is done, the value of 6064h will be the same as the value of 607Ah.

When bit 6 of 6040h is set to 1, 607Ah indicates the target increment displacement of current segment.

After positioning of current segment is done, user displacement increment will be the same as the value of 607Ah.

607Ch Home offset

Address:	607Ch	Effective mode:	At stop
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the physical location of mechanical zero that deviates from the home of the motor in position control modes (profile position mode, interpolation mode, and homing mode).

The home offset takes effect in the following conditions: The device is powered on, the homing operation is complete, and bit15 of 6041h is set to 1.

After homing is done, the position actual value (6064h) will be the same as the value of 607Ch.

If 607Ch is outside the value of 607Dh (Software position limit), E09.1 (Home setting error) will occur.

607D.01h Min. position limit

Address:	607D-01h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	-2147483648	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the minimum software position limit relative to the mechanical zero point.

Minimum software position limit = (607D.01h)

The software position limit is used to judge the absolute position. When homing is not performed, the internal software position limit is invalid.

The condition for activating the software position limit is set in H0A.01 (object dictionary 0x200A.02h).

607D.02h Max. position limit

Address:	607D-02h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	2147483647	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the maximum software position limit relative to the mechanical zero.

Maximum software position limit = (607D.02h)

607Eh Reference polarity

Address:	607Eh	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0xFF

Description

Defines the polarity of position or speed references.

When bit 7 is 1, it indicates the position reference is multiplied by "–1" and the motor direction is reversed in the standard position mode or interpolation mode.

When bit 6 is 1, it indicates the speed reference (60FFh) is multiplied by "–1" and the motor direction is reversed in the speed mode.

When bit 5 is 1, it indicates the torque demand value (6071h) is multiplied by "–1" and the motor direction is reversed in the torque mode.

Other bits are meaningless.

607Fh **Max. speed**

Address:	607Fh	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the maximum user running speed.

Set a proper gear ratio (8:1 recommended) when using a 26-bit encoder. Otherwise, the motor speed will be limited to 3840 [mm/s]/[rpm].

6081h **Profile velocity**

Address:	6081h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	111848106	Change:	Real-time

Value Range:

0 to 4294967295

Description

It sets the average velocity normally attained at the end of the acceleration ramp during a profiled motion.

The setpoint takes effect after the slave receives the displacement reference.

6083h **Profile acceleration**

Address:	6083h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s^2
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the acceleration rate in the acceleration stage of the displacement reference in the profile position mode.

The following formula applies if a motor equipped with 23-bit encoder needs to run at 400 [mm/s]/[rpm] (6081h: 400 x 8388608/60) with acceleration rate being 400 [mm/s]/[rpm]/s (6083h: 400 x 8388608/60) and deceleration rate being 200 [mm/s]/[rpm]/s (6084h: 200 x 8388608/60) under a gear ratio of 1:1:

Acceleration time tup = Δ6081h/ Δ6083h = 1 (s); Deceleration time tdown = Δ6081h/ Δ6084h = 2 (s).

The setpoint 0 will be forcibly changed to 1.

6084h **Profile deceleration**

Address:	6084h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s²
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the deceleration rate in the deceleration stage of the displacement reference in the profile position mode.

The following formula applies if a motor equipped with 23-bit encoder needs to run at 400 [mm/s]/[rpm] (6081h: 400 x 8388608/60) with acceleration rate being 400 [mm/s]/[rpm]/s (6083h: 400 x 8388608/60) and deceleration rate being 200 [mm/s]/[rpm]/s (6084h: 200 x 8388608/60) under a gear ratio of 1:1:

Acceleration time tup = Δ6081h/ Δ6083h = 1 (s); Deceleration time tdown = Δ6081h/ Δ6084h = 2 (s).
The setpoint 0 will be forcibly changed to 1.

6085h **Quick stop deceleration**

Address:	6085h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s²
Max.:	4294967295	Data Type:	UInt32
Default:	2147483647	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the deceleration rate when the quick stop command (6040h = 0x0002) is active and 605Ah (Quick stop option code) is set to 2 or 5.
The setpoint 0 will be forcibly changed to 1.

6087h **Torque slope**

Address:	6087h	Effective mode:	Real time
Min.:	0	Unit:	0.1%/s
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:

0.%/s–4294967295.%/s

Description

It sets the rate of change of torque in profile torque mode, in unit of torque increment per second.

In the profile torque mode, if 605Ah is set to 1, 2, 5, or 6, or 605Dh is set to 1 or 2, the servo drive decelerates to stop as defined by 6087h.

If the value exceeds the torque reference limit, the servo drive runs at the limit. The setting value 0 will be forcibly changed into 1.

6091.01h Motor resolution

Address:	6091-01h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1	Change:	At stop

Value Range:

1–4294967295

Description

Defines the numerator of the gear ratio.

Defines the proportional relation between the load shaft displacement designated by the user and the motor shaft displacement.

The relation between motor position feedback (encoder unit) and load shaft position feedback (reference unit) is as follows.

Motor position feedback = Load shaft position feedback x Gear ratio

The relation between the motor speed ([mm/s]/[rpm]) and the load shaft speed (reference unit/s) is as follows:

Motor speed ([mm/s]/[rpm]) = Load shaft speed * 6091h * 60/Encoder resolution

The motor acceleration ([mm/s]/[rpm]/ms) and the load shaft acceleration (reference unit/s2) is in the following relationship:

Motor acceleration ([mm/s]/[rpm]/ms) = Load shaft acceleration * 6091h * 1000 / Encoder resolution / 60

6091.02h Shaft resolution

Address:	6091-02h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1	Change:	At stop

Value Range:

1–4294967295

Description

Defines the denominator of the gear ratio.

6098h Homing method

Address:	6098h	Effective mode:	Real time
Min.:	-3	Unit:	-
Max.:	35	Data Type:	Int8

Default: 1 Change: Real-time

Value Range:

-3–35

Description

It selects the homing method.

-3 Nearby, Z signal as home.

-2 Forward, positive mechanical limit as deceleration point and Z signal as home.

-1 Reverse, negative mechanical limit as deceleration point and Z signal as home.

1 Reverse, negative limit switch as deceleration point and Z signal as home, falling edge of the negative limit switch signal must be reached before Z signal.

2 Forward, positive limit switch as deceleration point and Z signal as home, falling edge of positive limit switch signal must be reached before Z signal.

3 Forward, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.

4 Reverse, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.

5 Reverse, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.

6 Forward, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.

7 Forward, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.

8 Forward, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.

9 Forward, home switch as deceleration point and Z signal as home, rising edge on the other side of the home switch signal must be reached before Z signal.

10 Forward, home switch as deceleration point and Z signal as home, falling edge on the other side of the home switch signal must be reached before Z signal.

11 Reverse, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.

12 Reverse, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.

13 Reverse, home switch as deceleration point and Z signal on the other side of the home switch signal as home, rising edge on the other side of the home switch signal must be reached before Z signal.

14 Reverse, home switch as deceleration point and Z signal on the other side of the home switch signal as home, falling edge on the other side of the home switch signal must be reached before Z signal.

17–32 are similar to 1–14 except that the deceleration point coincides with the home.
33 Reverse, Z signal as home.
34 Forward, Z signal as home.
Current position as the home
When 6098h is set to 15, 16, 31 or 32, it is meaningless and the servo drive does not perform the homing operation.

6099.01h Speed during search for switch

Address:	6099-01h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	111848106	Change:	At stop

Value Range:
0 to 4294967295
Description
Defines the speed during search for the deceleration point signal. A large setpoint helps prevent E601.0 (Homing timeout).

6099.02h Speed during search for zero

Address:	6099-02h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	11184810	Change:	At stop

Value Range:
0 to 4294967295
Description
Defines the speed in searching for the home signal. Setting this speed to a low value prevents overshoot during stop at high speed, avoiding excessive deviation between the stop position and the set mechanical home.

609Ah Homing acceleration

Address:	609Ah	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s²
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:
0 to 4294967295

Description

It sets the acceleration during the homing operation.

60B0h Position offset

Address:	60B0h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Sets the position offset.

60B1h Velocity offset

Address:	60B1h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit/s
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

–2147483648 to +2147483647

Description

Set the velocity offset.

60B2h Torque offset

Address:	60B2h	Effective mode:	Real time
Min.:	-4000	Unit:	0.10%
Max.:	4000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-4000.%–4000.%

Description

Sets the torque offset.

60B8h Touch probe function

Address:	60B8h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0x0 to 0xFFFF

Description

-

bit	Name	Description
0	Touch probe 1 function selection 0: Probe 1 disabled 1: Probe 1 enabled	Bit0 to bit5: settings related to probe 1 When a DI is used to trigger the touch probe function, the DI source cannot be changed once the touch probe function is enabled. For absolute encoders, Z signal refers to the zero point of the single-turn position feedback.
1	Touch probe 1 trigger mode 0: Single trigger mode (Latches the position at the first trigger event.) 1: Continuous trigger mode	
2	Touch probe 1 trigger signal selection 0: DI signal 1: Z signal	
3	N/A	
4	Touch probe 1 positive edge 0: Latching at positive edge disabled 1: Latching at positive edge enabled	
5	Touch probe 1 negative edge 0: Latching at negative edge disabled 1: Latching at negative edge enabled	
6–7	N/A	-
8	Touch probe 2 function selection 0: Probe 2 disabled 1: Probe 2 enabled	Bit8 to bit13: settings related to probe 2
9	Touch probe 2 trigger mode 0: Single trigger mode (Latches the position at the first trigger event.) 1: Continuous trigger mode	
10	Touch probe 2 trigger signal selection 0: DI signal 1: Z signal	
11	N/A	
12	Touch probe 2 positive edge 0: Latching at positive edge disabled 1: Latching at positive edge enabled	
13	Touch probe 2 negative edge 0: Latching at negative edge disabled 1: Latching at negative edge enabled	
14–15	N/A	-

60B9h Touch probe status

Address:	60B9h	Effective mode:	-
Min.:	0x0	Unit:	-

Max.: 0xFFFF Data Type: UInt16
Default: 0x0 Change: Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Defines the functions of touch probe 1 and touch probe 2.

See the following table for descriptions of each bit of 60B9h.

bit	Name	Description
0	Touch probe 1 function selection 0: Probe 1 disabled 1: Probe 1 enabled	Bit0 to bit2: Status of probe 1
1	Touch probe 1 positive edge value 0: No positive edge value latched 1: Edge value latched	
2	Touch probe 1 negative edge value 0: No negative edge value latched 1: Negative edge value latched	
3–5	N/A	-
6–7	When the function of probe 1 is selected as continuous sampling, the total number of times the probe is triggered	When the function of probe 1 is selected as continuous sampling, the total number of times (0–3) the probe is triggered
8	Probe 2 enable: 0: Probe 2 disabled 1: Probe 2 enabled	Bit8 to bit10: Status of probe 2
9	Touch probe 2 positive edge value 0: No positive edge value latched 1: Edge value latched	
10	Touch probe 2 negative edge value 0: No negative edge value latched 1: Negative edge value latched	
11–13	N/A	-
14–15	When the function of probe 2 is selected as continuous sampling, the total number of times the probe is triggered	When the function of probe 2 is selected as continuous sampling, the total number of times (0–3) the probe is triggered

60BAh Touch probe 1 positive edge position value

Address: 60BAh Effective mode: -
Min.: -2147483648 Unit: Reference unit
Max.: 2147483647 Data Type: Int32
Default: 0 Change: Unchangeable

Value Range:
-2147483648–2147483647
Description
Indicates the position feedback value (reference unit) latched at positive edge of touch probe 1 signal.

60BBh **Touch probe 1 negative edge position value**

Address:	60BBh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Indicates the position feedback value (reference unit) latched at negative edge of touch probe 1 signal.

60BCh **Touch probe 2 positive edge position value**

Address:	60BCh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648–147483647
Description
Indicates the position feedback value (reference unit) latched at positive edge of touch probe 2 signal.

60BDh **Touch probe 2 negative edge position value**

Address:	60BDh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Indicates the position feedback value (reference unit) latched at negative edge of touch probe 2 signal.

60C5h **Max. acceleration**

Address:	60C5h	Effective mode:	-

Min.:	0	Unit:	Reference unit/s²
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:
0 to 4294967295
Description
Defines the maximum permissible acceleration rate of the acceleration segment in the profile position mode, profile velocity mode, and homing mode.
The setpoint 0 will be forcibly changed to 1.

60C6h Max. deceleration

Address:	60C6h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s²
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:
0 to 4294967295
Description
Defines the maximum permissible deceleration in the profile position mode, profile velocity mode, and homing mode.
The setpoint 0 will be forcibly changed to 1.

60D5h Touch probe 1 positive edge counter

Address:	60D5h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
The counting value is added by "1" each time this object is triggered.

60D6h Touch probe 1 negative edge counter

Address:	60D6h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
The counting value is added by "1" each time this object is triggered.

60D7h **Touch probe 2 positive edge counter**

Address:	60D7h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

The counting value is added by "2" each time this object is triggered.

60D8h **Touch probe 2 negative edge counter**

Address:	60D8h	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

The counting value is added by "2" each time this object is triggered.

60E0h **Positive torque limit**

Address:	60E0h	Effective mode:	Real time
Min.:	0	Unit:	0.10%
Max.:	4000	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:

0.%–4000.%

Description

It sets the maximum positive torque in the motor.

60E1h **Negative torque limit**

Address:	60E1h	Effective mode:	Real time
Min.:	0	Unit:	0.10%
Max.:	4000	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:

0.%–4000.%

Description

It sets the maximum negative torque in the motor.

60F4h **Position deviation**

Address:	60F4h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position deviation (reference unit).

60FCh **Position reference**

Address:	60FCh	Effective mode:	-
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648–2147483647

Description

Indicates the position reference (encoder unit).

If no alarm is detected when the S-ON signal is active, the relation between the position reference in reference unit and that in encoder unit is as follows:

60FCh (in encoder unit) = 6062h (in reference unit) x 6091h

60FDh **DI state**

Address:	60FDh	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFFFFFF

Description

Indicates current DI logic of the drive.

0: Inactive

1: Active

The signal indicated by each bit is described as follows:

Bit signal
0: Reverse overtravel signal active
1: Forward overtravel signal active
2: Home signal active
3–15: N/A
16: DI1 input active
17: DI2 input active
18: DI3 input active
19: DI4 input active
20: DI5 input active
21–26: N/A
27: STO1 signal input
28: STO2 signal input
29: EDM output active
30: Z signal is active
31: N/A

60FFh PV, CSV mode speed reference

Address:	60FFh	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit/s
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
–2147483648 to +2147483647
Description
Defines the target speed in the cyclic synchronous velocity mode/profile velocity mode.

60FE.01h Physical output

Address:	60FE-01h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0xFFFFFFFF
Description
Indicates the DO logic.
The signal indicated by each bit is described as follows:

Description of bits
0–15: N/A
16: DO1 forced output (0: off, 1: on), when bit16 of 60FE.02h is set to 1
17: DO2 forced output (0: off, 1: on), when bit17 of 60FE.02h is set to 1
18–25: N/A
26: Gain switching performs P/PI switching, only when bit 26 of 60FE.02h is set to 1
27–31: N/A

60FE.02h Bitmask

Address:	60FE-02h	Effective mode:	Real time
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0xFFFFFFFF
Description
0 to 15: N/A
16: Forced DO1 output enable
17: Forced DO2 output enable
18 to 25: N/A
26: P/PI switchover enable
27 to 31: N/A

24 Parameter List [Functional Safety P]

24.1 H02 Parameters

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H02.02	2002-03h	Rotation direction selection	0: Counterclockwise (CCW) as forward direction 1: Clockwise (CW) as forward direction	0	-	At stop	
H02.11	2002-0Ch	Motor speed threshold at brake output OFF in rotation state	20 rpm to 3000 rpm	30	RPM	Real-time	
H02.12	2002-0Dh	Delay from S-ON OFF to brake output OFF in rotation state	1ms to 65535ms	500	ms	Real-time	

24.2 H0A Parameters

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H0A.73	200A-4Ah	STO 24 V disconnection filter time	1ms to 5ms	5	ms	Real-time	
H0A.74	200A-4Bh	Filter time for two inconsistent STO channels	1ms to 1000ms	100	ms	Real-time	
H0A.75	200A-4Ch	Servo OFF delay after STO triggered	0ms to 25ms	20	ms	Real-time	

24.3 H20 Parameters



Before apply any safety function, ensure that it is enabled on the drive.

Parameter	Name	Value	Default	Unit	Change Mode	Page
H20.00	Safety module software version	0.00 to 655.35	0.00	-	Unchangeable	
H20.01	Safety function trigger selection	0: Local trigger 0: Local trigger 1: FSoE trigger-SRA	0	-	At stop	
H20.02	Safety module DI1 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop	
H20.03	Safety module DI2 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop	
H20.04	Safety module DI3 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1	0	-	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
		6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack				
H20.05	Safety module DI4 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop	
H20.06	Safety module DI5 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop	
H20.08	Safety module DI1 noise rejection filter time	1 ms–500 ms	5	ms	At stop	
H20.09	Safety module DI2 noise rejection filter time	1 ms–500 ms	5	ms	At stop	
H20.10	Safety module DI3 noise rejection filter time	1 ms–500 ms	5	ms	At stop	
H20.11	Safety module DI4 noise	1 ms–500 ms	5	ms	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
	rejection filter time					
H20.12	Safety module DI5 noise rejection filter time	1 ms–500 ms	5	ms	At stop	
H20.14	Safety module DI1 allowable discrepancy time	5 ms–60000 ms	10	ms	At stop	
H20.15	Safety module DI2 allowable discrepancy time	5 ms–60000 ms	10	ms	At stop	
H20.16	Safety module DI3 allowable discrepancy time	5 ms–60000 ms	10	ms	At stop	
H20.17	Safety module DI4 allowable discrepancy time	5 ms–60000 ms	10	ms	At stop	
H20.18	Safety module DI5 allowable discrepancy time	5 ms–60000 ms	10	ms	At stop	
H20.20	Safety module DO1 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
H20.21	Safety module DO2 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop	
H20.22	Safety module DO3 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop	
H20.23	Safety module DO4 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop	
H20.24	Safety module DO5 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active	0	-	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
		5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active				
H20.25	Safety module DO6 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop	
H20.28	STO trigger-to-SBC active delay time	-30000 ms–30000 ms	-30	ms	At stop	
H20.29	SS1/SS2 stop mode	0: Stop according to ramp 1: Stop by host controller	1	-	At stop	
H20.30	SS1/SS2 ramp-to-stop reference speed	60 rpm to 6000 rpm	1000	rpm	At stop	
H20.31	SS1/ SS2 ramp-to-stop deceleration time	1 ms–65535 ms	500	ms	At stop	
H20.32	SS1 monitor mode	0:SS1-t 1:SS1-r	0	-	At stop	
H20.33	SS1 trigger-to-STO delay time/SS2 trigger-to-STO delay time	0 ms–65535 ms	1000	ms	At stop	
H20.34	SS1/ SS1 zero speed threshold	1 rpm to 6000 rpm	10	rpm	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
H20.35	SS1/SS2 zero speed threshold time	0 ms–65535 ms	0	ms	At stop	
H20.36	SS1/SS2 ramp monitor start delay time	5 ms–65535 ms	10	ms	At stop	
H20.37	SS1/SS2 ramp monitor reference speed	60 rpm to 6000 rpm	1000	rpm	At stop	
H20.38	SS1/SS2 ramp deceleration monitor time	1 ms–65535 ms	65535	ms	At stop	
H20.41	SS1/SS2 ramp limit trigger-to-alarm time	0 ms–65535 ms	5	ms	At stop	
H20.42	SS1/SS2 ramp monitor stop speed	0 rpm to 6000 rpm	1	rpm	At stop	
H20.43	SS2 monitor mode	0:SS2-t 1:SS2-r	0	-	At stop	
H20.44	SOS speed change threshold	1 rpm to 6000 rpm	10	rpm	At stop	
H20.45	SOS position change threshold	1 to 536870912	932067	encoder unit	At stop	
H20.47	SOS overthres hold-to-alarm time	0 ms–65535 ms	5	ms	At stop	
H20.48	SLS1 switchover delay	0 ms–65535 ms	100	ms	At stop	
H20.49	SLS2 switchover delay	0 ms–65535 ms	100	ms	At stop	
H20.50	SLS3 switchover delay	0 ms–65535 ms	100	ms	At stop	
H20.51	SLS4 switchover delay	0 ms–65535 ms	100	ms	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
H20.52	SLS1 threshold	0 rpm to 6000 rpm	1000	rpm	At stop	
H20.53	SLS2 threshold	0 rpm to 6000 rpm	1000	rpm	At stop	
H20.54	SLS3 threshold	0 rpm to 6000 rpm	1000	rpm	At stop	
H20.55	SLS4 threshold	0 rpm to 6000 rpm	1000	rpm	At stop	
H20.56	SLS1 filter time	0 ms–65535 ms	100	ms	At stop	
H20.57	SLS2 filter time	0 ms–65535 ms	100	ms	At stop	
H20.58	SLS3 filter time	0 ms–65535 ms	100	ms	At stop	
H20.59	SLS4 filter time	0 ms–65535 ms	100	ms	At stop	
H20.60	SLS fault response mode	0:STO 1:SS1-t	0	-	At stop	
H20.70	SSM upper limit	–6000 rpm to 6000 rpm	200	rpm	At stop	
H20.71	SSM lower limit	–6000 rpm to 6000 rpm	-200	rpm	At stop	
H20.72	SSM hysteresis threshold	0 rpm to 6000 rpm	10	rpm	At stop	
H20.74	SDI zero position threshold	1 to 536870912	932067	encoder unit	At stop	
H20.76	SDI zero speed threshold	0 rpm to 3000 rpm	10	rpm	At stop	
H20.77	SDI delay time	0 ms–65535 ms	0	ms	At stop	
H20.78	SDI fault response mode	0:STO 1:SS1-t	0	-	At stop	

25 Description of Parameters [Functional safety P]

25.1 H02 Basic Control Parameters

H02.02 **Rotation direction selection**

Hex:	2002-03h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Counterclockwise (CCW) as forward direction
1: Clockwise (CW) as forward direction

Description

Defines the forward direction of the motor when viewed from the motor shaft side.

H02.11 **Motor speed threshold at brake output OFF in rotation state**

Hex:	2002-0Ch	Effective mode:	Real time
Min.:	20	Unit:	rpm
Max.	3000		
Default:	30	Data type:	UInt16
		Change:	Real-time

Value Range: 20 rpm to 3000 rpm

Description

Defines the motor speed threshold when brake (BK) output is OFF in the rotating state.

H02.12 **Delay from S-ON OFF to brake output OFF in rotation state**

Hex:	2002-0Dh	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.	65535	Data type:	UInt16
Default:	500	Change:	Real-time

Value Range:

1 ms to 65535 ms

Description

Sets the delay time from BK OFF to S-ON OFF when the motor is in rotating state.

25.2 H0A Fault and Protection Parameters

H0A.73 **STO 24 V disconnection filter time**

Hex:	200A-4Ah	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.:	5	Data type:	UInt16
Default:	5	Change:	Real-time

Value Range:
1ms to 5ms
Description
Defines the filter time from the moment when STO2 is disconnected from the 24 V power supply to the moment when the STO status is displayed or E150.0 is reported.

H0A.74 **Filter time for two inconsistent STO channels**

Hex:	200A-4Bh	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.:	1000	Data type:	UInt16
Default:	100	Change:	Real-time

Value Range:
1ms to 1000ms
Description
Defines the filter time from the moment when STO2 is input with different voltage to the moment when E150.1 is reported.

H0A.75 **Servo OFF delay after STO triggered**

Hex:	200A-4Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	25	Data type:	UInt16
Default:	20	Change:	Real-time

Value Range:
0 ms to 25 ms
Description
Defines the delay from the moment the STO state is triggered to the moment the S-ON signal is switched off.

25.3 H20 Functional Safety Parameters

Note

It is recommended to verify the safety function when you are configuring the safety parameters.

H20.00 Safety module software version

Hex:	2020-01h	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:

0.00 to 655.35

Description

Displays the software version of the safety module and consists of two decimal places.

H20.01 Safety function trigger selection

Hex:	2020-02h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Local trigger

1: FSoE trigger

Description

Sets the trigger of the safety function.

H20.02 Safety module DI1 function selection

Hex:	2020-03h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	11	Data type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inactive

1: STO

2: SBC

3: SS1
4: SS2
5: SLS1
6: SLS2
7: SLS3
8: SLS4
9: SDIp
10: SDIn
11: Ack

Description

Assigns function to DI1 terminal of the safety module.

H20.03 Safety module DI2 function selection

Hex:	2020-04h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	11	Data type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inactive
1: STO
2: SBC
3: SS1
4: SS2
5: SLS1
6: SLS2
7: SLS3
8: SLS4
9: SDIp
10: SDIn
11: Ack

Description

Assigns function to DI2 terminal of the safety module.

H20.04 Safety module DI3 function selection

Hex:	2020-05h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	11	Data type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inactive

1: STO
2: SBC
3: SS1
4: SS2
5: SLS1
6: SLS2
7: SLS3
8: SLS4
9: SDIp
10: SDIn
11: Ack

Description

Assigns function to DI3 terminal of the safety module.

H20.05 **Safety module DI4 function selection**

Hex:	2020-06h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	11		
Default:	0		
Value Range:		Data type:	UInt16
0: Inactive		Change mode:	Change at stop

1: STO
2: SBC
3: SS1
4: SS2
5: SLS1
6: SLS2
7: SLS3
8: SLS4
9: SDIp
10: SDIn
11: Ack

Description

Assigns function to DI3 terminal of the safety module.

H20.06 **Safety module DI5 function selection**

Hex:	2020-07h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	11	Data type:	UInt16
Default:	0	Change:	At stop
Value Range:			

0: Inactive
1: STO
2: SBC
3: SS1
4: SS2
5: SLS1
6: SLS2
7: SLS3
8: SLS4
9: SDIp
10: SDIn
11: Ack

Description

Assigns function to DI5 terminal of the safety module.

H20.08 **Safety module DI1 noise rejection filter time**

Hex:	2020-09h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	500	Data type:	UInt16
Default:	5	Change:	At stop

Value Range:

1ms to 500ms

Description

Sets the noise filter time of DI1 of the safety module. Only when the signal change of DI1 is continuously maintained above the filter time, the safety module performs the corresponding safety function.

H20.09 **Safety module DI2 noise rejection filter time**

Hex:	2020-0Ah	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	500	Data type:	UInt16
Default:	5	Change:	At stop

Value Range:

1ms to 500ms

Description

Sets the noise filter time of DI2 of the safety module. Only when the signal change of DI2 is continuously maintained above the filter time, the safety module performs the corresponding safety function.

H20.10 Safety module DI3 noise rejection filter time

Hex:	2020-0Bh	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	500	Data type:	UInt16
Default:	5	Change:	At stop

Value Range:

1ms to 500ms

Description

Sets the noise filter time of DI3 of the safety module. Only when the signal change of DI3 is continuously maintained above the filter time, the safety module performs the corresponding safety function.

H20.11 Safety module DI4 noise rejection filter time

Hex:	2020-0Ch	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	500	Data type:	UInt16
Default:	5	Change:	At stop

Value Range:

1 ms–500 ms

Description

Sets the noise filter time of DI4 of the safety module. Only when the signal change of DI4 is continuously maintained above the filter time, the safety module performs the corresponding safety function.

H20.12 Safety module DI5 noise rejection filter time

Hex:	2020-0Dh	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	500	Data type:	UInt16
Default:	5	Change:	At stop

Value Range:

1ms to 500ms

Description

Sets the noise filter time of DI5 of the safety module. Only when the signal change of DI5 is continuously maintained above the filter time, the safety module performs the corresponding safety function.

H20.14 Safety module DI2 allowable discrepancy time

Hex:	2020-0F	Effective mode:	Upon the next power-on

Min.:	5	Unit	ms
Max.:	60000	Data type:	UInt16
Default:	10	Change mode:	Change at stop

Value Range:
5 ms to 60000 ms

Description

If the discrepancy at two input signals of DI1 lasts for a period of time exceeding the time set by this parameter,fault E134.1 is reported.

H20.15 Safety module DI2 allowable discrepancy time

Hex:	2020-10h	Effective mode:	Upon the next power-on
Min.:	5	Unit:	ms
Max.:	60000	Data type:	UInt16
Default:	10	Change:	At stop

Value Range:
5ms to 60000ms

Description

If the discrepancy at two input signals of DI2 lasts for a period of time exceeding the time set by this parameter, fault E134.2 is reported.

H20.16 Safety module DI3 allowable discrepancy time

Hex:	2020-11h	Effective mode:	Upon the next power-on
Min.:	5	Unit:	ms
Max.:	60000	Data type:	UInt16
Default	10	Change:	At stop

Value Range:
5 ms to 60000 ms

Description

If the discrepancy at two input signals of DI3 lasts for a period of time exceeding the time set by this parameter, fault E134.3 is reported

H20.17 Safety module DI4 allowable discrepancy time

Hex:	2020-12h	Effective mode:	Upon the next power-on
Min.:	5	Unit:	ms
Max.:	60000	Data type:	UInt16
Default:	10	Change:	At stop

Value Range:
5ms to 60000ms

Description

If the discrepancy at two input signals of DI4 lasts for a period of time exceeding the time set by this parameter, fault E134.4 is reported.

H20.18 Safety module DI5 allowable discrepancy time

Hex:	2020-13h	Effective mode:	Upon the next power-on
Min.:	5	Unit:	ms
Max.:	60000	Data type:	UInt16
Default:	10	Change mode:	Change at stop

Value Range:

5 ms to 60000 ms

Description

If the discrepancy at two input signals of DI5 lasts for a period of time exceeding the time set by this parameter, fault E134.5 is reported

H20.20 Safety module DO1 function selection

Hex:	2020-15h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	14	Data type:	UInt16
Default:	0	Change mode:	Change at stop

Value Range:

0: Inactive
1: STO Active
2: SBC Active
3: SS1 Active
4: SS2 Active
5: SLS1 Active
6: SLS2 Active
7: SLS3 Active
8: SLS4Active
9: SDIp Active
10: SDIn Active
11: SOS Active
12: SSM Active
13: SS1-r Active
14: SS2-r Active

Description

Assigns function to DO1 terminal of the safety module.

H20.21 Safety module DO2 function selection

Hex:	2020-16h	Effective mode:	Upon the next power-on

Min.:	0	Unit:	-
Max.:	14	Data type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inactive
1: STO Active
2: SBC Active
3: SS1 Active
4: SS2 Active
5: SLS1 Active
6: SLS2 Active
7: SLS3 Active
8: SLS4 Active
9: SDIp Active
10: SDIn Active
11: SOS Active
12: SSM Active
13: SS1-r Active
14: SS2-r Active

Description

Assigns function to DO2 terminal of the safety module.

H20.22 Safety module DO3 function selection

Hex:	2020-17h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	14	Data type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inactive
1: STO Active
2: SBC Active
3: SS1 Active
4: SS2 Active
5: SLS1 Active
6: SLS2 Active
7: SLS3 Active
8: SLS4 Active
9: SDIp Active
10: SDIn Active
11: SOS Active
13: SS1-r Active

14: SS2-r Active

Description

Assigns function to DO3 terminal of the safety module.

This DO is a non-safety DO circuit and cannot be configured with SSM function.

H20.23 Safety module DO4 function selection

Hex:	2020-18h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	14	Data type:	UInt16
Default:	0	Change mode:	At stop

Value Range:

0: Inactive
1: STO Active
2: SBC Active
3: SS1 Active
4: SS2 Active
5: SLS1Active
6: SLS2 Active
7: SLS3 Active
8: SLS4 Active
9: SDIp Active
10: SDInActive
11: SOSActive
12: SSM Active
13: SS1-rActive
14: SS2-r Active

Description

Assigns function to DO4 terminal of the safety module.

H20.24 Safety module DO5 function selection

Hex:	2020-19h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	14	Data type:	UInt16
Default:	0	Change mode:	At stop

Value Range:

0: Inactive
1: STO Active
2: SBC Active
3: SS1 Active
4: SS2 Active
5: SLS1 Active
6: SLS2 Active

7:SLS3 Active
8:SLS4 Active
9:SDIp Active
10:SDIn Active
11:SOS Active
12:SSM Active
13:SS1-r Active
14:SS2-r Active

Description

Assigns function to DO5 terminal of the safety module.

H20.25 **Safety module DO6 function selection**

Hex:	2020-1Ah	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	14	Data type:	UInt16
Default:	0	Change mode:	At stop

Value Range

0: Inactive
1: STO Active
2: SBC Active
3: SS1 Active
4: SS2 Active
5: SLS1 Active
6: SLS2 Active
7: SLS3 Active
8: SLS4 Active
9: SDIp Active
10: SDIn Active
11: SOS Active
13: SS1-r Active
14: SS2-r Active

Description

Assigns function to DO6 terminal of the safety module.
SSM function is not assigned to DO6 which is not safety DO circuit.

H20.28 **Effective delay time from STO to SBC active**

Hex:	2020-1Dh	Effective mode:	Upon the next power-on
Min.:	-30000	Unit:	ms
Max.:	30000	Data type:	UInt16
Default:	-30	Change mode:	At stop

Value Range

-30000 ms to 30000 ms

Description

Sets the delay time from the triggering of the STO function to output of the active SBC state. This parameter can be used to set the sequence of activation of STO and SBC.

H20.29 SS1/SS2 stop mode

Hex:	2020-1Eh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Stop according to ramp

1: Stop by host controller

Description

Sets the stop mode for SS1/SS2.

H20.30 SS1/SS2 ramp-to-stop reference speed

Hex:	2020-1Fh	Effective mode:	Upon the next power-on
Min.:	60	Unit:	rpm
Max.:	6000	Data type:	UInt16
Default:	1000	Change:	At stop

Value Range:

60 rpm to 6000 rpm

Description

Sets the reference speed for deceleration to stop. The deceleration is equal to reference speed/deceleration time.

H20.31 SS1/ SS2 ramp-to-stop deceleration time

Hex:	2020-20h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	65535	Data type:	UInt16
Default:	500	Change:	At stop

Value Range:

1 ms–65535 ms

Description

Sets the time required to decelerate from the reference speed to 0. The deceleration is equal to reference speed/deceleration time.

H20.32 SS1/SS2 monitor mode

Hex:	2020-21h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data type:	UInt16
Default:	0	Change:	At stop

Value Range:

0:SS1-t

1:SS1-r

Description

Sets the monitoring mode for SS1.

H20.33 S1 trigger-to-STO delay time/SS2 trigger-to-STO delay time

Hex:	2020-22h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data type:	UInt16
Default	1000	Change:	At stop

Value Range:

0 ms to 65535 ms

Description

After SS1 is triggered, the drive enters the STO state after a period of time exceeding the value set by this parameter has elapsed.

After SS2 is triggered, the drive enters the SOS state after a period of time exceeding the value set by this parameter has elapsed.

H20.34 SS1/ SS1 zero speed threshold

Hex:	2020-23h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	rpm
Max.:	6000	Data type:	UInt16
Default:	10	Change:	At stop

Value Range:

1 rpm to 6000 rpm

Description

During SS1 deceleration, if the speed falls below the the value set by this parameter for a period of time exceeding the zero speed threshold time, the drive enters the STO state.

During SS2 deceleration, if the speed falls below the the value set by this parameter for a period of time exceeding the zero speed threshold time, the drive enters the SOS state.

H20.35 SS1/SS2 zero speed threshold time

Hex:	2020-24h	Effective mode:	Upon the next power-on

Min.:	0	Unit:	ms
Max.:	65535	Data type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 ms–65535 ms

Description

During SS1 deceleration, if the speed falls below the zero speed threshold for a period of time exceeding the value set by this parameter, the drive enters the STO state.

During SS2 deceleration, if the speed falls below the zero speed threshold for a period of time exceeding the value set by this parameter, the drive enters the SOS state.

H20.36 SS1/SS2 ramp monitor start delay time

Hex:	2020-25h	Effective mode:	Upon the next power-on
Min.:	5	Unit:	ms
Max.:	65535	Data type:	UInt16
Default:	10	Change:	At stop

Value Range:

5 ms–65535 ms

Description

After SS1 is triggered, the speed ramp monitoring starts after a period of time set by this parameter has elapsed, which is only valid in SS1-r mode.

After SS2 is triggered, the speed ramp monitoring starts after a period of time set by this parameter has elapsed, which is only valid in SS2-r mode.

H20.37 SS1/SS2 ramp monitoring reference speed

Hex:	2020-26h	Effective mode:	Upon the next power-on
Min.:	60	Unit:	rpm
Max.:	6000	Data type:	UInt16
Default:	1000	Change:	At stop

Value Range:

60 rpm to 6000 rpm

Description

Sets the reference speed for calculating the range of ramp monitoring. Speed ramp monitoring threshold is equal to reference speed/ramp deceleration monitor time.

H20.38 SS1/SS2 ramp deceleration monitoring time

Hex:	2020-27h	Effective mode:	Upon the next power-on
Min.:	1		
Max.:	65535	Unit:	ms

Default 65535 Change: At stop

Value Range:

1 ms to 65535 ms

Description

Sets the time required to decelerate from the reference speed to 0 during ramp monitoring. Speed ramp monitoring threshold is equal to reference speed/ramp deceleration monitor time.

H20.41 SS1/SS2 ramp limit trigger-to-alarm time

Hex:	2020-2Ah	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data type:	UInt16
Default:	5	Change mode:	At stop

Value Range:

0 ms to 65535 ms

Description

During the deceleration process of SS1/SS2, if the motor speed exceeds the ramp monitoring limit for a period of time exceeding the value set by this parameter, a fault is reported and the drive enters the STO state.

H20.42 SS1/SS2 ramp monitoring stop speed

Hex:	2020-2Bh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	rpm
Max.:	6000	Data type:	UInt16
Default:	1	Change mode:	At stop

Value Range

0 rpm to 6000 rpm

Description

During the deceleration process of SS1/SS2, when the motor speed falls below the value set by this parameter, the ramp monitoring is stopped.;

H20.43 SS2 monitoring mode

Hex:	2020-2Ch	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data type:	UInt16
Default:	0	Change mode:	At stop

Value Range:

0:SS2-t

1:SS2-r

Description

Sets the SS2 monitoring mode at stop.

H20.44 **SOS speed change threshold**

Hex:	2020-2Dh	Effective mode:	Upon the next power-on
Min.:	1	Unit:	rpm
Max.:	6000	Data type:	UInt16
Default:	10	Change mode:	At stop

Value Range:
1 rpm to 6000 rpm
Description
Sets the maximum allowable difference between motor speed and 0 rpm in SOS state.

H20.45 **SOS position change threshold**

Hex:	2020-2Eh	Effective mode:	Upon the next power-on
Min.:	1	Unit:	Encoder unit
Max.:	536870912	Data type:	UInt16
Default:	932067	Change:	At stop

Value Range:
1 to 536870912
Description
Sets the maximum allowable variation of position feedback in SOS state.

H20.47 **SOS overthreshold-to-alarm time**

Hex:	2020-30h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data type:	UInt16
Default:	5	Change:	At stop

Value Range:
0ms to 65535ms
Description
In the SOS state, if the speed feedback or position feedback exceeds the threshold for a period of time exceeding the value set by this parameter, a fault will be reported.

H20.48 **SLS switchover delay 1**

Hex:	2020-31h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data type:	UInt16
Default	100	Change mode:	At stop

Value Range
0 ms to 65535 ms

Description

Sets the delay time from activation of SLS1 request command to activationof SLS1 monitoring.

H20.49 SLS2 switchover delay

Hex:	2020-32h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data type:	UInt16
Default:	100	Change:	At stop

Value Range:

0ms to 65535ms

Description

Sets the delay time from activation of SLS2 request command to activation of SLS2 monitoring.

H20.50 SLS3 switchover delay

Hex:	2020-33h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data type:	UInt16
Default:	100	Change:	At stop

Value Range:

0ms to 65535ms

Description

Sets the delay time from activation of SLS3 request command to activation of SLS3 monitoring.

H20.51 SLS4 switchover delay

Hex:	2020-34h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data type:	UInt16
Default:	100	Change mode:	At stop

Value Range:

0 ms to 65535 ms

Description

Sets the delay time from activation of SLS4 request command to activationof SLS4 monitoring.

H20.52 SLS1 threshold

Hex:	2020-35h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	rpm

Max.:	6000	Data type:	UInt16
Default:	1000	Change:	At stop

Value Range:

0rpm to 6000rpm

Description

Sets the speed threshold for SLS1 monitoring.

H20.53 **SLS2 threshold**

Hex:	2020-36h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	rpm
Max.:	6000	Data type：	UInt16
Default:	1000	Change mode:	At stop

Value Range:

0 rpm to 6000 rpm

Description

Sets the speed threshold for SLS2 monitoring.

H20.54 **SLS3 threshold**

Hex:	2020-37h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	rpm
Max.:	6000	Data type：	UInt16
Default	1000	Change mode:	At stop

Value Range:

0 rpm to 6000 rpm

Description

Sets the speed threshold for SLS3 monitoring.

H20.55 **SLS4 threshold**

Hex:	2020-38h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	rpm
Max.:	6000	Data type:	UInt16
Default:	1000	Change:	At stop

Value Range:

0 rpmto 6000 rpm

Description

Sets the speed threshold for SLS4 monitoring.

H20.56 **SLS1 filter time**

Hex:	2020-39h	Effective mode:	Upon the next power-on

Min.: 0
Max.: 65535
Default: 100
Unit: ms
Data type: UInt16
Change: At stop

Value Range:
0ms to 65535ms
Description
Sets the filtering time for determining that the motor speed is within the SLS1 limit.

H20.57 **SLS2 filter time**
Hex: 2020-3Ah
Min.: 0
Max.: 65535
Default 100
Effective mode: Upon the next power-on
Unit: ms
Data type: UInt16
Change mode: At stop

Value Range:
0 ms to 65535 ms
Description
Sets the filtering time for determining that the motor speed is within the SLS2 limit.

H20.58 **SLS3 filter time**
Hex: 2020-3Bh
Min.: 0
Max.: 65535
Default 100
Effective mode: Upon the next power-on
Unit: ms
Data type: UInt16
Change mode: At stop

Value Range:
0 ms to 65535 ms
Description
Sets the filtering time for determining that the motor speed is within the SLS3 limit.

H20.59 **SLS4 filter time**
Hex: 2020-3Ch
Min.: 0
Max.: 65535
Default 100
Effective mode: Upon the next power-on
Unit: ms
Data type: UInt16
Change mode: At stop

Value Range:
0 ms to 65535 ms
Description
Sets the filtering time for determining that the motor speed is within the SLS4 limit.

H20.60 **SLS fault response mode**
Hex: 2020-3Dh
Effective mode: Upon the next power-on

Min.:	0	Unit:	-
Max.:	1	Data type:	UInt16
Default:	0	Change:	At stop

Value Range:

0:STO

1:SS1-t

Description

Sets the mode for stopping the motor when its speed exceeds the speed limit after the SLS monitoring takes effect.

H20.70 SSM upper limit

Hex:	2020-47h	Effective mode:	Upon the next power-on
Min.:	-6000	Unit:	rpm
Max.:	6000	Data type:	UInt16
Default:	200	Change mode:	At stop

Value Range:

-6000 rpm to 6000 rpm

Description

Sets the upper limit of SSM.

H20.71 SSM upper limit

Hex:	2020-48h	Effective mode:	Upon the next power-on
Min.:	-6000	Unit:	rpm
Max.:	6000	Data type:	UInt16
Default:	200	Change mode:	At stop

Value Range:

-6000 rpm to 6000 rpm

Description

Sets the lower limit of SSM.

H20.72 SSM hysteresis threshold

Hex:	2020-49h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	rpm
Max.:	6000	Data type:	UInt16
Default:	10	Change mode:	At stop

Value Range:

0 rpm to 6000 rpm

Description

Sets the hysteresis threshold of SSM monitoring to avoid the SSM output jumping too frequently when the speed fluctuates near the upper or lower threshold.

H20.74 **SDI zero position window**

Hex:	2020-4Bh	Effective mode:	Upon the next power-on
Min.:	1	Unit:	Unit of the encoder
Max.:	536870912	Data type：	UInt16
Default:	932067	Change mode:	At stop

Value Range:

1 to 536870912

Description

Sets the position threshold for stopping the monitoring.
（Position window for stop position）

H20.76 **SDI zero speed threshold**

Hex:	2020-4Dh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	rpm
Max.:	3000	Data type:	UInt16
Default:	10	Change:	At stop

Value Range:

0rpm to 3000rpm

Description

Sets the speed threshold for stopping the monitoring.
(Velocity window for n=0)

H20.77 **SDI delay time**

Hex:	2020-4Eh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data type:	UInt16
Default:	0	Change:	At stop

Value Range:

0ms to 65535ms

Description

Sets the delay time from activation of SDI command to activation of SDI monitoring.

H20.78 **SDI fault response mode**

Hex:	2020-4Fh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0:STO
1:SS1-t
Description
Sets the mode for stopping the motor when it runs in the forbidden direction after the SDI monitoring takes effect.

26 Parameter List [Functional Safety N]

26.1 H02 Parameters

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H02.02	2002-03h	Rotation direction selection	0: Counterclockwise (CCW) as forward direction 1: Clockwise (CW) as forward direction	0	-	At stop	
H02.11	2002-0Ch	Motor speed threshold at brake output OFF in rotation state	20 rpm to 3000 rpm	30	RPM	Real-time	
H02.12	2002-0Dh	Delay from S-ON OFF to brake output OFF in rotation state	1ms to 65535ms	500	ms	Real-time	

26.2 H0A Parameters

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H0A.73	200A-4Ah	STO 24 V disconnection filter time	1ms to 5ms	5	ms	Real-time	
H0A.74	200A-4Bh	Filter time for two inconsistent STO channels	1ms to 1000ms	100	ms	Real-time	
H0A.75	200A-4Ch	Servo OFF delay after STO triggered	0ms to 25ms	20	ms	Real-time	

26.3 H20 Parameters



Before apply any safety function, ensure that it is enabled on the drive.

Parameter	Name	Value	Default	Unit	Change Mode	Page
H20.00	Safety module software version	0.00 to 655.35	0.00	-	Unchangeable	
H20.01	Safety function trigger selection	0: Local trigger 0: Local trigger 1: FSoE trigger-SRA	0	-	At stop	
H20.02	Safety module DI1 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop	
H20.03	Safety module DI2 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop	
H20.04	Safety module DI3 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1	0	-	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
		6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack				
H20.05	Safety module DI4 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop	
H20.06	Safety module DI5 function selection	0: Inactive 1: STO 2: SBC 3: SS1 4: SS2 5: SLS1 6: SLS2 7: SLS3 8: SLS4 9: SDIp 10: SDIn 11: Ack	0	-	At stop	
H20.08	Safety module DI1 noise rejection filter time	1 ms–500 ms	5	ms	At stop	
H20.09	Safety module DI2 noise rejection filter time	1 ms–500 ms	5	ms	At stop	
H20.10	Safety module DI3 noise rejection filter time	1 ms–500 ms	5	ms	At stop	
H20.11	Safety module DI4 noise	1 ms–500 ms	5	ms	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
	rejection filter time					
H20.12	Safety module DI5 noise rejection filter time	1 ms–500 ms	5	ms	At stop	
H20.14	Safety module DI1 allowable discrepancy time	5 ms–60000 ms	10	ms	At stop	
H20.15	Safety module DI2 allowable discrepancy time	5 ms–60000 ms	10	ms	At stop	
H20.16	Safety module DI3 allowable discrepancy time	5 ms–60000 ms	10	ms	At stop	
H20.17	Safety module DI4 allowable discrepancy time	5 ms–60000 ms	10	ms	At stop	
H20.18	Safety module DI5 allowable discrepancy time	5 ms–60000 ms	10	ms	At stop	
H20.20	Safety module DO1 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
H20.21	Safety module DO2 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop	
H20.22	Safety module DO3 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop	
H20.23	Safety module DO4 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop	
H20.24	Safety module DO5 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active	0	-	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
		5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 12: SSM Active 13: SS1-r Active 14: SS2-r Active				
H20.25	Safety module DO6 function selection	0: Inactive 1: STO Active 2: SBC Active 3: SS1 Active 4: SS2 Active 5: SLS1 Active 6: SLS2 Active 7: SLS3 Active 8: SLS4 Active 9: SDIp Active 10: SDIn Active 11: SOS Active 13: SS1-r Active 14: SS2-r Active	0	-	At stop	
H20.28	STO trigger-to-SBC active delay time	-30000 ms–30000 ms	-30	ms	At stop	
H20.29	SS1/SS2 stop mode	0: Stop according to ramp 1: Stop by host controller	1	-	At stop	
H20.30	SS1/SS2 ramp-to-stop reference speed	60 rpm to 6000 rpm	1000	rpm	At stop	
H20.31	SS1/ SS2 ramp-to-stop deceleration time	1 ms–65535 ms	500	ms	At stop	
H20.32	SS1 monitor mode	0:SS1-t 1:SS1-r	0	-	At stop	
H20.33	SS1 trigger-to-STO delay time/SS2 trigger-to-STO delay time	0 ms–65535 ms	1000	ms	At stop	
H20.34	SS1/ SS1 zero speed threshold	1 rpm to 6000 rpm	10	rpm	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
H20.35	SS1/SS2 zero speed threshold time	0 ms–65535 ms	0	ms	At stop	
H20.36	SS1/SS2 ramp monitor start delay time	5 ms–65535 ms	10	ms	At stop	
H20.37	SS1/SS2 ramp monitor reference speed	60 rpm to 6000 rpm	1000	rpm	At stop	
H20.38	SS1/SS2 ramp deceleration monitor time	1 ms–65535 ms	65535	ms	At stop	
H20.41	SS1/SS2 ramp limit trigger-to-alarm time	0 ms–65535 ms	5	ms	At stop	
H20.42	SS1/SS2 ramp monitor stop speed	0 rpm to 6000 rpm	1	rpm	At stop	
H20.43	SS2 monitor mode	0:SS2-t 1:SS2-r	0	-	At stop	
H20.44	SOS speed change threshold	1 rpm to 6000 rpm	10	rpm	At stop	
H20.45	SOS position change threshold	1 to 536870912	932067	encoder unit	At stop	
H20.47	SOS overthres hold-to-alarm time	0 ms–65535 ms	5	ms	At stop	
H20.48	SLS1 switchover delay	0 ms–65535 ms	100	ms	At stop	
H20.49	SLS2 switchover delay	0 ms–65535 ms	100	ms	At stop	
H20.50	SLS3 switchover delay	0 ms–65535 ms	100	ms	At stop	
H20.51	SLS4 switchover delay	0 ms–65535 ms	100	ms	At stop	

Parameter	Name	Value	Default	Unit	Change Mode	Page
H20.52	SLS1 threshold	0 rpm to 6000 rpm	1000	rpm	At stop	
H20.53	SLS2 threshold	0 rpm to 6000 rpm	1000	rpm	At stop	
H20.54	SLS3 threshold	0 rpm to 6000 rpm	1000	rpm	At stop	
H20.55	SLS4 threshold	0 rpm to 6000 rpm	1000	rpm	At stop	
H20.56	SLS1 filter time	0 ms–65535 ms	100	ms	At stop	
H20.57	SLS2 filter time	0 ms–65535 ms	100	ms	At stop	
H20.58	SLS3 filter time	0 ms–65535 ms	100	ms	At stop	
H20.59	SLS4 filter time	0 ms–65535 ms	100	ms	At stop	
H20.60	SLS fault response mode	0:STO 1:SS1-t	0	-	At stop	
H20.70	SSM upper limit	–6000 rpm to 6000 rpm	200	rpm	At stop	
H20.71	SSM lower limit	–6000 rpm to 6000 rpm	-200	rpm	At stop	
H20.72	SSM hysteresis threshold	0 rpm to 6000 rpm	10	rpm	At stop	
H20.74	SDI zero position threshold	1 to 536870912	932067	encoder unit	At stop	
H20.76	SDI zero speed threshold	0 rpm to 3000 rpm	10	rpm	At stop	
H20.77	SDI delay time	0 ms–65535 ms	0	ms	At stop	
H20.78	SDI fault response mode	0:STO 1:SS1-t	0	-	At stop	

26.4 6000 Parameters

Param.	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
6620.01h	6620-01h	Safety control word low 8 bits	0 to 255	0	-	Unchangeable	
6620.02h	6620-02h	Safety control word high 8 bits	0 to 255	0	-	Unchangeable	
6621.01h	6621-01h	Safety status word low 8 bits	0 to 255	0	-	Unchangeable	
6621.02h	6621-02h	Safety status word high 8 bits	0 to 255	0	-	Unchangeable	
6630h	6630h	Restart Ack signal	0 to 1	0	-	Real-time	
6632h	6632h	Fault state	0 to 1	0	-	Real-time	
6640h	6640h	STO signal	0 to 1	0	-	Real-time	
6641h	6641h	STO reset mode selection	0 to 1	0	-	Real-time	
6650.01h	6650-01h	SS1 signal	0 to 1	0	-	Real-time	
6651.01h	6651-01h	SS1 trigger-to-STO delay time	0ms to 65535ms	1000	ms	Real-time	
6653.01h	6653-01h	SS1 zero speed threshold	1rpm to 6000rpm	10	RPM	Real-time	
6654.01h	6654-01h	SS1 zero speed threshold time	0ms to 65535ms	0	ms	Real-time	
6656.01h	6656-01h	SS1 deceleration limit	0 encoder unit/s²–4294967295 encoder unit/s²	15	Encoder unit/s²	Real-time	
6657.01h	6657-01h	SS1 ramp monitor start delay time	0ms to 65535ms	10	ms	Real-time	
6660h	6660h	SBC signal	0 to 1	0	-	Real-time	
6668.01h	6668-01h	SOS signal	0 to 1	0	-	Real-time	

Param.	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
666A.01h	666A-01h	SOS zero position threshold	0 to 536870912	932067	Encoder unit	Real-time	
666C.01h	666C-01h	SOS zero speed threshold	1rpm to 6000rpm	10	RPM	Real-time	
6670.01h	6670-01h	SS2 signal	0 to 1	0	-	Real-time	
6671.01h	6671-01h	SS2 trigger-to-STO delay time	0ms to 65535ms	10	ms	Real-time	
6672.01h	6672-01h	SS2 zero speed threshold time	0ms to 65535ms	0	ms	Real-time	
6674.01h	6674-01h	SS2 deceleration limit	0 encoder unit/s^2–4294967295 encoder unit/s^2	15	Encoder unit/s^2	Real-time	
6675.01h	6675-01h	SS2 ramp monitor start delay time	0ms to 65535ms	10	ms	Real-time	
6676.01h	6676-01h	SS2 reset mode selection	0 to 1	0	-	Real-time	
6690.01h	6690-01h	SLS1 signal	0 to 1	0	-	Real-time	
6690.02h	6690-02h	SLS2 signal	0 to 1	0	-	Real-time	
6690.03h	6690-03h	SLS3 signal	0 to 1	0	-	Real-time	
6690.04h	6690-04h	SLS4 signal	0 to 1	0	-	Real-time	
6691.01h	6691-01h	SLS1 switchover delay	0ms to 65535ms	100	ms	Real-time	
6691.02h	6691-02h	SLS2 switchover delay	0ms to 65535ms	100	ms	Real-time	
6691.03h	6691-03h	SLS3 switchover delay	0ms to 65535ms	100	ms	Real-time	
6691.04h	6691-04h	SLS4 switchover delay	0ms to 65535ms	100	ms	Real-time	
6693.01h	6693-01h	SLS1 threshold	0rpm to 6000rpm	1000	RPM	Real-time	

Param.	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
6693.02h	6693-02h	SLS2 threshold	0rpm to 6000rpm	1000	RPM	Real-time	
6693.03h	6693-03h	SLS3 threshold	0rpm to 6000rpm	1000	RPM	Real-time	
6693.04h	6693-04h	SLS4 threshold	0rpm to 6000rpm	1000	RPM	Real-time	
6694.01h	6694-01h	SLS1 filter time	0ms to 65535ms	10	ms	Real-time	
6694.02h	6694-02h	SLS2 filter time	0ms to 65535ms	10	ms	Real-time	
6694.03h	6694-03h	SLS3 filter time	0ms to 65535ms	10	ms	Real-time	
6694.04h	6694-04h	SLS4 filter time	0ms to 65535ms	10	ms	Real-time	
66D0h	66D0h	SDIp signal	0 to 1	0	-	Real-time	
66D1h	66D1h	SDIn signal	0 to 1	0	-	Real-time	
66D3h	66D3h	SDI zero position threshold	0 to 536870912	932067	Encoder unit	Real-time	
66D5h	66D5h	SDI zero speed threshold	0rpm to 3000rpm	10	RPM	Real-time	
66E0.01h	66E0-01h	SSM state	0 to 1	0	-	Unchangeable	
66E2.01h	66E2-01h	SSM upper limit	–6000 rpm to +6000 rpm	200	RPM	Real-time	
66E4.01h	66E4-01h	SSM lower limit	–6000 rpm to +6000 rpm	-200	RPM	Real-time	
E600.01h	E600-01h	FSoE slave command	0 to 255	0	-	Unchangeable	
E600.02h	E600-02h	FSoE slave connection ID	0 to 65535	0	-	Unchangeable	
E600.03h	E600-03h	FSoE slave CRC value	0 to 65535	0	-	Unchangeable	
E601.01h	E601-01h	FSoE connection status	0 to 1	0	-	Unchangeable	
E700.01h	E700-01h	FSoE master command	0 to 255	0	-	Real-time	
E700.02h	E700-02h	FSoE master connection ID	0 to 65535	0	-	Real-time	

Param.	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
E700.03h	E700-03h	FSoE master CRC value	0 to 65535	0	-	Real-time	
E901.01h	E901-01h	FSoE version	0 to 65535	0	-	Unchangeable	
E901.02h	E901-02h	FSoE address	0 to 65535	0	-	Unchangeable	
E901.03h	E901-03h	PSoE connection ID	0 to 65535	0	-	Unchangeable	
E901.04h	E901-04h	Watchdog time	0 to 65535	0	-	Unchangeable	
E901.06h	E901-06h	Connection type	0 to 65535	0	-	Unchangeable	
E901.07h	E901-07h	Communication parameter length	0 to 65535	0	-	Unchangeable	
E901.08h	E901-08h	Application layer parameter length	0 to 65535	0	-	Unchangeable	
E901.09h	E901-09h	SRA CRC	0 to 65535	0	-	Unchangeable	
F980.01h	F980-01h	FSoE address	0 to 255	0	-	Unchangeable	

27 Description of Parameters [Functional safety N]

27.1 H02 Basic Control Parameters

H02.02 **Rotation direction selection**

Hex:	2002-03h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Counterclockwise (CCW) as forward direction

1: Clockwise (CW) as forward direction

Description

Defines the forward direction of the motor when viewed from the motor shaft side.

H02.11 **Motor speed threshold at brake output off in rotating state**

Hex:	2002-0Ch	Effective mode:	Real time
Min.:	20	Unit:	rpm
Max.:	3000	Data Type:	UInt16
Default:	30	Change:	Real time

Value Range:

20rpm~3000rpm

Description

Defines the motor speed threshold when the brake output (BK) is set to off in the rotating state.

H02.12 **Delay from S-ON OFF to brake output OFF in rotating state**

Hex:	2002-0Dh	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	500	Change:	Real time

Value Range:

1ms~65535ms

Description

Defines the delay from the moment the S-ON signal is off to the moment when brake output (BK) signal is off in the rotating state.

27.2 H0A Fault and Protection Parameters

H0A.73 STO 24 V disconnection filter time

Hex:	200A-4Ah	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.:	5	Data Type:	UInt16
Default:	5	Change:	Real time

Value Range:

1ms to 5ms

Description

Defines the filter time from the moment when STO2 is disconnected from the 24 V power supply to the moment when the STO status is displayed or E150.0 is reported.

H0A.74 Filter time for two inconsistent STO channels

Hex:	200A-4Bh	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	100	Change:	Real time

Value Range:

1ms to 1000ms

Description

Defines the filter time from the moment when STO2 is input with different voltage to the moment when E150.1 is reported.

H0A.75 Servo OFF delay after STO triggered

Hex:	200A-4Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	25	Data Type:	UInt16
Default:	20	Change:	Real time

Value Range:

0ms~25ms

Description

Defines filter time from the moment when the STO status is displayed or E150.0/ E150.1 is reported to the moment when the S-ON signal is switched off.

27.3 H20 Functional Safety Parameters

Note

It is recommended to verify the safety function when you are configuring the safety parameters.

H20.00 Safety module software version

Hex:	2020-01h	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:

0.00 to 655.35

Description

Displays the software version of the safety module and consists of two decimal places.

H20.01 Safety function trigger selection

Hex:	2020-02h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Local trigger

1: FSoE trigger

Description

Sets the trigger of the safety function.

H20.02 Safety module DI1 function selection

Hex:	2020-03h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	11	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inactive

1: STO

2: SBC

3: SS1
4: SS2
5: SLS1
6: SLS2
7: SLS3
8: SLS4
9: SDIp
10: SDIn
11: Ack

Description

Assigns function to DI1 terminal of the safety module.

H20.03 Safety module DI2 function selection

Hex:	2020-04h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	11	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inactive
1: STO
2: SBC
3: SS1
4: SS2
5: SLS1
6: SLS2
7: SLS3
8: SLS4
9: SDIp
10: SDIn
11: Ack

Description

Assigns function to DI2 terminal of the safety module.

H20.04 Safety module DI3 function selection

Hex:	2020-05h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	11	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inactive

1: STO
2: SBC
3: SS1
4: SS2
5: SLS1
6: SLS2
7: SLS3
8: SLS4
9: SDIp
10: SDIn
11: Ack

Description

Assigns function to DI3 terminal of the safety module.

H20.05 **Safety module DI4 function selection**

Hex:	2020-06h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	11	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0:Inactive
1:STO
2:SBC
3:SS1
4:SS2
5:SLS1
6:SLS2
7:SLS3
8:SLS4
9:SDIp
10:SDIn
11:Ack

Description

Assigns function to DI4 terminal of the safety module.

H20.06 **Safety module DI5 function selection**

Hex:	2020-07h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	11	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inactive
1: STO
2: SBC
3: SS1
4: SS2
5: SLS1
6: SLS2
7: SLS3
8: SLS4
9: SDIp
10: SDIn
11: Ack

Description

Assigns function to DI5 terminal of the safety module.

H20.08 **Safety module DI1 noise rejection filter time**

Hex:	2020-09h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	500	Data Type:	UInt16
Default:	5	Change:	At stop

Value Range:

1ms to 500ms

Description

Sets the noise filter time of DI1 of the safety module. Only when the signal change of DI1 is continuously maintained above the filter time, the safety module performs the corresponding safety function.

H20.09 **Safety module DI2 noise rejection filter time**

Hex:	2020-0Ah	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	500	Data Type:	UInt16
Default:	5	Change:	At stop

Value Range:

1ms to 500ms

Description

Sets the noise filter time of DI2 of the safety module. Only when the signal change of DI2 is continuously maintained above the filter time, the safety module performs the corresponding safety function.

H20.10 Safety module DI3 noise rejection filter time

Hex:	2020-0Bh	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	500	Data Type:	UInt16
Default:	5	Change:	At stop

Value Range:

1ms to 500ms

Description

Sets the noise filter time of DI3 of the safety module. Only when the signal change of DI3 is continuously maintained above the filter time, the safety module performs the corresponding safety function.

H20.11 Safety module DI4 noise rejection filter time

Hex:	2020-0Ch	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	500	Data Type:	UInt16
Default:	5	Change:	At stop

Value Range:

1 ms–500 ms

Description

Sets the noise filter time of DI4 of the safety module. Only when the signal change of DI4 is continuously maintained above the filter time, the safety module performs the corresponding safety function.

H20.12 Safety module DI5 noise rejection filter time

Hex:	2020-0Dh	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	500	Data Type:	UInt16
Default:	5	Change:	At stop

Value Range:

1ms to 500ms

Description

Sets the noise filter time of DI5 of the safety module. Only when the signal change of DI5 is continuously maintained above the filter time, the safety module performs the corresponding safety function.

H20.14 Safety module DI1 allowable discrepancy time

Hex:	2020-0Fh	Effective mode:	Upon the next power-on

Min.:	5	Unit:	ms
Max.:	60000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

5ms~60000ms

Description

If the discrepancy at two input signals of DI1 lasts for a period of time exceeding the time set by this parameter, fault E134.1 is reported.

H20.15 Safety module DI2 allowable discrepancy time

Hex:	2020-10h	Effective mode:	Upon the next power-on
Min.:	5	Unit:	ms
Max.:	60000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

5ms to 60000ms

Description

If the discrepancy at two input signals of DI2 lasts for a period of time exceeding the time set by this parameter, fault E134.2 is reported.

H20.16 Safety module DI3 allowable discrepancy time

Hex:	2020-11h	Effective mode:	Upon the next power-on
Min.:	5	Unit:	ms
Max.:	60000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

5ms~60000ms

Description

If the discrepancy at two input signals of DI3 lasts for a period of time exceeding the time set by this parameter, fault E134.3 is reported.

H20.17 Safety module DI4 allowable discrepancy time

Hex:	2020-12h	Effective mode:	Upon the next power-on
Min.:	5	Unit:	ms
Max.:	60000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

5ms to 60000ms

Description

If the discrepancy at two input signals of DI4 lasts for a period of time exceeding the time set by this parameter, fault E134.4 is reported.

H20.18 Safety module DI5 allowable discrepancy time

Hex:	2020-13h	Effective mode:	Upon the next power-on
Min.:	5	Unit:	ms
Max.:	60000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

5ms~60000ms

Description

If the discrepancy at two input signals of DI5 lasts for a period of time exceeding the time set by this parameter, fault E134.5 is reported.

H20.20 Safety module DO1 function selection

Hex:	2020-15h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	14	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0:Inactive
1:STO Active
2:SBC Active
3:SS1 Active
4:SS2 Active
5:SLS1 Active
6:SLS2 Active
7:SLS3 Active
8:SLS4 Active
9:SDIp Active
10:SDIn Active
11:SOS Active
12:SSM Active
13:SS1-r Active
14:SS2-r Active

Description

Assigns function to DO1 terminal of the safety module.

H20.21 Safety module DO2 function selection

Hex:	2020-16h	Effective mode:	Upon the next power-on

Min.:	0	Unit:	-
Max.:	14	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inactive
1: STO Active
2: SBC Active
3: SS1 Active
4: SS2 Active
5: SLS1 Active
6: SLS2 Active
7: SLS3 Active
8: SLS4 Active
9: SDIp Active
10: SDIn Active
11: SOS Active
12: SSM Active
13: SS1-r Active
14: SS2-r Active

Description

Assigns function to DO2 terminal of the safety module.

H20.22 Safety module DO3 function selection

Hex:	2020-17h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	14	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inactive
1: STO Active
2: SBC Active
3: SS1 Active
4: SS2 Active
5: SLS1 Active
6: SLS2 Active
7: SLS3 Active
8: SLS4 Active
9: SDIp Active
10: SDIn Active
11: SOS Active
13: SS1-r Active

14: SS2-r Active

Description

Assigns function to DO3 terminal of the safety module.

This DO is a non-safety DO circuit and cannot be configured with SSM function.

H20.23 Safety module DO4 function selection

Hex:	2020-18h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	14	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0:Inactive
1:STO Active
2:SBC Active
3:SS1 Active
4:SS2 Active
5:SLS1 Active
6:SLS2 Active
7:SLS3 Active
8:SLS4 Active
9:SDIp Active
10:SDIn Active
11:SOS Active
12:SSM Active
13:SS1-r Active
14:SS2-r Active

Description

Assigns function to DO4 terminal of the safety module.

H20.24 Safety module DO5 function selection

Hex:	2020-19h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	14	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0:Inactive
1:STO Active
2:SBC Active
3:SS1 Active
4:SS2 Active
5:SLS1 Active
6:SLS2 Active

7:SLS3 Active
8:SLS4 Active
9:SDIp Active
10:SDIn Active
11:SOS Active
12:SSM Active
13:SS1-r Active
14:SS2-r Active

Description

Assigns function to DO5 terminal of the safety module.

H20.25 **Safety module DO6 function selection**

Hex:	2020-1Ah	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	14	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0:Inactive
1:STO Active
2:SBC Active
3:SS1 Active
4:SS2 Active
5:SLS1 Active
6:SLS2 Active
7:SLS3 Active
8:SLS4 Active
9:SDIp Active
10:SDIn Active
11:SOS Active
13:SS1-r Active
14:SS2-r Active

Description

Assigns function to DO6 terminal of the safety module.
This DO is a non-safety DO circuit and cannot be configured with SSM function.

H20.28 **STO-to-SBC activation delay**

Hex:	2020-1Dh	Effective mode:	Upon the next power-on
Min.:	-30000	Unit:	ms
Max.:	30000	Data Type:	UInt16
Default:	-30	Change:	At stop

Value Range:

-30000ms~30000ms

Description

Sets the delay time from the triggering of the STO function to output of the active SBC state. This parameter can be used to set the sequence of activation of STO and SBC.

H20.29 SS1/SS2 stop mode

Hex:	2020-1Eh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Stop according to ramp

1: Stop by host controller

Description

Sets the stop mode for SS1/SS2.

H20.30 SS1/SS2 ramp-to-stop reference speed

Hex:	2020-1Fh	Effective mode:	Upon the next power-on
Min.:	60	Unit:	rpm
Max.:	6000	Data Type:	UInt16
Default:	1000	Change:	At stop

Value Range:

60 rpm to 6000 rpm

Description

Sets the reference speed for deceleration to stop. The deceleration is equal to reference speed/deceleration time.

H20.31 SS1/ SS2 ramp-to-stop deceleration time

Hex:	2020-20h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	500	Change:	At stop

Value Range:

1 ms–65535 ms

Description

Sets the time required to decelerate from the reference speed to 0. The deceleration is equal to reference speed/deceleration time.

H20.32 SS1/SS2 monitor mode

Hex:	2020-21h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0:SS1-t

1:SS1-r

Description

Sets the monitoring mode for SS1.

H20.33 SS1 trigger-to-STO delay/SS2 trigger-to-STO delay

Hex:	2020-22h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	1000	Change:	At stop

Value Range:

0ms~65535ms

Description

After SS1 is triggered, the drive enters the STO state after a period of time exceeding the value set by this parameter has elapsed. After SS2 is triggered, the drive enters the SOS state after a period of time exceeding the value set by this parameter has elapsed.

H20.34 SS1/ SS1 zero speed threshold

Hex:	2020-23h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	rpm
Max.:	6000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

1 rpm to 6000 rpm

Description

During SS1 deceleration, if the speed falls below the the value set by this parameter for a period of time exceeding the zero speed threshold time, the drive enters the STO state.

During SS2 deceleration, if the speed falls below the the value set by this parameter for a period of time exceeding the zero speed threshold time, the drive enters the SOS state.

H20.35 SS1/SS2 zero speed threshold time

Hex:	2020-24h	Effective mode:	Upon the next power-on

Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 ms–65535 ms

Description

During SS1 deceleration, if the speed falls below the zero speed threshold for a period of time exceeding the value set by this parameter, the drive enters the STO state.

During SS2 deceleration, if the speed falls below the zero speed threshold for a period of time exceeding the value set by this parameter, the drive enters the SOS state.

H20.36 SS1/SS2 ramp monitor start delay time

Hex:	2020-25h	Effective mode:	Upon the next power-on
Min.:	5	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

5 ms–65535 ms

Description

After SS1 is triggered, the speed ramp monitoring starts after a period of time set by this parameter has elapsed, which is only valid in SS1-r mode.

After SS2 is triggered, the speed ramp monitoring starts after a period of time set by this parameter has elapsed, which is only valid in SS2-r mode.

H20.37 SS1/SS2 ramp monitor reference speed

Hex:	2020-26h	Effective mode:	Upon the next power-on
Min.:	60	Unit:	rpm
Max.:	6000	Data Type:	UInt16
Default:	1000	Change:	At stop

Value Range:

60rpm~6000rpm

Description

Sets the reference speed for calculating the range of ramp monitoring. Speed ramp monitoring threshold is equal to reference speed/ramp deceleration monitor time.

H20.38 SS1/SS2 ramp deceleration monitor time

Hex:	2020-27h	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	65535	Data Type:	UInt16

Default: 65535 Change: At stop

Value Range:

1ms~65535ms

Description

sets the time required to decelerate from the reference speed to 0 during ramp monitoring. Speed ramp monitoring threshold is equal to reference speed/ramp deceleration monitor time.

H20.41 SS1/SS2 ramp limit trigger-to-alarm time

Hex: 2020-2Ah Effective mode: Upon the next power-on

Min.: 0 Unit: ms

Max.: 65535 Data Type: UInt16

Default: 5 Change: At stop

Value Range:

0ms~65535ms

Description

During SS1 deceleration, if the motor speed exceeds the ramp monitoring limit for a period of time exceeding the value set by this parameter, a fault is reported and the drive enters the STO state. During SS2 deceleration, if the motor speed exceeds the ramp monitoring limit for a period of time exceeding the value set by this parameter, a fault is reported and the drive enters the STO state.

H20.42 SS1/SS2 ramp monitor stop speed

Hex: 2020-2Bh Effective mode: Upon the next power-on

Min.: 0 Unit: rpm

Max.: 6000 Data Type: UInt16

Default: 1 Change: At stop

Value Range:

0rpm~6000rpm

Description

During SS1 deceleration, when the motor speed falls below the value set by this parameter, the ramp monitoring is stopped. During SS2 deceleration, when the motor speed falls below the value set by this parameter, the ramp monitoring is stopped.

H20.43 SS2 monitor mode

Hex: 2020-2Ch Effective mode: Upon the next power-on

Min.: 0 Unit: -

Max.: 1 Data Type: UInt16

Default: 0 Change: At stop

Value Range:

0:SS2-t

1:SS2-r

Description

Sets the monitor mode for SS2.

H20.44 SOS speed change threshold

Hex:	2020-2Dh	Effective mode:	Upon the next power-on
Min.:	1	Unit:	rpm
Max.:	6000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:
1rpm~6000rpm

Description
Sets the maximum allowable difference between motor speed and 0 rpm in SOS state.

H20.45 SOS position change threshold

Hex:	2020-2Eh	Effective mode:	Upon the next power-on
Min.:	1	Unit:	Encoder unit
Max.:	536870912	Data Type:	UInt16
Default:	932067	Change:	At stop

Value Range:
1 to 536870912

Description
Sets the maximum allowable variation of position feedback in SOS state.

H20.47 SOS overthreshold-to-alarm time

Hex:	2020-30h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	5	Change:	At stop

Value Range:
0ms to 65535ms

Description
In the SOS state, if the speed feedback or position feedback exceeds the threshold for a period of time exceeding the value set by this parameter, a fault will be reported.

H20.48 SLS switchover delay 1

Hex:	2020-31h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	At stop

Value Range:
0ms~65535ms

Description
Sets the delay time from activation of SLS1 command to activation of SLS1 monitoring.

H20.49 SLS2 switchover delay

Hex:	2020-32h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	At stop

Value Range:
0ms to 65535ms
Description
Sets the delay time from activation of SLS2 request command to activation of SLS2 monitoring.

H20.50 SLS3 switchover delay

Hex:	2020-33h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	At stop

Value Range:
0ms to 65535ms
Description
Sets the delay time from activation of SLS3 request command to activation of SLS3 monitoring.

H20.51 SLS switchover delay 4

Hex:	2020-34h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	At stop

Value Range:
0ms~65535ms
Description
Sets the delay time from activation of SLS4 request command to activation of SLS4 monitoring.

H20.52 SLS1 threshold

Hex:	2020-35h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	RPM

Max.:	6000	Data Type:	UInt16
Default:	1000	Change:	At stop

Value Range:
0rpm to 6000rpm
Description
Sets the speed threshold for SLS1 monitoring.

H20.53 **SLS2 threshold**

Hex:	2020-36h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	rpm
Max.:	6000	Data Type:	UInt16
Default:	1000	Change:	At stop

Value Range:
0rpm~6000rpm
Description
Sets the speed threshold for SLS2 monitoring.

H20.54 **SLS3 threshold**

Hex:	2020-37h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	rpm
Max.:	6000	Data Type:	UInt16
Default:	1000	Change:	At stop

Value Range:
0rpm~6000rpm
Description
Sets the speed threshold for SLS3 monitoring.

H20.55 **SLS4 threshold**

Hex:	2020-38h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	RPM
Max.:	6000	Data Type:	UInt16
Default:	1000	Change:	At stop

Value Range:
0rpm to 6000rpm
Description
Sets the speed threshold for SLS4 monitoring.

H20.56 **SLS1 filter time**

Hex:	2020-39h	Effective mode:	Upon the next power-on

Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	At stop

Value Range:

0ms to 65535ms

Description

Sets the filtering time for determining that the motor speed is within the SLS1 limit.

H20.57 **SLS2 filter time**

Hex:	2020-3Ah	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	At stop

Value Range:

0ms~65535ms

Description

Sets the filtering time for determining that the motor speed is within the SLS2 limit.

H20.58 **SLS3 filter time**

Hex:	2020-3Bh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	At stop

Value Range:

0ms~65535ms

Description

Sets the filtering time for determining that the motor speed is within the SLS3 limit.

H20.59 **SLS4 filter time**

Hex:	2020-3Ch	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	At stop

Value Range:

0ms~65535ms

Description

Sets the filtering time for determining that the motor speed is within the SLS4 limit.

H20.60 **SLS fault response mode**

Hex:	2020-3Dh	Effective mode:	Upon the next power-on

Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0:STO

1:SS1-t

Description

Sets the mode for stopping the motor when its speed exceeds the speed limit after the SLS monitoring takes effect.

H20.70 SSM upper limit threshold

Hex:	2020-47h	Effective mode:	Upon the next power-on
Min.:	-6000	Unit:	rpm
Max.:	6000	Data Type:	Int16
Default:	200	Change:	At stop

Value Range:

-6000rpm~6000rpm

Description

Upper limit for SSM monitoring

H20.71 SSM lower limit threshold

Hex:	2020-48h	Effective mode:	Upon the next power-on
Min.:	-6000	Unit:	rpm
Max.:	6000	Data Type:	Int16
Default:	-200	Change:	At stop

Value Range:

-6000rpm~6000rpm

Description

Lower limit for SSM monitoring

H20.72 SSM hysteresis threshold

Hex:	2020-49h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	rpm
Max.:	6000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

0rpm~6000rpm

Description

Sets the hysteresis threshold of SSM monitoring to avoid the SSM output jumping too frequently when the speed fluctuates near the upper or lower threshold.

H20.74 **SDI zero position window**

Hex:	2020-4Bh	Effective mode:	Upon the next power-on
Min.:	1	Unit:	Encoder unit
Max.:	536870912	Data Type:	UInt32
Default:	932067	Change:	At stop

Value Range:

1~536870912 in encoder unit

Description

Sets the position threshold for stopping the monitoring.
（Position window for stop position）

H20.76 **SDI zero speed threshold**

Hex:	2020-4Dh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	RPM
Max.:	3000	Data Type:	UInt16
Default:	10	Change:	At stop

Value Range:

0rpm to 3000rpm

Description

Sets the speed threshold for stopping the monitoring.
(Velocity window for n=0)

H20.77 **SDI delay time**

Hex:	2020-4Eh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0ms to 65535ms

Description

Sets the delay time from activation of SDI command to activation of SDI monitoring.

H20.78 **SDI fault response mode**

Hex:	2020-4Fh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0:STO
1:SS1-t
Description
Sets the mode for stopping the motor when it runs in the forbidden direction after the SDI monitoring takes effect.

27.4 6000h Object Dictionary

6620.01h Low 8 bits of safety control word

Hex:	6620-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt8
Default:	0	Change:	Unmodifiable

Value Range:
0~255
Description
Reflects the current state of the RPDO control command issued by the host controller.

Mutable PDO	Description
bit0	Displays STO command state. 0: STO trigger command present 1: No STO trigger command
bit1	Displays SS1 command state. 0: SS1 trigger command present 1: No SS1 trigger command
bit2	Displays SS2 command state. 0: SS2 trigger command present 1: No SS2 trigger command
bit3	Displays SOS command state. 0: SOS trigger command present 1: No SOS trigger command
bit5	Displays SDIp command state. 0: SDIp trigger command present 1: No SDIp trigger command
bit6	Displays SDIn command state. 0: SDIn trigger command present 1: No SDIn trigger command
bit7	Displays Ack fault state. 0: No Ack command 1: Ack command present

6620.02h Safety control word high 8 bits

Hex:	6620-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt8
Default:	0	Change:	Unchangeable

Value Range:

0 to 255

Description

Reflects the current state of the RPDO control command issued by the host controller.

Variable PDO	Description
bit0	Displays reset command state 0: No reset command 1: Reset command present
bit1	Displays SBC command state 0: SBC trigger command present 1: No SBC trigger command
bit2	Displays SLS1 command state 0: SLS1 trigger command present 1: No SLS1 trigger command
bit3	Displays SLS2 command state 0: SLS2 trigger command present 1: No SLS2 trigger command
bit4	Displays SLS3 command state 0: SLS3 trigger command present 1: No SLS3 trigger command
bit5	Displays SLS4 command state 0: SLS4 trigger command present 1: No SLS4 trigger command

6621.01h Safety status word low 8 bits

Hex:	6621-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt8
Default:	0	Change:	Unchangeable

Value Range:

0 to 255

Description

Reflects the current TPDO state uploaded by the safety module.

Variable PDO	Description
bit0	Displays STO state 0: Non-STO state 1: STO state
bit1	Displays SSM state 0: The speed is within SSM limit range 1: The speed is out of SSM limit range
bit3	Displays SOS state 0: Non-SOS state 1: SOS state
bit5	Displays SDIp state 0: Motor is not in forward motion 1: Motor is in forward motion
bit6	Displays SDIn state 0: Motor is not in reverse motion 1: Motor is in reverse motion
bit7	Displays safety function fault state 0: Normal 1: Faulty

6621.02h **High 8 bits of safety status word**

Hex:	6621-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt8
Default:	0	Change:	Unmodifiable

Value Range:

0~255

Description

Reflects the current TPDO state uploaded by the safety module.

Mutable PDO	Description
bit0	Displays reset state. 0: Non-reset state 1: Reset state
bit1	Displays SBC state. 0: Non-SBC state 1: SBC state
bit2	Displays SLS1 state. 0: Non-SLS1 state 1: SLS1 state
bit3	Displays SLS2 state. 0: Non-SLS2 state 1: SLS2 state
bit4	Displays SLS3 state. 0: Non-SLS3 state 1: SLS3 state
bit5	Displays SLS4 state. 0: Non-SLS4 state 1: SLS4 state
bit7	Displays FSOE state. 0: Abnormal connection 1: Normal connection

6630h **Restart Ack reset signal**

Hex:	6630h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real time

Value Range:

0~1

Description

Mutable PDO	Description
RPDO	Executes reset command. 0: Reset deselected 1: Reset active
TPDO	Displays reset state. 0: Non-reset state 1: Reset state

6632h **Fault state**

Hex:	6632h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Max.:	0	Change:	Real-time

Value Range:

0~1

Description

Mutable PDO	Description
TPDO	Displays the fault status. 0: Non-faulty state 1: Faulty state

6640h **STO signal**

Hex:	6640h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real-time

Value Range:

0 to 1

Description

Variable PDO	Description
RPDO	Executes STO command 0: STO active 1: STO deselected
TPDO	Displays STO state 0: Non-STO state 1: STO state

6641h **STO reset mode**

Hex:	6641h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real-time

Value Range:

0~1

Description

Set the STO reset mode:

Mutable SDO	Description
SDO	STO reset mode selection 0: Restart Ack signal not required upon STO reset 1：Restart Ack signal required upon STO reset

6650.01h SS1 Signal

Hex:	6650-01h	Effective mode:	Real -time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real -time

Value Range:

0~1

Description

Mutable PDO	Description
RPDO	Executes SS1 command. 0: SS1 active 1: SS1 deselected
TPDO	Displays SS1 state. 0: Non-SS1 state 1: SS1 state

6651.01h SS1 trigger-to-STO delay time

Hex:	6651-01h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	1000	Change:	Real-time

Value Range:

0ms to 65535ms

Description

After SS1 is triggered, OD Index STO state after a period of time exceeding the value set by this parameter has elapsed.

6653.01h SS1 zero speed threshold

Hex:	6653-01h	Effective mode:	At stop
Min.:	1	Unit:	RPM
Max.:	6000	Data Type:	UInt32
Default:	10	Change:	Real-time

Value Range:

1rpm to 6000rpm

Description

During SS1 deceleration, if the speed falls below the the value set by this parameter for a period of time exceeding the zero speed threshold time, the drive enters the STO state.

6654.01h SS1 zero speed threshold time

Hex:	6654-01h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms to 65535ms

Description

During SS1 deceleration, if the speed falls below the zero speed threshold for a period of time exceeding the value set by this parameter, the drive enters the STO state.

6656.01h SS1 deceleration limit

Hex:	6656-01h	Effective mode:	At stop
Min.:	0	Unit:	Encoder unit/s^2
Max.:	4294967295	Data Type:	UInt32
Default:	15	Change:	Real-time

Value Range:

0 encoder unit/s^2–4294967295 encoder unit/s^2

Description

Sets the minimum deceleration threshold for SS1 when ramp monitoring is performed.

6657.01h SS1 ramp monitor start delay time

Hex:	6657-01h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0ms~65535ms

Description

After SS1 is triggered, the speed ramp monitoring starts after a period of time set by this parameter has elapsed, which is only valid in SS1-r mode.

6660h SBC signal

Hex:	6660h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real-time

Value Range:

0 to 1

Description

Variable PDO	Description
RPDO	Executes SBC command. 0: SBC active 1: SBC deselected
TPDO	Displays SBC state. 0: Normal state 1: SBC state

6668.01h SOS signal

Hex:	6668-01h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real-time

Value Range:

0~1

Description

Variable PDO	Description
RPDO	Executes SOS command. 0: Trigger SOS 1: Do not SOS
TPDO	Displays SOS state. 0: Non-SOS state 1: SOS state

666A.01h SOS zero position threshold

Hex:	666A-01h	Effective mode:	At stop
Min.:	0	Unit:	Encode unit
Max.:	536870912	Data Type:	UInt32
Default:	932067	Change:	Real-time

Value Range:

0~536870912 in encoder unit

Description

Sets the maximum allowable variation of position feedback in SOS state.

666C.01h SOS zero speed threshold

Hex:	666C-01h	Effective mode:	At stop
Min.:	0	Unit:	rpm
Max.:	6000	Data Type:	UInt32
Default:	10	Change:	Real-time

Value Range:

0rpm~6000rpm

Description

Sets the maximum allowable difference between motor speed and 0 rpm in SOS state.

6670.01h SS2 signal

Hex:	6670-01h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real-time

Value Range:

0~1

Description

Variable PDO	Description
RPDO	Executes SS2 command. 0: SS2 active 1: SS2 deselected
TPDO	Displays SS2 state. 0: Non-SS2 state 1: SS2 state

6671.01h SS2 trigger-to-STO delay time

Hex:	6671-01h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0ms~65535ms

Description

After SS2 is triggered, the drive enters the SOS state after a period of time exceeding the value set by this parameter has elapsed.

6672.01h SS2 zero speed threshold time

Hex:	6672-01h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms to 65535ms

Description

During SS2 deceleration, if the speed falls below the zero speed threshold for a period of time exceeding the value set by this parameter, the drive enters the SOS state.

6674.01h SS2 deceleration limit

Hex:	6674-01h	Effective mode:	At stop
Min.	0	Unit:	Encoder unit/s²
Max.:	4294967295	Data Type:	UInt32
Default:	15	Change:	Real-time

Value Range:

0~4294967295

Description

Sets the minimum deceleration threshold for SS2 when ramp monitoring is performed.

6675.01h SS2 ramp monitor start delay time

Hex:	6675-01h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0ms to 65535ms

Description

After SS2 is triggered, the speed ramp monitoring starts after a period of time set by this parameter has elapsed, which is only valid in SS2-r mode.

6676.01h SS2 reset mode selection

Hex:	6676-01h	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real-time

Value Range:

0 to 1

Description

Variable SDO	Description
SDO	SS2 reset mode 0: Restart Ack signal is not required upon SS2 reset 1: Restart Ack signal is required upon SS2 reset upon SS2 reset

6690.01h SLS1 signal

Hex:	6690-01h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real-time

Value Range:

0 to 1

Description

Variable PDO	Description
RPDO	Executes SLS1 command 0: SLS1 active 1: SLS1 deselected
TPDO	Displays SLS1 state 0: Normal state 1: SLS1 monitoring state

6690.02h SLS2 signal

Hex:	6690-02h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real-time

Value Range:

0~1

Description

Displays SLS function state and executes SLS command.

Variable PDO	Description
RPDO	Executes SLS2 command 0: SLS2 active 1: SLS2 deselected
TPDO	Displays SLS2 state. 0: Normal state 1: SLS2 monitoring state

6690.03h SLS3 signal

Hex:	6690-03h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real-time

Value Range:

0~1

Description

Displays SLS function state and executes SLS command.

Variable PDO	Description
RPDO	Executes SLS3 command. 0: SLS3 active 1: SLS3 deselected
TPDO	Displays SLS3 state. 0: Normal state 1: SLS3 monitoring state

6690.04h SLS4 signal

Hex:	6690-04h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Real-time

Value Range:

0~1

Description

Displays SLS function state and executes SLS command.

Variable PDO	Description
RPDO	Executes SLS4 command. 0: SLS4 active 1: SLS4 deselected
TPDO	Displays SLS4 state. 0: Normal state 1: SLS4 monitoring state

6691.01h SLS1 switchover delay

Hex:	6691-01h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0ms to 65535ms

Description

Sets the delay time from activation of SLS1 request command to activation of SLS1 monitoring.
(Time delay to initiate SLS1 limits)

6691.02h SLS2 switchover delay

Hex:	6691-02h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0ms to 65535ms

Description

Sets the delay time from activation of SLS2 request command to activation of SLS2 monitoring.

6691.03h SLS3 switchover delay

Hex:	6691-03h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0ms~65535ms

Description

Sets the delay time from activation of SLS3 request command to activation of SLS3 monitoring.

6691.04h SLS4 switchover delay

Hex:	6691-04h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0ms~65535ms

Description

Sets the delay time from activation of SLS4 request command to activation of SLS4 monitoring.

6693.01h SLS speed limit threshold 1

Hex:	6693-01h	Effective mode:	At stop
Min.:	0	Unit:	rpm
Max.:	6000	Data Type:	UInt32

Default: 1000 Change: Real-time

Value Range:
0rpm~6000rpm

Description
Sets the threshold for SLS1.

6693.02h SLS2 threshold

Hex: 6693-02h Effective mode: At stop
Min.: 0 Unit: rpm
Max.: 6000 Data Type: UInt32
Default: 1000 Change: Real-time

Value Range:
0rpm~6000rpm

Description
Sets the threshold for SLS2.

6693.03h SLS3 threshold

Hex: 6693-03h Effective mode: At stop
Min.: 0 Unit: rpm
Max.: 6000 Data Type: UInt32
Default: 1000 Change: Real-time

Value Range:
0rpm to 6000rpm

Description
Sets the threshold for SLS3.

6693.04h SLS4 threshold

Hex: 6693-04h Effective mode: At stop
Min.: 0 Unit: rpm
Max.: 6000 Data Type: UInt32
Default: 1000 Change: Real-time

Value Range:
0rpm~6000rpm

Description
Sets the threshold for SLS4.

6694.01h SLS1 filter time

Hex: 6694-01h Effective mode: At stop
Min.: 0 Unit: ms
Max.: 65535 Data Type: UInt16

Default:	10	Change:	Real-time

Value Range:

0ms to 65535ms

Description

Sets the filter time within SLS1 window
(Time for speed within SLS1 window)

6694.02h SLS2 filter time

Hex:	6694-02h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0ms to 65535ms

Description

Sets the filter time within SLS2 window

6694.03h SLS3 filter time

Hex:	6694-03h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0ms to 65535ms

Description

Sets the filter time within SLS3 window

6694.04h SLS4 filter time

Hex:	6694-04h	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0ms to 65535ms

Description

Sets the filter time within SLS4 window

66D0h SDIp signal

Hex:	66D0h	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean

Default: 0 Change: Real-time

Value Range:

0~1

Description

Displays the forward rotation state of the motor and issues the SDI forward command.

Variable PDO	Description
RPDO	Executes SDIp monitoring function. 0: Forward direction is not allowed 1: Forward direction is allowed
TPDO	Indicates forward rotation state of the motor. 0: Motor is not running forwawrdly 1: Motor is running forwawrdly

66D1h **SDIn signal**

Hex: 66D1h Effective mode: Real-time

Min.: 0 Unit: -

Max.: 1 Data Type: Boolean

Default: 0 Change: Real-time

Value Range:

0~1

Description

Displays the reverse rotation state of the motor and issues the SDI reverse command.

Variable PDO	Description
RPDO	Executes SDIp monitoring function. 0: Reverse direction is not allowed 1: Reverse direction is allowed
TPDO	Displays SDIn state. 0: Motor is not running reversely 1: Motor is running reversely

66D3h **SDI zero position threshold**

Hex: 66D3h Effective mode: At stop

Min.: 0 Unit: Encoder unit

Max.: 536870912 Data Type: UInt32

Default: 932067 Change: Real-time

Value Range:

0 to 536870912

Description

Sets the position window for stopping the monitoring.

66D5h SDI zero speed threshold

Hex:	66D5h	Effective mode:	At stop
Min.:	0	Unit:	RPM
Max.:	3000	Data Type:	UInt32
Default:	10	Change:	Real-time

Value Range:

0rpm to 3000rpm

Description

Zero speed threshold for SDI monitoring

66E0.01h SSM state

Hex:	66E0-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Unchangeable

Value Range:

0 to 1

Description

SSM can be implemented as a bit in the safety state.

Variable PDO	Description
TPDO	Displays SSM state 0: Motor speed out of SSM limit 1: Motor speed within SSM limit

66E2.01h SSM upper limit

Hex:	66E2-01h	Effective mode:	At stop
Min.:	-6000	Unit:	RPM
Max.:	6000	Data Type:	Int32
Default:	200	Change:	Real-time

Value Range:

–6000 rpm to +6000 rpm

Description

Upper limit for SSM monitoring

66E4.01h SSM lower limit

Hex:	66E4-01h	Effective mode:	At stop
Min.:	-6000	Unit:	rpm
Max.:	6000	Data Type:	Int32

Default:	-200	Change:	Real-time

Value Range:
–6000 rpm to +6000 rpm
Description
Lower limit for SSM monitoring

E600.01h **FSoE slave command**

Hex:	E600-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt8
Default:	0	Change:	Unchangeable

Value Range:
0 to 255
Description
FSoE slave command

E600.02h **FSoE slave connection ID**

Hex:	E600-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
FSoE slave connection ID

E600.03h **FSoE slave CRC value**

Hex:	E600-03h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
FSoE slave CRC value

E601.01h **FSoE connection status**

Hex:	E601-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1	Data Type:	Boolean
Default:	0	Change:	Unchangeable

Value Range:
0 to 1
Description

Variable PDO	Description
TPDO	Displays FSoE connection status 0: Connection is normal. 1: Connection is abnormal.

E700.01h FSoE master command

Hex:	E700-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt8
Default:	0	Change:	Real-time

Value Range:
0 to 255
Description
FSoE master command

E700.02h FSoE master connection ID

Hex:	E700-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 65535
Description
FSoE master connection ID

E700.03h FSoE master CRC value

Hex:	E700-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 65535
Description
FSoE master CRC value

E901.01h FSoE version

Hex:	E901-01h	Effective mode:	-
Min.:	0	Unit:	-

Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Supported FSoE version

E901.02h FSoE address

Hex:	E901-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
FSoE address

E901.03h PSoE connection ID

Hex:	E901-03h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
ID of connection between FSoE master and slave.

E901.04h Watchdog time

Hex:	E901-04h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Watchdog timeout

E901.06h Connection type

Hex:	E901-06h	Effective mode:	-
Min.:	0	Unit:	-

Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

0: Master connection

1: Slave connection

E901.07h Communication parameter length

Hex:	E901-07h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

The length of the communication parameters in the parameter set.

E901.08h Application layer parameter length

Hex:	E901-08h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

The length of the application parameters in the parameter set.

E901.09h SRA CRC

Hex:	E901-09h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

CRC checksum of safety-related application parameter sets.

F980.01h FSOE address

Hex:	F980-01h	Effective mode:	-

Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 255

Description

FSoE slave address

28 Troubleshooting

28.1 Fault Level and Display

Faults and alarms of the servo drive are divided into three levels based on severity: No. 1 > No. 2 > No. 3, as shown below.

- No. 1 non-resettable fault
- No. 1 resettable fault
- No. 2 resettable fault
- No. 3 resettable alarm

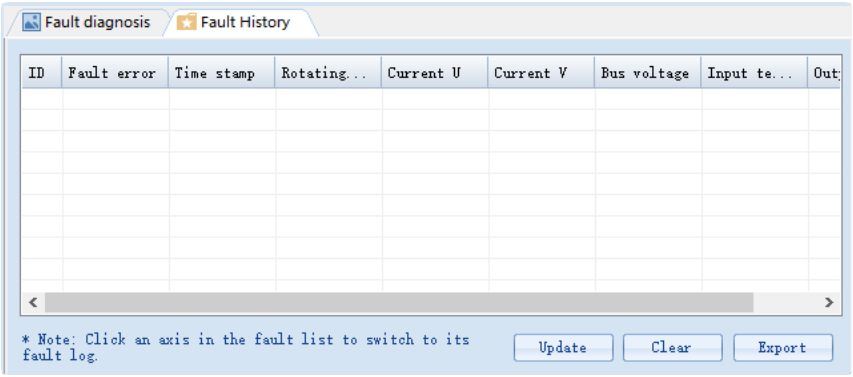
Note

"Resettable" means the keypad stops displaying the fault/warning once a "Reset signal" is input.

Fault and alarm log

The servo drive can record the latest 20 faults and alarms and values of status parameters upon fault/alarm. If repeated faults are present in the last 5 times, the repeated faults can be recorded many times after being cleared. If repeated alarms are present in the last 5 times, only one is recorded.

A fault/alarm will still be saved in the fault log after reset. To remove the fault/alarm from the fault log, set H02.31 to 2. See the following figure for details.



Read the value of H0b.34 through InoDriverShop to get the fault/alarm code. See examples in the following table.

H0b.34 (hex)	Description of H0b.34 (hex)
0101	0: Fault subcode 101: Fault code

28.2 Fault Reset

Operating procedure:

- To stop the keypad from displaying the fault/alarm, set H0d.01 (Fault reset) to 1 or activate the DI terminal assigned with DI function 2 (FunIN.2: ALM- RST, fault and alarm reset).
- To reset No. 1 and No. 2 faults, switch off the S-ON signal, and then set H0d.01 to 1 or activate the DI terminal allocated with DI function 2.
- To reset No. 3 alarms, set H0d.01 to 1 or activate the DI terminal allocated with DI function 2.

Note

- Some faults and warnings can be reset only after the fault causes are rectified by modifying the settings. However, a reset operation does not necessarily activate the modifications to settings.
- For modifications activated at next power-on (R, S, T/L1C, L2C), perform a power cycle.
- For modifications activated after stop, switch off the S-ON signal. The servo drive can operate normally only after modifications are activated.

☆Related function No.:

Start Process	Fault	Cause	Troubleshooting
FunIN.2	ALM-RST	Fault/alarm reset signal	The servo drive may, depending on the alarm type, continue running after reset. When FunIN.2 is assigned to a low-speed DI, the effective level change of this DI must be kept for more than 3 ms. Otherwise, fault reset will be inactive. Do not assign FunIN.2 to a high-speed DI. Otherwise, fault/alarm reset will be inactive. • Inactive: Not resetting the fault/alarm • Active: Resetting the fault/alarm

28.3 Handling of Faults and Alarms [Standard P]

28.3.1 List of Fault Codes

No. 1 non-resettable faults:

Table 28–1 List of No. 1 non-resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Aux. Code
E101	E101.0	Abnormal parameters in groups H02 and above	No.1	No	0x6320	0x01010101
	E101.1	Parameter error in group H00/H01	No.1	No	0x6320	0x11010101
	E101.2	Address error in read/write operation after the number of parameters changes	No.1	No	0x6320	0x21010101
	E101.9	Parameter attribute initialization check error	No.1	No	0x0101	0x91010101
E102	E102.0	FPGA communication establishment error	No.1	No	0x7500	0x01020102
	E102.1	FPGA initialization start error	No.1	No	0x7500	0x11020102
	E102.8	FPGA and MCU software version mismatch	No.1	No	0x7500	0x81020102
E104	E104.1	MCU running timeout (MCU break down)	No.1	No	0x7500	0x11040104
	E104.2	FPGA running timeout (FPGA break down)	No.1	No	0x7500	0x21040104
	E104.4	MCU command update timeout	No.1	No	0x7500	0x41040104
E120	E120.0	Unknown encoder model	No.1	No	0x7122	0x01200120
	E120.1	Unknown motor model	No.1	No	0x7122	0x11200120
	E120.2	Unknown drive model	No.1	No	0x7122	0x21200120
	E120.5	Motor and drive current mismatch	No.1	No	0x7122	0x51200120
	E120.6	FPGA and motor model mismatch	No.1	No	0x7122	0x61200120
	E120.7	Model check error	No.1	No	0x0120	0x71200120
	E120.8	Junction temperature parameter check error	No.1	No	0x0120	0x81200120
E136	E136.0	Encoder ROM motor parameter check error	No.1	No	0x7305	0x01360136
	E136.1	Encoder ROM motor parameter read error	No.1	No	0x7305	0x11360136
	E136.9	Dimension parameter Initialization error	No.1	No	0x7305	0x11360136

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Aux. Code
E138	E138.0	Accuracy compensation data error	No.1	No	0x0138	0x01380138
	E138.1	Cogging ripple compensation data check failure	No.1	No	0x0138	0x11380138
	E138.2	Gantry sync compensation data check failure	No.1	No	0x0138	0x21380138
	E138.3	Overload compensation data check failure	No.1	No	0x0138	0x31380138
E140	E140.1	MCU key calculation failed	No.1	No	0x0140	0x02400140
	E140.4	Signature verification failed	No.1	No	0x0140	0x03400140
E201	E201.0	Phase-P overcurrent	No.1	No	0x2312	0x02010201
	E201.1	Phase-U overcurrent	No.1	No	0x2312	0x12010201
	E201.2	Phase-V overcurrent	No.1	No	0x2312	0x22010201
	E201.4	Phase-N overcurrent	No.1	No	0x2312	0x42010201
E210	E210.0	Output short-circuited to ground	No.1	No	0x2330	0x02100210
E234	E234.0	Runaway (protection scheme 1)	No.1	No	0x0234	0x02340234
	E234.1	Runaway (protection scheme 2)	No.1	No	0x0234	0x12340234
E308	E308.0	Pulse encoder phase A wire breakage	No.1	No	0x0308	0x03080308
	E308.1	Pulse encoder phase B wire breakage	No.1	No	0x0308	0x13080308
	E308.2	Pulse encoder phase Z wire breakage	No.1	No	0x0308	0x23080308
E603	E603.0	Gantry communication CRC failure	No.1	No	0x0603	0x06030603
	E603.1	Gantry communication timeout	No.1	No	0x0603	0x16030603
	E603.2	Drive failed to establish communication for a long time	No.1	No	0x0603	0x26030603
E606	E606.0	Gantry torque alignment timeout	No.1	No	0x0606	0x06060606
E619	E619.0	Absolute accuracy compensation parameter setting error	No.1	No	0x0619	0x06190619
	E619.1	Absolute accuracy compensation overflow	No.1	No	0x0619	0x16190619
E720	E720.0	Wrong encoder interface	No.1	No	0x0720	0x07200720
E740	E740.0	Absolute encoder communication timeout	No.1	No	0x0740	0x07400740
	E740.2	Absolute encoder error	No.1	No	0x7305	0x27400740

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Aux. Code
	E740.3	Absolute encoder single-turn calculation error	No.1	No	0x7305	0x37400740
	E740.6	Encoder write error	No.1	No	0x7305	0x67400740
	E740.8	BISSC register communication failure	No.1	No	0x7305	0x87400740
	E740.9	Encoder data transmit delay too long	No.1	No	0x7305	0x97400740
E755	E755.0	Nikon encoder communication fault	No.1	No	0x0FFF	0x07550755
E765	E765.0	Nikon encoder over-temperature or overspeed	No.1	No	0x0765	0x07650765
E770	E770.6	Fully closed-loop 2nd encoder initialization communication error	No.1	No	0x7305	0x67700770
	E770.7	Fully closed-loop Inovance 2nd encoder communication error	No.1	No	0x7305	0x77700770
E771	E771.0	Communication handshake failed between the interpolator and drive	No.1	No	0x0771	0x07710771
EA33	EA33.0	Encoder read/write check error	No.1	No	0x7305	0x0A330A33
	EA33.1	Fully closed-loop Inovance 2nd encoder data read/write error	No.1	No	0x7305	0X1A330A33
EA34	EA34.0	Abnormal Hall state	No.1	No	0x0A34	0x0A340A34
	EA34.1	Dynamic Hall auto-tuning error	No.1	No	0x0A34	0x1A340A34
	EA34.2	Static Hall auto-tuning error	No.1	No	0x0A34	0x2A340A34
EEE0	EEE0.0	Gantry paired axis error	No.1	No	0x0EE0	0x0EE00EE0

No. 1 resettable faults:

Table 28–2 List of No. 1 resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Aux. Code
E126	E126.0	Process segment number error	No.1	Yes	0x0126	0x01260126
	E126.1	Internal operation mode error of the process segment	No.1	Yes	0x0126	0x11260126
	E126.2	Position reference type error in process segment position mode	No.1	Yes	0x0126	0x21260126
E150	E150.0	STO safety state applied	No.1	Yes	0x0150	0x01500150
	E150.1	STO input state abnormal	No.1	Yes	0x0150	0x11500150

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Aux. Code
	E150.2	Buffer 5 V supply error	No.1	Yes	0x0150	0x21500150
	E150.3	STO input circuit hardware diagnosis failure	No.1	Yes	0x0150	0x31500150
	E150.4	PWM Buffer hardware diagnosis failure	No.1	Yes	0x0150	0x41500150
	E150.5	STO input signal interference	No.1	Yes	0x0150	0x51500150
E208	E208.2	Encoder communication timeout	No.1	Yes	0x0208	0x22080208
	E208.4	FPGA current loop operation timeout	No.1	Yes	0x0208	0x42080208
E320	E320.0	Discharge fault	No.1	Yes	0x0320	0x03200320
	E320.1	External braking resistor surface temperature too high	No.1	Yes	0x0320	0x13202320
E321	E321.0	Dynamic brake resistor overload	No.1	Yes	0x0321	0x03210321
E400	E400.0	Main circuit overvoltage	No.1	Yes	0x3210	0x04000400
E410	E410.0	Main circuit undervoltage	No.1	Yes	0x3220	0x04100410
	E410.1	Main circuit de-energized	No.1	Yes	0x0410	0x14100410
E500	E500.0	Motor overspeed	No.1	Yes	0x8400	0x05000500
	E500.1	Speed feedback overflow	No.1	Yes	0x8400	0x15000500
	E500.2	FPGA position feedback pulse overspeed	No.1	Yes	0x0500	0x25000500
E602	E602.0	Locked-rotor	No.1	Yes	0x0602	0x06022602
	E602.1	Angle auto-tuning overtravel	No.1	Yes	0x0602	0x16022602
	E602.2	U/V/W phase sequence reversed	No.1	Yes	0x0602	0x26020602
	E602.3	Large encoder jitter during angle auto-tuning	No.1	Yes	0x0602	0x36022602
	E602.4	Auto-tuning failed. Auto-tuning timeout.	No.1	Yes	0x0602	0x46022602
	E602.5	Angle auto-tuning failed. Z signal not found.	No.1	Yes	0x0602	0x56022602
	E602.6	Angle auto-tuning does not converge	No.1	Yes	0x0602	0x66022602
E604	E604.0	Inconsistent settings of two gantry axes	No.1	Yes	0x0604	0x06040604
	E604.1	Gantry not set to position mode	No.1	Yes	0x0604	0x16040604
	E604.2	Gantry is running on an unsupported feature	No.1	Yes	0x0604	0x26040604
E605	E605.0	Speed too fast upon S-ON	No.1	Yes	0x0605	0x06050605

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Aux. Code
E612	E612.0	Rotor locked during phase sequence auto-tuning	No.1	Yes	0x0612	0x06122612
	E612.1	Overtravel occurred during phase sequence auto-tuning	No.1	Yes	0x0612	0x16122612
	E612.3	Large encoder jitter during phase sequence auto-tuning	No.1	Yes	0x0612	0x36122612
	E612.4	Phase sequence auto-tuning failed. Auto-tuning timeout.	No.1	Yes	0x0612	0x46122612
E620	E620.0	Motor overload	No.1	Yes	0x3230	0x06200620
	E620.1	Overload current limit mode, motor overloaded	No.1	Yes	0x3230	0x16200620
E621	E621.0	Overload current limiting torque attained	No.1	Yes	0x0621	0x06210621
E630	E630.0	Motor stall over-temperature protection	No.1	Yes	0x7121	0x06300630
E631	E631.1	24 V power supply or brake not connected	No.1	Yes	0x0631	0x16310631
	E631.2	P-MOS open circuit	No.1	Yes	0x0631	0x26310631
	E631.3	N-MOS disconnection	No.1	Yes	0x0631	0x36310631
E640	E640.0	High IGBT junction overtemperature	No.1	Yes	0x4210	0x06400640
	E640.1	Flywheel diode overtemperature	No.1	Yes	0x0640	0x16400640
E650	E650.0	Heatsink overtemperature	No.1	Yes	0x4210	0x06500650
E660	E660.0	Motor overtemperature	No.1	Yes	0x4210	0x06600660
E770	E770.0	Fully-closed loop input phase A wire breakage	No.1	Yes	0x7305	0x07700770
	E770.1	Fully-closed loop input phase B wire breakage	No.1	Yes	0x7305	0x17700770
	E770.2	Fully-closed loop input phase Z wire breakage	No.1	Yes	0x7305	0x27700770
	E770.3	Fully closed-loop external loop encoder communication timeout.	No.1	Yes	0x7305	0x37700770
	E770.8	Full closed-loop encoder data transmit delay is too large	No.1	Yes	0x7305	0x87700770
E939	E939.0	Motor power cables disconnected	No.1	Yes	0x0939	0x09390939
EB00	EB00.0	Excessive position deviation	No.1	Yes	0x8611	0x0B000B00

No. 2 resettable faults

Table 28–3 List of No. 2 resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Aux. Code
E122	E122.0	Multi-turn absolute encoder setting error	No.2	Yes	0x6320	0x01220122
	E122.1	Different DIs allocated with the same function	No.2	Yes	0x6320	0x11220122
	E122.2	DO function allocation error	No.2	Yes	0x0122	0x21220122
	E122.3	Upper limit in the rotation mode too high	No.2	Yes	0x6320	0x31220122
	E122.4	VDI function allocation error	No.2	Yes	0x0122	0x41220122
	E122.5	DI and VDI assigned with the same function	No.2	Yes	0x0122	0x51220122
	E122.6	Absolute function setting fault of 2nd encoder	No.2	Yes	0x6320	0x61220122
	E122.7	Fully closed-loop parameter setting error	No.2	Yes	0x6320	0x71220122
	E122.8	Interpolator version mismatch	No.2	Yes	0x6320	0x81220122
E420	E420.0	Main circuit phase loss	No.2	Yes	0x3130	0x04200420
E661	E661.0	STune failure	No.2	Yes	0x0661	0x06610661
E662	E662.0	ETune failure	No.2	Yes	0x0662	0x06620662
E664	E664.0	Resonance too strong	No.2	Yes	0x0664	0x06640664
E731	E731.0	Encoder multi-turn data lost	No.2	Yes	0x7305	0x07310731
	E731.1	Inovance second encoder multi-turn data lost	No.2	Yes	0x7305	0x17310731
E733	E733.0	Encoder multi-turn counting error	No.2	Yes	0x7305	0x07330733
	E733.1	Inovance second encoder multi-turn data lost	No.2	Yes	0x7305	0x17330733
E735	E735.0	Encoder multi-turn counting overflow	No.2	Yes	0x7305	0x07350735
E760	E760.0	Encoder over-temperature	No.2	Yes	0x4210	0x07600760
E994	E994.0	Station numbers conflict	No.2	Yes	0x0994	0x09940994
EB00	EB00.1	Position deviation overflow	No.2	Yes	0x8611	0x1B000B00
EB01	EB01.0	Position reference increment too large	No.2	Yes	0x6320	0x0B010B01
	EB01.1	Individual position reference increment too large	No.2	Yes	0x6320	0x1B010B01
	EB01.2	Position reference increment too large continuously	No.2	Yes	0x6320	0x2B010B01
	EB01.3	Reference overflow	No.2	Yes	0x6320	0x3B010B01
EB02	EB02.0	Position deviation too large in fully closed-loop mode	No.2	Yes	0x8611	0x0B020B02

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Aux. Code
	EB02.1	Fully closed-loop position deviation overflow	No.2	Yes	0x8611	0x1B020B02
EB03	EB03.0	Electronic gear ratio beyond the limit - H05.02	No.2	Yes	0x0B03	0x0B030B03
	EB03.1	Electronic gear ratio beyond the limit - Electronic gear ratio 1	No.2	Yes	0x0B03	0x1B030B03
	EB03.2	Electronic gear ratio beyond the limit -Electronic gear ratio 2	No.2	Yes	0x0B03	0x2B030B03
EB04	EB04.0	Large gantry position deviation	No.2	Yes	0x0B04	0x0B040B04
	EB04.1	Gantry position deviation overrun	No.2	Yes	0x0B04	0x1B040B04
ED02	ED02.0	Modbus communication timeout	No.2	Yes	0x0D02	0x0D020D02
ED03	ED03.0	CANLink communication failure	No.2	Yes	0x0D03	0x0D030D03
ED04	ED04.0	CANopen communication timeout	No.2	Yes	0x0D04	0x0D040D04
ED05	ED05.0	CANopen communication initialized	No.2	Yes	0x0D05	0x0D050D05
ED08	ED08.0	CANopen bus PDO transmission length error	No.2	Yes	0x0D08	0x0D080D08
ED11	ED11.0	CANopen sync period error too large	No.2	Yes	0x0D11	0x0D110D11
EE09	EE09.0	Software position limit setting error	No.2	Yes	0x6320	0x0E090E09
	EE09.1	Home setting error	No.2	Yes	0x6320	0x1E090E09
	EE09.2	Gear ratio beyond the limit	No.2	Yes	0x6320	0x2E090E09

28.3.2 List of Alarm Codes

Alarm

Table 28–4 List of alarm codes

Warning code	Alarm subcode	Name	Fault level	Resettable	Error code	Aux. Code
E108	E108.0	Storage parameter write error	No.3	Yes	0x5530	0x01080108
	E108.1	Storage parameter read error	No.3	Yes	0x5530	0x11080108
	E108.2	Invalid check on data written in EEPROM	No.3	Yes	0x5530	0x21080108

Warning code	Alarm subcode	Name	Fault level	Resettable	Error code	Aux. Code
	E108.3	Invalid check on data read in EEPROM	No.3	Yes	0x5530	0x31080108
	E108.4	Single data is stored too many times	No.3	Yes	0x0108	0x41080108
E110	E110.0	Frequency-division pulse output setting error	No.3	Yes	0x0110	0x01100110
E120	E120.3	The motor and drive do not match in the power	No.3	Yes	0x7122	0x31200120
E121	E121.0	Invalid S-ON command	No.3	Yes	0x0121	0x01210121
E126	E126.3	PR process segment write parameter out of limit	No.3	Yes	0x0126	0x31260126
E510	E510.0	Frequency division pulse output overspeed	No.3	Yes	0x0510	0x05100510
E600	E600.0	Inertia auto-tuning failure	No.3	Yes	0x0600	0x06000600
E601	E601.0	Homing alarm	No.3	Yes	0x0601	0x06010601
	E601.1	Homing switch error	No.3	Yes	0x0601	0x16010601
	E601.2	Homing mode setting error	No.3	Yes	0x6320	0x26010601
	E601.4	Gantry homing mode setting error	No.3	Yes	0x0601	0x46010601
E602	E602.9	Angle auto-tuning not done for incremental encoder motor	No.3	Yes	0x0602	0x96022602
E607	E607.0	Large gantry torque deviation	No.3	Yes	0x0607	0x06070607
E608	E608.0	Master-to-slave parameter setting error	No.3	Yes	0x0608	0x06080608
E609	E609.0	Data save timeout	No.3	Yes	0x0609	0x06090609
	E609.1	Data save overflow	No.3	Yes	0x0609	0x16090609
	E609.2	Failed to save data	No.3	Yes	0x0609	0x26090609
	E609.3	Failed to erase data	No.3	Yes	0x0609	0x36090609
E621	E621.1	Overload current limiting torque attained	No.3	Yes	0x0621	0x16210621
E631	E631.4	P-MOS disconnection	No.3	Yes	0x0631	0x46310631
	E631.5	N-MOS disconnection	No.3	Yes	0x0631	0x56310631
E730	E730.0	Encoder battery alarm	No.3	Yes	0x7305	0x07300730
	E730.1	Inovance 2nd encoder battery voltage low	No.3	Yes	0x7305	0x17300730
E831	E831.1	AI1 zero offset too large	No.3	Yes	0x0831	0x18310831
	E831.2	AI2 zero offset too large	No.3	Yes	0x0831	0x28310831
E834	E834.1	AI1 overvoltage	No.3	Yes	0x0834	0x18340834
	E834.2	AI2 overvoltage	No.3	Yes	0x0834	0x28340834
E900	E900.0	DI emergency braking	No.3	Yes	0x0900	0x09000900
E902	E902.0	DI/VDI setting invalid	No.3	Yes	0x6320	0x09020902

Warning code	Alarm subcode	Name	Fault level	Resettable	Error code	Aux. Code
	E902.1	DO/VDO setting invalid	No.3	Yes	0x0902	0x19020902
	E902.2	Torque reach setting invalid	No.3	Yes	0x0902	0x29020902
E909	E909.0	Motor overload	No.3	Yes	0x3230	0x09090909
E910	E910.0	Control circuit overvoltage	No.3	Yes	0x3210	0x09100910
E920	E920.0	Braking resistor overload	No.3	Yes	0x3210	0x09200920
E921	E921.0	Dynamic brake resistor overload alarm	No.3	Yes	0x3210	0x09210921
E922	E922.0	Resistance of the external braking resistor too small	No.3	Yes	0x6320	0x09220922
E924	E924.0	Regenerative transistor over-temperature	No.3	Yes	0x3230	0x09240924
E940	E940.0	Change of controlled motor is detected. It is recommended to restore factory settings before use	No.3	Yes	0x0940	0x09400940
E941	E941.0	Modified parameters activated at next power-on	No.3	No	0x6320	0x09410941
E942	E942.0	Parameter storage too frequent	No.3	Yes	0x7600	0x09420942
E950	E950.0	Positive limit switch alarm	No.3	Yes	0x5443	0x09500950
E952	E952.0	Negative limit switch alarm	No.3	Yes	0x5444	0x09520952
E954	E954.0	Position reference overflow	No.3	Yes	0x0954	0x09540954
E956	E956.0	Forward position reference overtravel in process segment position mode	No.3	Yes	0x0956	0x09560956
E958	E958.0	Reverse position reference overtravel in process segment position mode	No.3	Yes	0x0958	0x09580958
E971	E971.0	Undervoltage alarm for voltage drop protection	No.3	Yes	0x0971	0x09710971
E980	E980.0	Frequency division output overflow	No.3	Yes	0x0980	0x09800980
E990	E990.0	Pulse input overspeed alarm	No.3	Yes	0x0990	0x09900990
E991	E991.1	SIGN pulse connection error	No.3	Yes	0x0991	0x19910991
EA34	EA34.9	Hall is not configured	No.3	Yes	0x0A34	0x9A340A34
EA41	EA41.0	Torque fluctuation compensation failure	No.3	Yes	0X0A41	0x0A410A41
EE08	EE08.7	Error frame pre-warning	No.3	Yes	0x0E08	0x7E080E08

28.3.3 Description of Fault Codes

28.3.3.1 Solutions to Faults

- E101.0: Abnormal parameters in groups H02 and above
  Description:

  The total number of parameters changes, which generally occurs after software update. Setpoints of parameters in groups H02 and above exceed the limit, which generally occurs after software update.

Cause	Troubleshooting	Solution
1. The actual value of the parameter exceeds the upper/lower limit of the parameter.	Read H0b.90 and H0b.91 and obtain the abnormal parameter group number.	Rectify the wrong values. Restore default settings.
2. The voltage of the control circuit power supply drops instantaneously.	Check whether the control circuit (L1C, L2C) is in the process of power-off or instantaneous power failure occurs. Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range: 220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: 10% to +10% (198 V to 264 V) 380 V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	Restore system parameters to default settings (H02.31 = 1) and write parameters again. Increase the power supply capacity or replace with a power supply of higher capacity. Restore system parameters to default settings (H02.31 = 1), and write parameters again.
3. Instantaneous power failure occurs when saving parameters.	Check whether instantaneous power failure occurs when saving parameters.	Power on the system again, restore system parameters to default settings (H02.31 = 1), and write parameters again.
4. The number of write operations within a certain period of time exceeds the limit.	Check whether instantaneous power failure occurs when saving parameters. Check whether parameters are updated frequently through the host controller.	If the servo drive is faulty, replace the servo drive. Change the parameter writing method and write parameters again. Power on the system again, restore system parameters to default settings (H02.31 = 1), and write parameters again.

Cause	Troubleshooting	Solution
5. The software is updated.	Check whether parameter values in group H02 and above exceed the upper/ lower limit due to software update.	Reset the servo drive model and servo motor model, and restore system parameters to default settings (H02.31 = 1).
6. The servo drive is faulty.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the servo drive.

- E101.1: parameter error in group H00/H01
  Description:

  The total number of parameters changes, which generally occurs after software update. Setpoints of parameters in groups H00 or H01 exceed the limit, which generally occurs after software update.

Cause	Troubleshooting	Solution
The servo drive detects whether parameter values in groups H00 and H01 exceed the upper/lower limit during initialization upon power-on. If yes, the keypad displays E101.1. Motor parameters in group H00 are read from the encoder. Servo drive parameters in group H01 are mapped based on the servo drive model defined by H01.10.	Read H0b.90 and H0b.91 and obtain the abnormal parameter group number. Check groups H00 and H01 to find the parameter whose value exceeds the limit. Confirm whether this parameter range is abnormal.	Replace the motor or drive.

- E101.2: Address error in read/write operation after the number of parameters changes
  Description:

  Address error in read/write operation after the number of parameters changes.

Cause	Troubleshooting	Solution
The total number of parameters changes after software update, leading to address error in read/write operation.	Read H0b.90 and H0b.91 and obtain the abnormal parameter group number.	Rectify the wrong values. Restore default settings.

- E101.9: Parameter attribute initialization check error
  Description:

Parameter attribute initialization check error.

Cause	Troubleshooting	Solution
Parameter attribute initialization check error	Check whether H0A.99 has been written.	Restore factory settings. If the problems persists after several power cycles, replace the drive.

- E102.0: FPGA communication establishment error
  Description:

  The communication between MCU and FPGA cannot be established.

Cause	Troubleshooting	Solution
The communication between MCU and FPGA cannot be established.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.

- E102.1: FPGA initialization start error
  Description:

  FPGA failed.

Cause	Troubleshooting	Solution
FPGA cannot start.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.

- E102.8: FPGA and MCU software version mismatch
  Description:

  FPGA and MCU version mismatch.

Cause	Troubleshooting	Solution
The software versions of MCU and FPGA are inconsistent.	Check whether the MCU version (H01.00) is 9xx.x (the fourth digit displayed on the keypad is 9). Check whether the FPGA version (H01.01) is 9xx.x (the fourth digit displayed on the keypad is 9).	Contact Inovance for technical support. Update the FPGA or MCU software.

- E104.1: MCU running timeout (MCU break down)
  Description:

  The access to MCU times out.

Cause	Troubleshooting	Solution
1.FPGA failure 2. FPGA and HOST communication handshaking error 3. Access timeout occurs between HOST and the coprocessor	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.

- E104.2: FPGA running timeout (FPGA break down)
  Description:

  The MCU torque interrupt scheduling time is abnormal. This fault is reported only during commissioning.

Cause	Troubleshooting	Solution
1.FPGA failure 2. FPGA and MCU communication handshaking error	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.

- E104.4: MCU command update timeout
  Description:

  Take the moment when interrupt starts as the starting time, if the time when commands are written to MCU is larger than the time when position and speed regulators are started by FPGA, an alarm will be reported.

Cause	Troubleshooting	Solution
The system reports that the encoder communication time is set improperly or the command calculation time is too long.	The fault persists after the servo drive is powered off and on repeatedly.	Hide the unnecessary functions. Replace the servo drive.

- E120.0: Unknown encoder model
  Description:

  The servo drive detects the encoder model during initialization upon power-on. If the encoder model does not comply with the requirement, E120.0 occurs.

Cause	Troubleshooting	Solution
1. The product (motor or servo drive) code does not exist.	Read the nameplates of the servo drive and motor to check whether SV680P series servo drive and 26-bit servo motor are used. Meanwhile, check whether H00.00 (motor code) is set to 14102. Check the servo drive code (H01.02) to see whether this servo drive code exists.	If the motor code is unknown, set H00.00 to 14102 when the SV680 series servo drive and 23-bit servo motor are used. If the drive code is unknown, check it against the nameplate of the drive. If the drive model is incorrect, contact our technicians.
2. The power rating of the motor does not match that of the servo drive.	Check whether the servo drive code (H01.02) matches the serial-type motor code (H00.05).	Replace the unmatched products.

- E120.1: Unknown motor model
  Description:

  The servo drive detects the motor model defined by H00.00 during initialization upon power-on. If the motor model does not exist, E120.1 occurs.

Cause	Troubleshooting	Solution
The motor model defined by H00.00 is abnormal	Check whether the value of H00.00 matches the data on the nameplate of the used motor.	Rectify the value of H00.00.

- E120.2: Unknown drive model
  Description:

  The servo drive detects the servo drive model defined by H01.10 during initialization upon power-on. If the servo drive model does not exist, E120.2 occurs.

Cause	Troubleshooting	Solution
H01.10 is incorrect	Check the value of H01.10.	Replace the servo drive.

- E120.5: Motor and drive current mismatch
  Description:

  The rated output of the servo drive is far higher than the rated current of the motor. You must use a servo drive of lower rated output or a motor with higher rated current.

Cause	Troubleshooting	Solution
The internal scale value is abnormal.	Check whether the servo drive model is correct. If the set current sampling coefficient is too large, calculation overflow will occur.	Replace the servo drive.

- E120.6: FPGA and motor model mismatch
  Description:

  1. The motor model is set improperly, causing mismatch and malfunction of the servo drive. 2. The motor model is set properly, but the motor encoder is not supported by the servo drive.

Cause	Troubleshooting	Solution
FPGA software version and H00.00 mismatch	Check whether the FPGA software version (H01.01) supports the motor model set by H00.00.	Update the FPGA software to support the motor model or replace the motor.

- E120.7: Model check error
  Description:

  The servo drive model parameter cannot be identified.

Cause	Troubleshooting	Solution
Model parameter CRC check failed	Check that the model parameter is present.	Write the model parameter again.

- E120.8: Junction temperature parameter check error
  Description:

  The junction temperature parameter is identified incorrectly.

Cause	Troubleshooting	Solution
Junction temperature parameter CRC check failed	Check that the junction temperature parameter is present.	Rewrite the junction temperature parameter.

- E122.0: Multi-turn absolute encoder setting error
  Description:

  The motor does not match the absolute position mode or the motor code is set improperly.

Cause	Troubleshooting	Solution
The motor does not match the absolute position mode or the motor code is set incorrectly.	Check the motor nameplate to see whether the motor is configured with a multi-turn absolute encoder. Check whether H00.00 (motor code) is set properly.	Reset H00.00 (motor code) according to the motor nameplate or use a suitable motor.

- E122.1: Different DIs assigned with the same function
  Description:

  1. The same function is assigned to different DIs. 2. The DI function No. exceeds the maximum number allowed for DI functions.

Cause	Troubleshooting	Solution
1. The same function is allocated to different DIs.	Check whether parameters in groups H03 (H03.02, H03.04...H03.20) and H17 (H17.00, H17.02...H17.30) are assigned with the same non-zero DI function No.	Assign different DI function numbers to parameters in groups H03 or H17, and then restart the control circuit to activate the assignment, or switch off the S-ON signal and send a "RESET" signal to activate the assignment.
2. The DI function No. exceeds the maximum number allowed for DI functions.	Check whether the MCU program is updated.	Restore system parameters to default values (H02.31 = 1) and restart the servo drive.

- E122.2: Different DOs assigned with the same function
  Description:

  The DO function No. exceeds the maximum number allowed for DO functions

Cause	Troubleshooting	Solution
The DO function No. exceeds the maximum number allowed for DO functions	Check whether DO function numbers defined by H04.00 and H04.02 are abnormal.	Set the correct DO function No.

- E122.3: Upper limit in the rotation mode invalid
  Description:

  The upper limit (reference range) of the mechanical single-turn position exceeds 2^{31} in the absolute position rotation mode.

Cause	Troubleshooting	Solution
The upper limit (reference range) of the mechanical single-turn position exceeds 2^{31} in the absolute position rotation mode.	Check the setting of the mechanical gear ratio, the upper limit of mechanical single-turn position and the electronic gear ratio when the servo drive runs in the absolute rotation mode (H02.01 = 2).	Reset the mechanical gear ratio, the upper limit of mechanical single-turn position and the electronic gear ratio to ensure the upper limit of the mechanical single-turn position (reference range) does not exceed 2^{31}.

- E122.4: Different VDIs assigned with the same function
  Description:

  The same function is assigned to different VDIs. The VDI function No. exceeds the maximum number allowed for VDI functions.

Cause	Troubleshooting	Solution
1. The same function is assigned to different VDIs	Check whether parameters in groups H03 (H03.02, H03.04...H03.20) and H17 (H17.00, H17.02...H17.30) are assigned with the same non-zero DI function No.	Assign different DI function numbers to parameters in groups H03 or H17, and then restart the control circuit to activate the assignment, or switch off the S-ON signal and send a "RESET" signal to activate the assignment.
2. The VDI function No. exceeds the maximum number allowed for VDI functions.	Check whether the MCU program is updated.	Restore system parameters to default values (H02.31 = 1) and restart the servo drive.

- E122.5: DI and VDI assigned with the same function
  Description:

  The same function is assigned to different VDIs. The VDI function No. exceeds the maximum number allowed for VDI functions.

Cause	Troubleshooting	Solution
Two or more DIs and VDIs are assigned with the same function No.	Check whether DI function numbers set in groups H03 and H17 are repetitive.	Change any repetitive number.

- E122.6: Absolute function setting fault of the 2nd encoder
  Description:

  The motor does not match the absolute mode.

Cause	Troubleshooting	Solution
The motor does not match the absolute mode.	Check the motor nameplate to see whether the motor is configured with a multi-turn absolute encoder.	Set H0F.02 to 0.

- E122.7: Fully closed-loop parameter setting error
  Description:

  In fully closed-loop applications, the inner loop is set to rotation mode.

Cause	Troubleshooting	Solution
When H0F.00 is not 0, set H02.01 to 2 (absolute position rotation mode)	Check the value of H02.01 if fully closed-loop is used.	Set the value of H02.01 to 2 if fully closed-loop is used.

- E122.8: Interpolator version mismatch
  Description:

  Interpolator version mismatch.

Cause	Troubleshooting	Solution
The T2 interpolator does not match the motor.	Check whether H00.50 is consistent with H00.51, and they are not 65535.	Check whether the interpolator is misused. For the alarm caused by replacing the interpolator, write the corresponding factory parameters and into the interpolator.

- E126.0: Process segment number error
  Description:

  Process segment number error

Cause	Troubleshooting	Solution
The process segment number is not 1000 or any other value from 0 to 15 in the process segment mode.	Check whether the value of H22.00 exceeds the specified range of process segment number (0–15 or 1000).	Write 0...15 to H22.00 in the technology segment mode.

- E126.1: Process segment internal operation mode error
  Description:

  Internal operation mode error of the process segment

Cause	Troubleshooting	Solution
The technology segment operation mode is not 0, 1, 2, 3, 7, or 8.	Check whether the values of bit0 to bit3 of the parameter defined by the process segment at fault are 0, 1, 2, 3, 7, and 8.	Set the technology segment operation mode to 0, 1, 2, 3, 7, and 8 in the technology segment mode.

- E126.2: Position reference type error in process segment position mode
  Description:

  Position reference type error in process segment position mode

Cause	Troubleshooting	Solution
The position reference type in the process segment position mode is not 00 (absolute reference) or 10 (incremental mode).	Check whether the value of bit6 or bit7 of the parameter defined by the process segment at fault is 00 or 10.	Set the position reference type in the process segment position mode to 00 (absolute reference) or 10 (incremental reference).

- E136.0: Encoder ROM motor parameter check error
  Description:

  When reading parameters in the encoder ROM, the servo drive detects that no parameters are saved there or parameter values are inconsistent with the setpoints.

Cause	Troubleshooting	Solution
1. The servo Servo drive model does not match the motor model.	View the servo drive and servo motor nameplates to check whether the SV680 series servo drive and servo motor are used.	Replace the servo drive and motor.
2. A parameter check error occurs or no parameter is saved in the ROM of the serial incremental encoder.	Check whether the encoder cable provided by Inovance is used. For cable specifications, see "Matching Cables". The cable must be connected securely without scratching, breaking or poor contact on both ends. Measure signals PS+, PS-, +5V and GND on both ends of the encoder cable and observe whether signals at both ends are consistent. For signal pin assignment, see the section related to wiring.	Use the encoder cable provided by Inovance. Ensure motor terminals are connected securely and servo drive screws are tightened properly. Use a new encoder cable if necessary. Route encoder cables and power cables (RST, UVW) through different routes.
3. The servo drive is faulty.	The fault persists after the servo drive is restarted.	Replace the servo drive.

- E136.1: Encoder ROM motor parameter read error
  Description:

  The encoder cable is not connected properly. A communication error occurs on the encoder due to interference.

Cause	Troubleshooting	Solution
1. The encoder cable connections are incorrect or loosened.	Check encoder wiring. Check for strong vibration, which loosens the encoder cable and even damages the encoder.	Connect the encoder cables according to the correct wiring diagram. Re-connect encoder cables and ensure encoder terminals are connected securely.
2. The servo drive is faulty.	The fault persists after the servo drive is restarted.	Replace the servo drive.
3. Encoder communication is interfered with.	Check whether E136.1 occurs occasionally.	Install a magnetic ring. Route the power cable and communication cable separately.

- E136.9: Dimension parameter Initialization error
  Description:

  Dimension parameter Initialization error

Cause	Troubleshooting	Solution
Encoder read-write error causes 32-bit dimensional compatibility initialization error.	Check whether H32.50 is set to enable compatibility.	If the encoder communication error still occurs after you disable compatibility, takes measures accordingly. If power-on is normal after you disable compatibility. turn on the alarm and contact the technical support personnel of Inovance.

- E138.0: Accuracy compensation data error
  Description:

  Accuracy compensation data error

Cause	Troubleshooting	Solution
1. Check failed because accuracy compensation data is lost. 2. FLASH hardware failure.	Read the drive compensation data from the commissioning software and observe whether the data is normal.	Compensate again through the commissioning software and power off to restart. If the alarm remains, contact the manufacturer.

- E138.1: Cogging ripple compensation data check failure
  Description:

  Cogging ripple compensation data check failure

Cause	Troubleshooting	Solution
1. Check failed because cogging ripple compensation data is lost. 2. FLASH hardware failure.	Read data through InoDriverShop.	Compensate again through the commissioning software and power off to restart. If the alarm remains, contact the manufacturer.

- E138.2: Gantry sync compensation data check failure
  Description:

  Gantry sync compensation data check failure

Cause	Troubleshooting	Solution
1. Check failed because gantry synchronization compensation data is lost. 2. FLASH hardware failure.	Read data through InoDriverShop.	Compensate again through the commissioning software and power off to restart. If the alarm remains, contact the manufacturer.

- E138.3: Overload compensation data check failure
  Description:

  Overload compensation data check failure

Cause	Troubleshooting	Solution
1. Check failed because overload compensation data is lost. 2. FLASH hardware failure.	Read data through InoDriverShop.	Compensate again through the commissioning software and power off to restart. If the alarm remains, contact the manufacturer.

- E140.1: MCU key calculation failed
  Description:

  The version of the encryption chip is incorrect.

Cause	Troubleshooting	Solution
Communication failure between MCU and the encryption chip	Check whether the error persists after restart.	Ask the manufacturer to flash the encryption software.

- E140.4: Signature verification failed
  Description:

  Signature verification of the encryption chip failed.

Cause	Troubleshooting	Solution
Encryption software is not flashed	Check whether the error persists after restart.	Ask the manufacturer to flash the encryption software.

- E150.0: STO safety state applied
  Description:

The STO input protection applies (safety state).

Cause	Troubleshooting	Solution
STO is triggered because either or both of two 24 V inputs are disconnected.	Check whether the STO function is activated. Check whether the STO power supply is normal. The fault persists after preceding causes are rectified.	It does not affect normal operation. After the STO terminal is back to normal, clear the fault using the fault reset function. Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected. Replace the servo drive.

- E150.1: STO input state abnormal
  Description:

  The single-channel input of STO is ineffective.

Cause	Troubleshooting	Solution
1. STO input power supply is abnormal.	Check whether the STO power supply is normal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
2.STO input resistor is abnormal.	After STO is triggered, only one STO signal is sent to MCU after the 24 V power supply is cut off due to input resistor drift.	Replace the servo drive.
3. STO is ineffective	The fault persists after preceding causes are rectified.	Replace the servo drive.

- E150.2: Buffer 5 V supply error
  Description:

  The MCU monitors the 5 V power supply of the PWM Buffer to detect whether overvoltage or undervoltage occurs. If the voltage is abnormal, E150.2 occurs.

Cause	Troubleshooting	Solution
The 5 V voltage supplied to the STO Buffer is abnormal due to undervoltage or overvoltage.	Check whether the fault can be removed by a restart. If not, the 5V voltage supplied to the Buffer is abnormal.	Replace the servo drive.

- E150.3: STO input circuit hardware diagnosis failure
  Description:

The photocoupler of the front hardware circuit for STO input is inspected. If the photocoupler is short-circuited, the servo will display E150.3.

Cause	Troubleshooting	Solution
Short circuit occurs on the upstream optocoupler of STO1 or STO2.	The fault persists and the keypad displays E150.3 after restart.	Replace the servo drive.

- E150.4: PWM buffer hardware diagnosis failure
  Description:

  An error occurs on the PWM buffer integrated circuit during initialization detection upon power-on (the PWM signal cannot be blocked).

Cause	Troubleshooting	Solution
STO buffer power-on detection abnormal	The fault persists and the keypad displays E150.4 after restart.	Replace the servo drive.

- E150.5: STO input signal interference
  Description:

  The STO input signal is interfered with, but the interference does not meet the noise filtering conditions set in H0A.73.

Cause	Troubleshooting	Solution
1. Poor contact of the STO terminal or unstable external 24V input voltage may lead to STO misoperation or malfunction.	Check whether the 24V input voltage of the STO terminal is unstable and disconnected repeatedly.	Replace the 24V power supply.

- E201.0: Phase-P overcurrent
  Description:

  An excessively high current flows through the positive pole of the DC-AC circuit.

Cause	Troubleshooting	Solution
1. Gains are set improperly, leading to motor oscillation.	Check whether vibration or sharp noise occurs during start and operation of the motor, or view "Current feedback" in the software tool.	The motor parameters are set improperly, modify the motor parameters. The current loop parameters are set improperly, re-adjust the current loop parameters. Improper speed loop parameters cause vibration. Servo drive operates improperly. Replace it.
2. The encoder cable is aged or corroded, or connected incorrectly or loosely.	Check whether the encoder cable provided by Inovance is used. Check whether the cable is aging, corroded, or connected loosely. Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.17h (Electrical angle) changes as motor shaft rotates.	Re-solder, tighten or replace the encoder cable.
3. The servo drive is faulty.	Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.17 (Electrical angle) changes as motor shaft rotates. Disconnect the motor cable but the fault persists after the servo drive is powered off and on again. Check whether resistance of the external braking resistor is too small or the braking resistor is short-circuited (between terminals P ⊕ , C).	Use an external braking resistor of matching resistance. Perform wiring again. Replace the servo drive.
4. Overcurrent occurs on the braking resistor.	Check whether resistance of the external braking resistor is too small or the braking resistor is short-circuited (between terminals P, C).	Use a braking resistor of matching resistance. Perform wiring again.

- E201.1: Phase-U overcurrent
  Description:

  A current higher than the threshold is collected in the phase-U current.

Cause	Troubleshooting	Solution
1. Motor cables are in poor contact.	Check whether the servo drive power cables and motor cables on the U, V, and W sides of the servo drive are loose.	Tighten the cables that are loose or disconnected.
2. The motor cables are grounded.	After confirming the drive power cables and motor cables are connected properly, measure whether the insulation resistance between the drive U/V/W side and the PE cable is at MΩ level.	Replace the motor in case of poor insulation.
3. U/V/W cables of the motor are short-circuited.	Disconnect motor cables and check whether short circuit occurs among motor U/V/W cables and whether burrs exist in the wiring.	Connect the motor cables correctly.
4. The motor is damaged.	Disconnect the motor cables and measure whether the resistance among UVW phases of motor cables is balanced.	Replace the motor if the resistance is unbalanced.

- E201.2: Phase-V overcurrent
  Description:

  A current higher than the threshold is collected in the phase-V current.

Cause	Troubleshooting	Solution
1. Motor cables are in poor contact.	Check whether the servo drive power cables and motor cables on the U, V, and W sides of the servo drive are loose.	Tighten the cables that are loose or disconnected.
2. The motor cables are grounded.	After confirming the drive power cables and motor cables are connected properly, measure whether the insulation resistance between the drive U/V/W side and the PE cable is at MΩ level.	Replace the motor in case of poor insulation.

Cause	Troubleshooting	Solution
3. U/V/W cables of the motor are short-circuited.	Disconnect motor cables and check whether short circuit occurs among motor U/V/W cables and whether burrs exist in the wiring.	Connect the motor cables correctly.
4. The motor is damaged.	Disconnect the motor cables and measure whether the resistance among UVW phases of motor cables is balanced.	Replace the motor if the resistance is unbalanced.

- E201.4: Phase-N overcurrent
  Description:

  An excessively high current flows through the negative pole of the DC-AC circuit.

Cause	Troubleshooting	Solution
1. Gains are set improperly, leading to motor oscillation.	Check whether vibration or sharp noise occurs during start and operation of the motor, or view "Current feedback" in the software tool.	Adjust the gains.
2. The encoder cable is aged or corroded, or connected incorrectly or loosely.	Check whether the encoder cable provided by Inovance is used and whether the cable is aging, corroded, or connected loosely.	Re-solder, tighten or replace the encoder cable.
3. Overcurrent occurs on the braking resistor.	Check whether resistance of the external braking resistor is too small or the braking resistor is short-circuited (between terminals P ⊕ , C).	Use a braking resistor of matching resistance. Perform wiring again.

Cause	Troubleshooting	Solution
4. Overcurrent is caused by the superposition of the braking current and phase current.	Check if the drive accelerates abruptly during braking. Check if the voltage feedback exceeds the release threshold through the Inovance drive commissioning platform, and if the torque command increases abruptly.	Increase the acceleration/ deceleration time.
5. The servo drive is faulty.	Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.17 (Electrical angle) changes as motor shaft rotates. Disconnect the motor cable but the fault persists after the servo drive is powered off and on again.	Replace the servo drive.

- E208.2: Encoder communication timeout
  Description:

  The FPGA detected a communication timeout with the encoder.

Cause	Troubleshooting	Solution
The servo drive fails to receive the data fed back by the encoder in three consecutive cycles.	Check whether H00.00 (Motor code) is set properly. Check whether the encoder cable is connected incorrectly, damaged, interfered with, or too long. Check whether the encoder version (H00.04) is set properly. It may be set to 0 or 65535 incorrectly. (You only need to check the version in the case of an Inovance encoder.) Check whether the encoder is faulty (see H0B.28 for details). 5. Check bit12 of H0b.30.	Modify the motor model according to the nameplate or use a suitable motor. Replace the cable or take additional anti-interference measures. If the cable is too long, you can change the value of H01.60. Perform a power cycle to read the version again. Use H0D.20 or perform a power cycle to check whether the fault persists. 5. The servo drive operates improperly. Replace it.

- E208.4: FPGA current loop operation timeout
  Description:

  The operating time of the current loop exceeds the interval threshold.

Cause	Troubleshooting	Solution
FPGA operation timeout	Internal fault code H0b.45 = 4208: Current loop operation timeout	Disable some unnecessary functions, such as notch and speed observer, to reduce the operating load of the current loop. Modify the value of H01.60, which may lead to slow response and noise of the motor.

- E210.0: Output short-circuited to ground
  Description:

  An abnormal motor phase current or bus voltage is detected during power-on self-testing. 1. The DC bus voltage exceeds the discharge threshold. 2. The phase U current of size C/D/E models is greater than 1/4 of H01.07. 3. Overcurrent occurs on phase-P and phase-N of servo drives in sizes A and B.

Cause	Troubleshooting	Solution
1. The servo drive power cables (U/V/W) are short-circuited to ground.	Disconnect the motor cables and measure whether the servo drive power cables (U/V/W) are short-circuited to ground (PE).	Connect the cables again or replace the servo drive power cables.
2. The motor is short-circuited to ground.	After confirming the servo drive power cables and motor cables are connected properly, measure whether the insulation resistance between the servo drive U/V/W side and the PE cable is at MΩ level.	Replace the motor.
3. The servo drive is faulty.	Disconnect the power cables from the servo drive, but the fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.
4. The motor speed is too high during grounding detection.	Check whether the motor is in the generating status during power-on.	Reduce the motor speed to less than 10 rpm.
5. Control circuit bus voltage is greater than the discharge threshold.	Check whether the bus voltage is higher than the bus discharge threshold (H01.41) when the fault is logged.	Set the discharge threshold correctly.

- E234.0: Runaway (protection scheme 1)
  Description:

The torque reference direction is opposite to the speed feedback direction in the torque control mode. The speed feedback direction is in reverse to the speed reference direction in the position or speed control mode.

Cause	Troubleshooting	Solution
1. The UVW cables are connected incorrectly.	Check whether the servo drive power cables are connected in the correct sequence at both ends.	Connect the UVW cables according to the correct sequence.
2. The interference signal causes an error in the initial phase detection of the motor mover upon power-on.	The UVW phase sequence is correct. But E234.0 occurs when the servo drive is enabled.	Power off and on the servo drive again.
3. The encoder model is wrong or the encoder is wired improperly.	View the servo drive and servo motor nameplates to check whether the devices used are Inovance SV680N series servo drive and 23-bit servo motor.	Replace with a mutually-matching servo drive and servo motor. For use of of SV680N series servo drive and 26-bit servo motor, set H00.00 to 14102. Check the motor model, encoder type, and encoder cable connection again.
4. The encoder cable is aged or corroded, or connected incorrectly or loosely.	Check whether the encoder cable provided by Inovance is used and whether the cable is aging, corroded, or connected loosely. Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.10 (Electrical angle) changes as motor shaft rotates.	Re-solder, tighten or replace the encoder cable.
5. The gravity load in vertical axis applications is too large.	Check whether the load of the vertical shaft is too large. Adjust brake parameters H02.09...H02.12 and check whether the fault is cleared.	Reduce the load of the vertical axis, increase the stiffness level, or hide this fault without affecting the safety performance and normal use.
6. Improper parameter settings lead to excessive vibration.	The stiffness level is set to an excessively high value, leading to excessive vibration.	Set a proper stiffness level to avoid excessive vibration.

- E234.1: Runaway (protection scheme 2)
  Description:

The torque reference direction is opposite to the speed feedback direction in the torque control mode. The speed feedback direction is in reverse to the speed reference direction in the position or speed control mode.

Cause	Troubleshooting	Solution
1. The motor output is limited due to torque limit or current saturation.	Check whether the motor is operating beyond its capacity or torque is limited.	Relax the torque limit, reduce acceleration/ deceleration and operation speed, or use a motor with matching capacity.
2. Host controller command direction is incorrect or position increment is too large.	Check whether 607Ah and 6064h are aligned in the host controller program. Check whether the command of the host controller changes abnormally. Check whether the electronic gear ratio of the servo drive is set to an excessively large value.	Align 607Ah and 6064h. Set a proper electronic gear ratio.
3: Collision	Check whether a collision occurs. Check whether the commands of the host controller are properly planned and whether the trajectory overlap that of any other mechanism.	Optimize the command planning of the host controller, increase the safety distance between mechanisms and increase the zero-speed stop safe distance for DB-less models.
4. The working conditions triggered the runaway alarm.	Check whether there is a waveform consistent with the runaway conditions. Check whether the load of the vertical shaft is too heavy and check whether the torque is limited in the non-torque mode.	If the load of the vertical shaft is too heavy and the brake is not applied in a timely manner, adjust the brake parameters H02.09 to H02.12 or increase the stiffness. Release the runaway threshold and set proper parameters to avoid excessive vibration. Ensure to take additional protection measures to mask runaway alarms, such as torque limit or changing the No. 2 fault to DB stop or coast to stop.

Cause	Troubleshooting	Solution
5. Electrical angle error.	Check whether the UVW phase sequence is correct. Check whether the encoder cable and power cable belong to the same motor. Check whether the electrical angle is auto-tuned. Check whether Hall is installed correctly. Check whether there is any deviation between the electrical angle and absolute position feedback of the same physical position before and after runaway or after a period of operation.	Connect the cables correctly. Perform angle auto-tuning again. Install the Hall sensor correctly. Perform electrical angle auto-tuning for several times and power on to check the electrical angle.
6. Power cable and encoder cable failure, motor and drive damage	Inspect the power cable and encoder cable for aging and corrosion, loose joints, and broken wire cores. Check the encoder cable for shield failure, reading head contamination, and power cable interference. Check whether the motor and drive components are damaged.	Re-solder, tighten or replace the power cable or encoder cable. Replace the motor and drive.

- E308.0: Pulse encoder phase A wire breakage
  Description:

  Pulse encoder phase A wire breakage

Cause	Troubleshooting	Solution
1. Phase A of the encoder is wired improperly. 2. The motor is set to a model with a pulse encoder.	Check encoder wiring. Check whether the motor code H00.00 is set correctly and matches the connected encoder.	Reconnect the encoder and power off and restart. Check whether the motor code H00.00 is set correctly and matches the connected encoder.

- E308.1: Pulse encoder phase B wire breakage
  Description:

  Pulse encoder phase B wire breakage

Cause	Troubleshooting	Solution
1. Phase B of the encoder is wired improperly.	Check encoder wiring.	Reconnect the encoder and power off and restart.

- E308.2: Pulse encoder phase Z wire breakage

Description:

Pulse encoder phase Z wire breakage

Cause	Troubleshooting	Solution
1. Phase Z of the encoder is wired improperly. 2. The connected encoder does not have phase Z.	Check the wiring. Check the encoder manual.	Connect the encoder again. Re-install the motor and select an AB two-phase encoder on the encoder configuration page.

- E320.0: Braking resistor overload
  Description:

  The braking resistor is overloaded.

Cause	Troubleshooting	Solution
The accumulative heat of the braking resistor exceeds the maximum thermal capacity of the braking resistor.	Check whether the value of H0b.67 exceeds 100%.	Check if large discharge current is present due to high bus voltage. Ensure that the motor cannot be driven reversely. Replace the servo drive.



In applications where the motor drives a vertical axis or is driven by the load, set H0A.12 to 0 to hide the runaway fault.

- E320.1: External braking resistor surface temperature too high
  Description:

  The accumulative heat of the built-in braking resistor is too great.

Cause	Troubleshooting	Solution
The accumulative heat of the built-in braking resistor is too great.	Cut off the power and check the braking resistor for over-temperature.	Check if large discharge current is present due to high bus voltage. Ensure that the motor cannot be driven reversely. Replace the servo drive.

- E321.0: Dynamic brake resistor overload
  Description:

  The dynamic braking resistor is overloaded.

Cause	Troubleshooting	Solution
The accumulative heat of exceed braking resistor exceeds the maximum thermal capacity of the resistor.	Check whether the value of H0b.98 exceeds 100%.	Ensure that the motor cannot be driven reversely in the dynamic braking state.

- E400.0: Main circuit overvoltage
  Description:

  The DC bus voltage between P ⊕ and N ⊖ exceeds the overvoltage threshold. 220 V servo drive: Normal value 310 V Overvoltage threshold 420 V. 380 V servo drive: Normal value 540 V Overvoltage threshold 760 V.

Cause	Troubleshooting	Solution
1. The voltage input to the main circuit is too high.	Check the power input specifications of the servo drive and measure whether the input voltage of the main circuit cables on the drive side (RST) is within the following range: 220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V) 380 V drive: Valid value: 380 V to 440 V, Allowable deviation: –10% to +10% (342 V to 484 V)	Replace or adjust the power supply according to the specified range.
2. The power supply is unstable or affected by lightning.	Check whether the power supply is unstable, affected by lightning, or complies with the preceding range.	Connect a surge protection device (SPD) and switch on the power supplies of the control circuit and the main circuit. If the fault persists, replace the servo drive.
3. The braking resistor fails.	If the built-in braking resistor is used (H02.25 = 0), check whether terminals P ⊕ and D are jumpered. If yes, measure the resistance between terminals C and D to ensure that the resistor works normally. If an external braking resistor is used (H02.25 = 1 or 2), measure the resistance of the external braking resistor connected between terminals P⊕ and C.	If the resistance is "∞" (infinite), the braking resistor is disconnected internally. If you use a built-in braking resistor with insufficient discharge capability, use an external braking resistor (H02.25 = 1 or 2) instead and remove the jumper between terminals P ⊕ and D. The resistance of the external braking resistor can be equal to or smaller than the built-in one and the power

Cause	Troubleshooting	Solution
		must not be smaller than the built-in one. If you use an external braking resistor which is damaged or has insufficient power, replace it with a new one with larger power and connect the new one between terminals P ⊕ and C. Set H02.26 (Power of external braking resistor) and H02.27 (Resistance of external braking resistor) to values consistent with the specifications of the external braking resistor used.
4. The resistance of the external braking resistor is too large, resulting in insufficient energy absorption during braking.	Measure the resistance of the external braking resistor connected between terminals P ⊕ and C. Compare the measured value with the recommended value.	Connect a new external braking resistor with recommended resistance between terminals P ⊕ and C. Set H02.26 (Power of external braking resistor) and H02.27 (Resistance of external braking resistor) to values consistent with the specifications of the external braking resistor used.
5. The motor is in abrupt acceleration/deceleration status and the maximum braking energy exceeds the energy absorption value.	Confirm the acceleration/ deceleration time during running and measure the DC bus voltage between P ⊕ and N to check whether the voltage exceeds the fault threshold during deceleration.	After confirming the input voltage of the main circuit is within the specified range, increase the acceleration/ deceleration time if the operating conditions allow.

Cause	Troubleshooting	Solution
6. The bus voltage sampling value deviates greatly from the measured value.	Check whether H0b.26 (Bus voltage) is within the following range: 220 V servo drive: H0b.26 ＞ 420 V 380 V servo drive: H0b.26 ＞760 V Measure the DC bus voltage between terminals P ⊕ and N ⊖ . Check whether the DC bus voltage is normal and smaller than the value of H0b.26.	Contact Inovance for technical support.
7. The servo drive is faulty.	The fault persists after the main circuit is powered off and on repeatedly.	Replace the servo drive.

- E410.0: Main circuit undervoltage
  Description:

  The DC bus voltage between P ⊕ and N ⊖ is lower than the undervoltage threshold. 220 V servo drive: Normal value: 310 V Undervoltage threshold: 200 V (180 V for S5R5 models) 380 V servo drive: Normal value 540 V Overvoltage threshold 380 V.

Cause	Troubleshooting	Solution
1. The power supply of the main circuit is unstable or power failure occurs. 2. Instantaneous power failure occurs.	Check the specifications of the input power supply. Measure whether the input voltages of the main circuit on the non-drive side and the drive side (RST) are within the following range: 220 V servo drive: Valid value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V) All the three phases need to be measured.	Increase the capacity of the power supply.
3. The power voltage drops during running.	Monitor the power supply voltage and check whether the main circuit power supply is applied to other devices, resulting in insufficient power capacity and voltage drop.	Increase the capacity of the power supply.

Cause	Troubleshooting	Solution
4. A three-phase servo drive is connected to a single-phase power supply, leading to phase loss.	Check the wiring of the main circuit.	Replace the cables and connect the main circuit cables properly.
5. The servo drive is faulty.	Check whether H0b.26 (Bus voltage) is within the following range: 220 V drive: H0b.26 ＞ 200 V 380 V servo drive: H0b.26＜ 380 V. The fault persists after the main circuit (RST) is powered off and on repeatedly.	Replace the servo drive.

- E410.1: Main circuit de-energized
  Description:

  Phase loss occurs on the three-phase servo drive.

Cause	Troubleshooting	Solution
The power supply is disconnected during operation.	Check the power input specifications of the servo drive and measure whether the input voltage at the power supply side of the main circuit cables and R/S/T on the drive side is within the following range: 220 V servo drive: Valid value: 220 V to 240 V Allowable deviation: –10% to +10% 380 V drive: Valid value: 380 V to 440 V Allowable deviation: –10% to +10% All the three phases need to be measured. Monitor the power supply voltage and check whether the main circuit power supply is applied to other devices, resulting in insufficient power capacity and voltage drop. Check whether H0b.26 (Bus voltage) complies with the following specifications: 220 V servo drive: H0b.26＜200V. 380 V drive: H0b.26＜ 380 V. The fault persists after the main circuit is powered off and on repeatedly. 4. Check the wiring of the main circuit.	Increase the capacity of the power supply. Replace the servo drive. Replace the cables and connect the main circuit cables (RST/L1L2L3) properly.

- E420.0: Main circuit phase loss
  Description:

  Drive three-phase input phase abnormal.

Cause	Troubleshooting	Solution
1. The three-phase input cables are connected improperly.	Check whether RST cables on the drive side and non-drive side are in good condition and connected properly.	Replace the cables and connect the main circuit cables properly.
2. A single-phase power supply is used for a three-phase servo drive 3. The three-phase power supply is imbalanced or the voltages of the three phases are too low.	Check the specifications of the power supply and measure whether the voltage input to the main circuit is within the following range: 220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V) 380 V drive: Valid value: 380 V to 4240 V Allowable deviation: –10% to +10% (342 V to 484 V) All the three phases need to be measured.	Servo drives of 0.75 kW (H01.10 = 5) can be supplied by single-phase power supplies. If the input voltage complies with the specifications, set H0A.00 (power input phase loss protection) to 2 (inhibit phase loss faults and alarms). If input voltage is outside the specified range, replace or adjust the power supply.

- E500.0: motor overspeed
  Description:

  The actual feedback speed of the motor exceeds the overspeed threshold.

Cause	Troubleshooting	Solution
1. The UVW phase sequence of the motor is incorrect.	Check whether the servo drive power cables are connected in the correct sequence at both ends.	Connect the UVW cables according to the correct sequence.
2. H0A.08 is set improperly.	Check whether the overspeed threshold is lower than the maximum speed. Overspeed threshold = 1.2 x Maximum motor speed (H0A.08 = 0) Overspeed threshold = H0A.08 (H0A.08 ≠ 0, and H0A.08 < 1.2 x Maximum motor speed)	Re-set the overspeed threshold according to the mechanical requirements.
3. The input reference exceeds the overspeed threshold.	Check whether the motor speed corresponding to the input reference exceeds the overspeed threshold. In CSP mode, check the gear ratio 6091.01h/6091.02h to determine the position reference increment for an individual synchronization period and convert it to the	CSP: Decrease the position reference increment per synchronization period. The host controller should cover the position ramp when generating references. PP: Decrease the value 6081h or increase the acceleration/ deceleration ramp (6083h, 6084h). HM: Decrease

Cause	Troubleshooting	Solution
	speed information. In PP mode, check the gear ratio 6091.01h/6091.02h and determine the 6081h (Profile velocity). In HM mode, check the gear ratio 6091.01h/ 6091.02h, and determine 6099.01h and 6099.02h. In speed control mode, view the gear ratio 6091-01h/ 6091-02h, and the values of 60FFh (Target velocity), 2006-H06.06 to 2006-H06.09, and 607Fh (Max profile velocity). In torque control mode, view the value of H07.17 (Speed limit source) and the corresponding speed limit value.	6099.01h and 6099.02h or increase the acceleration/ deceleration ramp (609Ah). Decrease the gear ratio according to actual conditions. Speed control mode: Decrease the target velocity, speed limit, and gear ratio. In PV mode, increase the speed ramp (6083h and 6084h). In CSV mode, the host controller should cover the speed ramp. In the torque control mode, set the speed limit to a value lower than the overspeed threshold.
4. The motor speed overshoots.	When H0A.08 = 0, check whether the speed feedback exceeds 1.2 times the maximum motor speed (H00.15). When the value of H0A.08 is not 0, check whether the speed feedback exceeds the setpoint of H0A.08.	Adjust the gain or mechanical running conditions.
5. The servo drive is faulty.	The fault persists after the servo drive is powered off and on again.	Replace the servo drive.
6: Encoder data error	Check whether there is interference, whether encoder type selection is incorrect, or whether encoder parameter settings are incorrect.	Take interference shielding measures, such as magnetic rings and shielding cables. Check whether the encoder type is selected correctly. If not, replace the encoder type correctly. Set the encoder parameters properly according to encoder manual.
7. The selected motor type is incorrect.	Check whether the type of the motor is set improperly. For example, the linear motor is set to a rotary motor or the rotary motor is set to a linear motor.	Replace the actual motor with the correct type or change the value of H00.00 to the correct motor type.

- E500.1: Speed feedback overflow

Description:

The FPGA speed measurement overflows.

Cause	Troubleshooting	Solution
1. FPGA internal speed overflows.	Check whether the servo drive power cables are connected in the correct sequence at both ends.	Connect the UVW cables according to the correct sequence.
2. The motor speed overshoots.	Check whether the speed feedback exceeds the overspeed threshold by using Inovance servo commissioning software. Overspeed threshold: 16384 rpm for a rotary motor, 8192 rpm for a DDR motor, and 16384 mm/s for a linear motor.	Adjust the gain or mechanical running conditions.
3: Encoder data error	Check whether there is interference, whether encoder type selection is incorrect, or whether encoder parameter settings are incorrect.	Take interference shielding measures, such as magnetic rings and shielding cables. Check whether the encoder type is selected correctly. If not, replace the encoder type correctly. Set the encoder parameters properly according to encoder manual.
4. The selected motor type is incorrect.	Check whether the type of the motor is set improperly. For example, the linear motor is set to a rotary motor or the rotary motor is set to a linear motor.	Replace the actual motor with the correct type or change the value of H00.00 to the correct motor type.

- E500.2: FPGA position feedback pulse overspeed
  Description:

  The MCU has detected that the position feedback increment from the FPGA is too large.

Cause	Troubleshooting	Solution
1. The MCU has detected that the position feedback increment from the FPGA is too large.	Check whether the value of H0B.17 changes abruptly.	Modify the value of H0A.70 (Overspeed threshold), which is 0 by default. Use the maximum speed of the motor as the threshold for large feedback increment.
2: Encoder data error	Check whether there is interference, whether encoder type selection is incorrect, or whether encoder parameter settings are incorrect.	Take interference shielding measures, such as magnetic rings and shielding cables. Check whether the encoder type is selected correctly. If not, replace the encoder type correctly. Set the encoder parameters properly according to encoder manual.
3. The selected motor type is incorrect.	Check whether the type of the motor is set improperly. For example, the linear motor is set to a rotary motor or the rotary motor is set to a linear motor.	Replace the actual motor with the correct type or change the value of H00.00 to the correct motor type.

- E602.0: Angle auto-tuning failure
  Description:

  Unusual jitter occurs on the encoder feedback during angle auto-tuning.

Cause	Troubleshooting	Solution
1. Locked-rotor occurred in mechanical equipment. 2. The data fed back by the encoder is abnormal. 3. U, V and W power cables are incorrectly connected or disconnected. 4. The drive/motor is faulty.	Stop the motor and push it to check whether locked-rotor occurred. Push the motor and observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement? Check the wiring. Use a multimeter to check wire breakage. If none of the above solves the problem, contact the manufacturer.	If yes, eliminate the problem and perform angle auto-tuning (phase sequence auto-tuning) again. If you determine that the feedback data of the encoder is abnormal, replace the encoder and perform angle auto-tuning (phase sequence auto-tuning) again. If any improper connection is found, reconnect the cables perform angle auto-tuning (phase sequence auto-tuning) again. If none of the above solves the problem, contact the manufacturer.

- E602.1: Angle auto-tuning overtravel
  Description:

  Angle auto-tuning overtravel

Cause	Troubleshooting	Solution
The moving distance during angle auto-tuning is too large. 1. The setting of auto-tuning parameters does not match the load characteristics, and large impact occurred during auto-tuning, resulting in an overtravel alarm. 2. The data fed back by the encoder is abnormal. A false alarm is raised.	Check whether the displacement is really too large, and whether overtravel is caused by the setting of auto-tuning parameters. Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is the feedback operation continuous? Is the observed displacement consistent with the actual displacement?	If the movement during auto-tuning is too large, the overtravel can be avoided by manually reducing the current rising slope (H32.21 closed-loop pre-positioning method) (H32.31 position locking method) or the maximum auto-tuning current (H32.20 closed-loop pre-positioning method) (H32.30 position locking method). If the encoder feedback data is abnormal, replace the encoder, and then identify the angle/phase sequence again.

- E602.2: U/V/W phase sequence reversed
  Description:

A wrong U/V/W phase sequence is detected during angle auto-tuning.

Cause	Troubleshooting	Solution
The system indicates the UVW wiring is wrong to avoid the motor from losing control.	Check U/V/W wiring through phase sequence auto-tuning.	After phase sequence is corrected, perform angle auto-tuning again. Exchange cables of any two phases and perform angle auto-tuning again.

- E602.3: Large encoder jitter during angle auto-tuning
  Description:

  Large encoder jitter during angle auto-tuning

Cause	Troubleshooting	Solution
Encoder feedback data has large jitter.	Check whether the encoder jitters abnormally at standstill.	Check the wiring of the encoder. Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. Manually increase H32.14/ H32.16 (inching angle auto-tuning) and H32.34/H32.36 (position locking angle auto-tuning).

- E602.4: Auto-tuning failed. Auto-tuning timeout.
  Description:

  Auto-tuning failed. Auto-tuning timeout.

Cause	Troubleshooting	Solution
If the angle auto-tuning process is not completed in 30 seconds, a timeout alarm is raised. Due to external disturbance (such as vibration of other parts on the bench), the completion condition of angle auto-tuning cannot be met. The feedback data of the encoder is subjected to poor characteristics, interference or anomaly, and the completion condition of angle auto-tuning cannot be met.	Check for vibrating parts on the bench. Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement? Is there abnormal jitter during standby?	Check whether the encoder cable shield is connected properly. If the encoder data is abnormal, replace the encoder, and then auto-tune the angle/phase sequence again. Adjust the angle auto-tuning parameters properly and reduce the completion conditions of angle auto-tuning. For example, you can increase the operation/standstill evaluation threshold of angle auto-tuning as appropriate.

- E602.5: Angle auto-tuning failed. Z signal not found.
  Description:

  Angle auto-tuning failed. Z signal not found.

Cause	Troubleshooting	Solution
The encoder configuration is incorrect. The connected motor encoder has no Z signal. The Z signal polarity is set incorrectly. The data fed back by the encoder is abnormal. No Z signal is present.	Check whether the encoder has a Z signal. Check if the polarity of the Z signal is configured correctly. Check bit 13 of H00.26. Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement?	Check the wiring of the encoder. Ensure the shielded cables are effectively connected. Check the polarity configuration of Z signal. If the encoder data is abnormal, replace the encoder and then identify the angle again.

- E602.6: Angle auto-tuning does not converge
  Description:

  Angle auto-tuning does not converge

Cause	Troubleshooting	Solution
1. External disturbance (such as vibration of other parts on the bench) is present. 2. Parameters are set incorrectly.	Check for vibrating parts on the bench. Check whether the angle gain is set too large.	Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. For the position lock method, you can reduce the angle gain (H32.37) manually. For the jog method, you can manually reduce the operation evaluation threshold (H32.13/H32.15) or increase the standstill evaluation threshold (H32.14/H32.16).

- E603.0: Gantry communication CRC failure
  Description:

  Gantry communication CRC failure.

Cause	Troubleshooting	Solution
Gantry communication keeps abnormal.	Check the gantry wiring and electromagnetic environment.	Check the gantry wiring and electromagnetic environment.

- E603.1: Gantry communication timeout
  Description:

  Gantry communication timeout

Cause	Troubleshooting	Solution
The gantry communication signal is abnormal or the gantry cable is in poor contact.	Check the gantry wiring and electromagnetic environment. Check whether H14.02 is 1.	Check the gantry wiring and electromagnetic environment.

Note

Alarm EE15.0 is raised if communication is disconnected from the slave axis.

- E603.2: Drive failed to establish communication for a long time
  Description:

  Drive failed to establish communication for a long time

Cause	Troubleshooting	Solution
Gantry communication is disconnected or communication has not been established for a long time.	Check the gantry wiring and electromagnetic environment. Check whether H14.02 is 1.	Check the gantry wiring and electromagnetic environment.

- E604.0: Inconsistent settings of two gantry axes
  Description:

  Inconsistent settings of two gantry axes

Cause	Troubleshooting	Solution
The parameter settings of both axes of the gantry are inconsistent.	Check parameter settings.	Correct the settings.

- E604.1: Gantry not set to position mode
  Description:

  Gantry not set to position mode

Cause	Troubleshooting	Solution
When gantry is enabled, the drive does not run in the position mode.	When gantry is enabled, check whether the drive runs in the position mode.	Switch the drive to the position mode (H02.00).

- E604.2: Gantry is running on an unsupported feature
  Description:

  Gantry is running on an unsupported feature

Cause	Troubleshooting	Solution
Gantry is running on an unsupported feature.	Check whether the gantry configuration parameters meet the requirements of the current control scheme. For example: Rigid gantry control scheme 2 does not support "torque alignment mode", "homing torque pre-alignment" and "gantry alignment deviation compensation value auto-tuning".	Check whether the gantry configuration parameters meet the requirements of the current control scheme and make corrections accordingly.

- E605.0: Motor speed too high upon S-ON
  Description:

  The motor speed exceeds the rated speed when the servo drive in size A/B is switched on.

Cause	Troubleshooting	Solution
The motor speed exceeds the rated speed when the servo drive is switched on.	Check if the drive is enabled when the motor has been driven.	Switch on the drive when the motor is standstill.

- E606.0: Gantry torque alignment timeout
  Description:

  Gantry torque alignment timeout

Cause	Troubleshooting	Solution
Gantry torque alignment times out.	Check whether the alignment time exceeds the alarm threshold set by H14.30.	Increase the alarm threshold to see if the relevant parameters are set properly.

- E612.0: Rotor locked during phase sequence auto-tuning
  Description:

  Rotor locked during phase sequence auto-tuning

Cause	Troubleshooting	Solution
1. Locked-rotor occurred in mechanical equipment. 2. The data fed back by the encoder is abnormal. 3. U, V and W power cables are incorrectly connected or disconnected. 4. The drive/motor is faulty.	Stop the motor and push it to check whether locked-rotor occurred. Push the motor and observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement? Check the wiring. Use a multimeter to check wire breakage. If none of the above solves the problem, contact the manufacturer.	If yes, eliminate the problem and perform angle auto-tuning (phase sequence auto-tuning) again. If you determine that the feedback data of the encoder is abnormal, replace the encoder and perform angle auto-tuning (phase sequence auto-tuning) again. If any improper connection is found, reconnect the cables perform angle auto-tuning (phase sequence auto-tuning) again. If none of the above solves the problem, contact the manufacturer.

- E612.1: Overtravel occurred during phase sequence auto-tuning
  Description:

  Overtravel occurred during phase sequence auto-tuning

Cause	Troubleshooting	Solution
The moving distance during phase sequence auto-tuning is too large. 1. The setting of auto-tuning parameters does not match the load characteristics, and large impact occurred during auto-tuning, resulting in an overtravel alarm. 2. The data fed back by the encoder is abnormal. A false alarm is raised.	Check whether the displacement is really too large, and whether overtravel is caused by the setting of auto-tuning parameters. Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is the feedback operation continuous? Is the observed displacement consistent with the actual displacement?	If the movement during auto-tuning is too large, you can manually reduce the current rising slope (H32.21). If the encoder feedback data is abnormal, replace the encoder, and then identify the angle/phase sequence again.

- E612.3: Large encoder jitter during phase sequence auto-tuning
  Description:

  Large encoder jitter during phase sequence auto-tuning

Cause	Troubleshooting	Solution
Encoder feedback data has large jitter.	Check whether the encoder jitters abnormally at standstill.	Check the wiring of the encoder. Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. Manually increase H32.24/ H32.25.

- E612.4: Phase sequence auto-tuning failed. Auto-tuning timeout.
  Description:

  Phase sequence auto-tuning failed. Auto-tuning timeout.

Cause	Troubleshooting	Solution
If the phase sequence auto-tuning process is not completed in 30 seconds, a timeout alarm is raised. 1. Due to external disturbance (such as vibration of other parts on the bench), the completion condition of angle auto-tuning cannot be met. 2. The feedback data of the encoder is subjected to poor characteristics, interference or anomaly, and the completion condition of angle auto-tuning cannot be met.	Check for vibrating parts on the bench. Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement? Is there abnormal jitter during standby?	Check whether the encoder cable shield is connected properly. If the encoder data is abnormal, replace the encoder, and then auto-tune the phase sequence again. Adjust the phase sequence auto-tuning parameters properly and reduce the completion conditions of the auto-tuning. For example, you can increase the operation/standstill evaluation threshold as appropriate.

- E619.0: Absolute accuracy compensation parameter setting error
  Description:

  Accuracy compensation parameter setting error

Cause	Troubleshooting	Solution
1. The accuracy compensation interval(H33.64) is set to 0. 2. Inovance communication encoder DDL: 1. The distance from the mechanical home to the correction home exceeds the upper limit of the encoder (encoder unit: 23^{34}). 2. The length of correction exceeds the upper limit of the encoder (2^{34}). 3: Homing mode record error. The value of H33.70 is not in {-2, -1, 1, 2, 4, 6, 17, 18, 24, 28, 33, 34}.	Check whether H33.64 is set to 0. Check whether the distance between the mechanical home and the correction home (start position) exceeds the limit (encoder unit: 2^{34}). Check whether the value of H33.70 is in {-2, -1, 1, 2, 4, 6, 17, 18, 24, 28, 33, 34}.	Set the correct compensation interval. Set the distance between the mechanical home and the correction home properly. Set H33.70 correctly.

- E619.1: Absolute accuracy compensation overflow
  Description:

  1. The input quadrature pulse frequency (quadruple) is greater than 1/(H33.74 x 25 ns). 2. The number of compensated pulses at a time is greater than 1.

Cause	Troubleshooting	Solution
The input quadrature pulse frequency (quadruple) is greater than 1 ÷ (H33.74 x 25 ns). 2. The number of compensated pulses at a time is greater than 1.	Check the motor speed at the alarm time. Check the compensation table to see if there is a length greater than 1 index interval.	Reduce motor speed. Load the correct error compensation table.

- E620.0: Motor overload
  Description:

  The accumulative heat of the motor reaches the fault threshold.

Cause	Troubleshooting	Solution
1. The motor and encoder cables are connected incorrectly or in poor contact.	Check the wiring between the servo drive, servo motor and the encoder according to the correct “wiring diagram”.	Connect cables according to the correct wiring diagram. It is recommended to use the cables provided by Inovance. When customized cables are used, prepare and connect the customized cables according to the wiring instructions.
2. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque.	Check the overload characteristics of the servo drive or servo motor. Check whether the average load rate (H0b.12) of the servo drive keeps exceeding 100.0%.	Use a servo drive of higher capacity and a matching servo motor. Reduce the load and increase the acceleration/deceleration time.
3. Acceleration/deceleration is too frequent or the load inertia is too large.	Calculate the mechanical inertia ratio or perform inertia auto-tuning. View the value of H08.15 (Load moment of inertia ratio). Confirm the individual operation cycle when the servo motor operates cyclically.	Increase the acceleration/ deceleration time during single-cycle running.
4. The gain adjustment is improper or the stiffness is too high.	Check whether the motor vibrates and generates unusual noise during operation.	Readjust the gain.
5. The servo drive model or motor model is set improperly.	Check the motor model (H00.00) and drive model (H01.10) stored in the bus encoder.	Check the servo drive nameplate and set the servo drive model (H01.10) and motor model properly according to section "Servo Drive Model and Nameplate"

Cause	Troubleshooting	Solution
		in SV680P Series Servo Drive Hardware Guide.
6. The motor is stalled due to mechanical factors, resulting in overload during operation.	Check the reference and motor speed (H0b.00) through the software tool or keypad. References in the position control mode: H0b.13 (Input position reference counter). References in the speed control mode: H0b.01 (Speed reference). References in the torque control mode: H0b.02 (Internal torque reference). Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
7. The servo drive is faulty.	The fault persists after the servo drive is powered off and on again.	Replace the servo drive.

Note

When E620.0 occurs, stop the servo drive for at least 30s before further operations.

- E620.1: Overload current limit mode, motor overloaded
  Description:

  Overload current limit mode, motor overloaded

Cause	Troubleshooting	Solution
1. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque. 2. Acceleration/deceleration is too frequent or the load inertia is too large. 3. The motor and encoder cables are connected incorrectly or in poor contact. 4. The gain adjustment is improper or the stiffness is too high. 5. The motor is stalled due to mechanical factors, resulting in overload during operation. 6. The servo drive is faulty.	Confirm the overload characteristics of the servo drive or motor. Check whether the average load rate (H0b.12) keeps exceeding 100.0%.	Replace with a servo drive of higher capacity and a matching servo motor, or reduce the load and increase the acceleration/ deceleration time.

- E621.0: Overload current limiting torque attained
  Description:

  Overload current limiting torque attained

Cause	Troubleshooting	Solution
1. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque. 2. Acceleration/deceleration is too frequent or the load inertia is too large. 3. The motor and encoder cables are connected incorrectly or in poor contact. 4. The gain adjustment is improper or the stiffness is too high. 5. The motor is stalled due to mechanical factors, resulting in overload during operation. 6. The servo drive is faulty.	Confirm the overload characteristics of the servo drive or motor. Check whether the average load rate (H0b.12) keeps exceeding 100.0%. Detect whether the value of H3278 is set too high.	Replace with a servo drive of higher capacity and a matching servo motor. Reduce the load and increase the acceleration/ deceleration time.

- E630.0: motor rotor locked over-temperature
  Description:

The actual motor speed is lower than 10rpm but the torque reference reaches the limit, and such status lasts for the time defined by H0A.32.

Cause	Troubleshooting	Solution
1. U/V/W output phase loss, wire breakage or incorrect phase sequence occurs on the servo drive.	Perform motor trial run without load and check cable connections and the phase sequence.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The motor parameters (especially the number of pole pairs) are set improperly, or motor angle auto-tuning is not performed, or motor power is greater than drive power.	View parameters in group H00 to check whether the number of pole pairs are set properly. Perform angle auto-tuning on the motor several times and check whether the value of H00.28 is consistent during angle auto-tuning. Check whether the motor and drive match in the power.	Modify motor parameter values or replace the drive.
3. The communication commands are being disturbed.	Check whether jitter occurs on the commands sent from the host controller and whether EtherCAT communication is being disturbed.	Check whether the communication line between the host controller and the servo drive is being disturbed.
4. The motor is stalled due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. References in the position control mode: H0b.13 (Input position reference counter). References in the speed control mode: H0b.01 (Speed reference). References in the torque control mode: H0b.02 (Internal torque reference). Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode. Check the current feedback (torque reference) waveform.	Check whether any mechanical part gets stuck or eccentric.

Note

When the fault occurs, stop the servo drive for at least 30s before further operations.

- E631.1: 24 V or brake not connected
  Description:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
The brake or the 24 power supply is not connected when the internal brake feature is used. 2. DO or VDO configuration 9: Brake function, and the function is not enabled by H04.24.	Check whether 24 V power supply or the brake is not connected when H02.16 is set to 1. 2. DO or VDO configuration 9: Brake function, and H04.24 = 0.	If you use the internal brake, connect the brake cable and 24 power supply. If you use a DO brake, set H0E-10 to 1.

- E631.2: P-MOS open circuit
  Description:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, P-MOS open circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	Replace the servo drive. Turn off the brake switch H02.16.

- E631.3: N-MOS open circuit
  Description:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, N-MOS open circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	Replace the servo drive. Turn off the brake switch H02.16.

- E640.0: IGBT over-temperature
  Description:

  The IGBT temperature reaches the fault threshold defined by H0A.18.

Cause	Troubleshooting	Solution
1. The ambient temperature is too high. 2. The servo drive is restarted repeatedly to reset the overload fault.	Measure the ambient temperature and view the fault records (set H0b.33 and view H0b.34) to check whether an overload fault/ alarm is reported (E620.0, E630.0, E650.0, E909.0, E920.0, E922.0).	Improve the cooling conditions of the servo drive to lower down the ambient temperature. Change the fault reset method. After overload occurs, wait for 30s before reset. Increase the capacities of the servo drive and servo motor. Increase the acceleration/ deceleration time and reduce the load.
3. The fan is damaged.	Check whether the fan works properly during operation.	Replace the servo drive.
4. The servo drive is installed in a wrong direction and the clearance between servo drives is improper.	Check whether the servo drive is installed properly.	Install the servo drive according to the installation requirements.
5. The servo drive is faulty.	The fault persists even though the servo drive is restarted five minutes after power-off.	Replace the servo drive.

Note

When the fault occurs, stop the servo drive for at least 30s before further operations.

- E640.1: Flywheel diode overtemperature
  Description:

  The temperature of the flywheel diode reaches the fault threshold defined by H0A.18.

Cause	Troubleshooting	Solution
1. The ambient temperature is too high. 2. The servo drive is restarted repeatedly to reset the overload fault.	Measure the ambient temperature and view the fault records (set H0b.33 and view H0b.34) to check whether an overload fault/ alarm is reported (E620.0, E630.0, E650.0, E909.0, E920.0, E922.0).	Improve the cooling conditions of the servo drive to lower down the ambient temperature. Change the fault reset method. After overload occurs, wait for 30s before reset. Increase the capacities of the servo drive and servo motor. Increase the acceleration/ deceleration time and reduce the load.
3. The fan is damaged.	Check whether the fan works properly during operation.	Replace the servo drive.
4. The servo drive is installed in a wrong direction and the clearance between servo drives is improper.	Check whether the servo drive is installed properly.	Install the servo drive according to the installation requirements.
5. The servo drive is faulty.	The fault persists even though the servo drive is restarted five minutes after power-off.	Replace the servo drive.

Note

When the fault occurs, stop the servo drive for at least 30s before further operations.

- E650.0: Heatsink overtemperature
  Description:

  The temperature of the servo drive power module is higher than the overtemperature threshold.

Cause	Troubleshooting	Solution
1. The ambient temperature is too high. 2. The servo drive is restarted repeatedly to reset the overload fault.	Measure the ambient temperature and view the fault records (set H0b.33 and view H0b.34) to check whether an overload fault/ alarm is reported (E620.0, E630.0, E650.0, E909.0, E920.0, E922.0).	Improve the cooling conditions of the servo drive to lower down the ambient temperature. Change the fault reset method. After overload occurs, wait for 30s before reset. Increase the capacities of the servo drive and servo motor. Increase the acceleration/ deceleration time and reduce the load.
3. The fan is damaged.	Check whether the fan works properly during operation.	Replace the servo drive.
4. The servo drive is installed in a wrong direction and the clearance between servo drives is improper.	Check whether the servo drive is installed properly.	Install the servo drive according to the installation requirements.
5. The servo drive is faulty.	The fault persists even though the servo drive is restarted five minutes after power-off.	Replace the servo drive.

Note

When the fault occurs, stop the servo drive for at least 30s before further operations.

- E660.0: Motor overtemperature
  Description:

  The temperature of the air-cooled motor is too high. Or PTC was turned on by mistake through H00.26.

Cause	Troubleshooting	Solution
The temperature of the air-cooled motor is too high. Or PTC was turned on by mistake through H00.26.	Measure whether the temperature of the air-cooled motor is too high. Check whether PTC is enabled on the drive, but the motor has no PTC hardware. Or check whether PTC is connected properly. For an Inovance motor, the temperature threshold is 130°C. For a third-party motor, measure the PTC resistance and determine the motor temperature based on the resistance specifications.	Cool the motor down. Check whether PTC is enabled on the drive, but the motor has no PTC hardware. Or check whether PTC is connected properly.

- E661.0: STune failure
  Description:

  During STune operation, the gain drops to the lower limit. Position loop gain < 5 Speed loop gain < 5 Model loop gain < 10

Cause	Troubleshooting	Solution
During STune operation, the gain drops to the lower limit. Position loop gain < 5 Speed loop gain < 5 Model loop gain < 10	Check if vibration resonance is properly suppressed in the system. The torque vibration amplitude exceeds the setpoint of H09.11.	Set the notch manually. Modify the electronic gear ratio to improve the command resolution, or increase the command filter time constant or in the parameter configuration interface. Check whether the current of the machine fluctuates periodically. Set H09.58 to 1 to clear resonance suppression parameters, and perform STune again.

- E662.0: ETune failure
  Description:

  Check whether resonance that occurred during ETune operation cannot be suppressed.

Cause	Troubleshooting	Solution
Check whether resonance that occurred during ETune operation cannot be suppressed.	Check whether there is abnormal noise or torque fluctuation during operation.	Set the notch manually when vibration cannot be suppressed automatically. Modify the electronic gear ratio to improve the command resolution, increase the command filter time constant or in the parameter configuration interface. Increase the value of H09.11 as appropriate. Check whether the current of the machine fluctuates periodically. Check whether the positioning threshold is too low. Increase the reference acceleration/deceleration time.

- E664.0: Resonance too strong
  Description:

  Resonance occurs on the servo system and the torque fluctuation amplitude is higher than the value of H09.54.

Cause	Troubleshooting	Solution
Resonance occurs on the servo system and the torque fluctuation amplitude is higher than the value of H09.54.	Check whether there is abnormal noise or torque fluctuation during operation.	Check whether the inertia ratio or loop gain parameters are set properly. Check whether resonance parameters are set properly. Increase the value of H09.54 or set H09.54 to 0 to disable this function.

- E720.0: Wrong encoder interface
  Description:

  The drive does not support the selected encoder interface.

Cause	Troubleshooting	Solution
The drive does not support the selected encoder interface.	Check whether H32.01 and H0F.06 are set properly. If the gantry function is turned on, check whether the gantry function conflicts with the master encoder or full closed-loop encoder setting.	Check whether the signal cable required by the current encoder interface scheme exceeds the upper limit of a single interface. Modify H32.01 and H0F.01.

- E731.0: Encoder multi-turn data lost
  Description:

  Encoder multi-turn data lost

Cause	Troubleshooting	Solution
1. The battery of the first encoder is not connected during power-off.	Check whether the battery is connected during power-off.	Set H0d.20 to 1 to clear the fault.
2. The battery voltage of the first encoder is lower than 2.9 V.	Measure the battery voltage.	Use a new battery with the matching voltage.
3. The first encoder is interfered with by a strong magnetic field.	Check whether the encoder is in a strong magnetic field.	Remove the magnetic field and set H0d.20 to 1 to clear the error.

- E731.1: Inovance second encoder multi-turn data lost
  Description:

  Inovance second encoder multi-turn data lost

Cause	Troubleshooting	Solution
1. The battery of the Inovance second encoder is not connected during power-off.	Check whether the battery is connected during power-off.	Set H0d.20 to 1 to clear the fault.
2. The Inovance second encoder battery voltage is lower than 2.9 V.	Measure the battery voltage.	Use a new battery with the matching voltage.
3. The Inovance second encoder is interfered with by a strong magnetic field.	Check whether the encoder is in a strong magnetic field.	Remove the magnetic field and set H0d.20 to 1 to clear the error.

- E733.0: Encoder multi-turn counting error
  Description:

  An encoder multi-turn counting error occurs.

Cause	Troubleshooting	Solution
The encoder is faulty.	Set H0d.20 to 2 to clear the fault, but E733.0 persists after restart.	Replace the motor.

- E733.1: Inovance 2nd encoder multi-turn counting error.
  Description:

  Inovance 2nd encoder multi-turn counting error

Cause	Troubleshooting	Solution
Inovance 2nd encoder error	Set H0d.20 to 3 to clear the fault, but E733.1 persists after restart.	Replace the motor.

- E735.0: Encoder multi-turn counting overflow
  Description:

  A multi-turn counting overflow occurs on the absolute encoder.

Cause	Troubleshooting	Solution
The number of forward revolutions exceeds 32767 or the number of reverse revolutions exceeds 32768.	Check whether the value of H0b.70 (Number of absolute encoder revolutions) is 32767 or 32768 when the servo drive works in the absolute linear mode (H02.01 = 1).	Set H0d.20 to 2 to power on again. Perform homing if necessary.

- E740.0: Absolute encoder communication timeout
  Description:

  The encoder realtime communication timeout state is set in 100 consecutive current loop cycles.

Cause	Troubleshooting	Solution
1. The encoder cable is connected improperly or in poor contact.	Check the wiring of the encoder and power on the servo drive again. Check whether the value of HJ30.16 (Encoder feedback mode) exceeds 100.	Check the wiring of the encoder and power on the servo drive again.
2. The motor type is set incorrectly.	Check the setting of the motor type parameter.	Check whether the encoder type is consistent with the setting. Power on the servo drive again.
3. The encoder is damaged.	Replace the encoder.	Replace the encoder.

- E740.2: Absolute encoder error
  Description:

During non-real-time communication (power-on initialization and reading ROM): encoder communication timeout, stop bit error, CRC error, data field error and position count error.

During real-time communication: The above-mentioned errors occur for N (set by H0A.50) consecutive times.

Cause	Troubleshooting	Solution
1. The encoder cable is abnormal. The communication with encoder suffers from interference.	Check whether the value of H0b.28 is not 0. Check whether the signal transmission is interfered with.	Check whether the servo drive and motor are grounded properly. You can wind a magnetic ring on the encoder cable to reduce interference and use a twisted pair.
2. The data length of the third party encoder is set incorrectly.	Check the encoder manual to see if H00.43/H00.44 are set to the correct values.	Check the encoder manual and set the encoder data length correctly.

- E740.3: Absolute encoder single-turn calculation error
  Description:

  Internal fault of the encoder.

Cause	Troubleshooting	Solution
An internal fault occurs on the encoder.	Check whether bit7 of H0b.28 is set to 1.	Check whether the encoder version (H00-04) is proper. Check whether encoder cables are in proper condition. Replace the motor.

- E740.6: Encoder data write error
  Cause:

  The attempt to write the encoder data fails.

Cause	Troubleshooting	Solution
An error occurs when writing the position offset after angle auto-tuning.	Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	Use a new encoder cable. If the fault persists after the encoder cable is replaced, the encoder may be faulty. In this case, replace the servo motor.

- E740.8: BiSS-C register communication failure
  Description:

  Non-real-time communication: encoder communication timeout, stop bit error, CRC error, data field error.

Cause	Troubleshooting	Solution
1. The BiSS-C read head is loose, and the distance between the head and the scale does not meet the installation requirements. 2. BiSS-C scale is contaminated. 3. The BiSS-C encoder read head is damaged.	Check the head for abnormal illumination of the indicator. Check whether the indicator is lit when the head is at a certain position.	Reinstall the read head. Replace the scale. Replace the read head.

- E740.9: Encoder data transmit delay is too long
  Description:

  The encoder data transmit delay is set to exceed one current loop period.

Cause	Troubleshooting	Solution
1. The value of H01.59 is set too large. 2. Too many encoder data bits.	Power off and restart the drive.	Decrease the value of H01.59. Use an encoder with fewer data bits.

- E755.0: Nikon encoder communication fault
  Description:

  Nikon encoder communication failure.

Cause	Troubleshooting	Solution
Nikon encoder communication error	Perform a power cycle to check if the error is still reported.	Manually reset the encoder error through H0d-21. If the error remains, check the encoder and its wiring.

- E760.0: Encoder overtemperature
  Description:

  The temperature of the absolute encoder is too high.

Cause	Troubleshooting	Solution
The temperature of the absolute encoder is too high.	Measure the encoder temperature or the motor temperature, which must not exceed 120°C. Note that you are measuring the temperature of the housing, which is is 20°C to 40°C lower than the internal temperature.	Switch off the S-ON signal to wait for the encoder to cool down.

- E765.0: 3rd party encoder over-temperature or overspeed
  Description:

  Encoder over-temperature or overspeed

Cause	Troubleshooting	Solution
Motor overtemperature or overspeed.	Check if the ambient temperature or the average load rate is too high (over 140°C). Check the motor for overspeed.	Switch off the S-ON signal to wait for the encoder to cool down.

- E770.0: Fully-closed loop input phase A wire breakage
  Description:

  Fully-closed loop phase A input differential voltage wire breakage

Cause	Troubleshooting	Solution
Fully-closed loop phase A input differential voltage wire breakage	Measure the phase AB differential voltage to check if it is below 2.5 V.	Adjust the fully-closed loop phase A input voltage.

- E770.1: Fully-closed loop input phase B wire breakage
  Description:

  Fully-closed loop phase B input differential voltage wire breakage

Cause	Troubleshooting	Solution
Fully-closed loop phase B input differential voltage wire breakage	Measure the phase B differential voltage to check if it is below 2.5 V.	Adjust the fully-closed loop phase B input voltage.

- E770.2: Fully-closed loop input phase Z wire breakage
  Description:

  Fully-closed loop phase Z input differential voltage wire breakage

Cause	Troubleshooting	Solution
Fully-closed loop phase Z input differential voltage wire breakage	Measure the phase Z differential voltage to check if it is below 2.5 V.	Adjust the fully-closed loop phase Z input voltage.

- E770.3: fully closed-loop external loop encoder communication timeout
  Description:

  Fully closed-loop external loop encoder communication timeout.

Cause	Troubleshooting	Solution
Fully closed-loop external loop encoder communication timeout.	Check the wiring.	Check the wiring.

- E770.6: Fully closed-loop Inovance 2nd encoder initialization communication error
  Description:

  The Inovance second encoder failed to initialize.

Cause	Troubleshooting	Solution
1. The encoder cable connections are incorrect or loosened.	Check encoder wiring. Check for strong vibration, which loosens the encoder cable and even damages the encoder.	Connect the encoder cables according to the correct wiring diagram. Re-connect encoder cables and ensure encoder terminals are connected securely.
2. The servo drive is faulty.	The fault persists after the servo drive is restarted.	Replace the servo drive.

- E770.7: Fully closed-loop 2nd encoder communication error
  Description:

  Second encoder communication failed.

Cause	Troubleshooting	Solution
1. The encoder is wired improperly. 2. The encoder cable connections become loose. 3. The encoder Z signal is interfered with. 4. The encoder is faulty. 5. Check whether H0F.29–H0F.33 are set correctly.	Check encoder wiring. Check for strong vibration, which loosens the encoder cable and even damages the encoder. Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. Check whether ambient devices are generating interference and whether multiple interference sources are present in the cabinet. Make servo drive stay in "rdy" status and rotate motor shaft counterclockwise (CCW) manually and observer whether H0b.17 (electrical angle) increases/decreases smoothly. Turning one circle corresponds to five 0–360° (for Z series motors). For X series motors, turning one circle corresponds to four 0–360°. If H0b.17 changes abnormally during motor rotating, the encoder is faulty. If no alarm is reported during motor shaft rotating but an alarm is reported during servo drive running, interference may exist. Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change. Check the encoder manual to see if H0F.29–H0F.33 are set to the correct values.	Connect the cables again according to the correct wiring diagram. Connect the cables again and ensure encoder terminals are connected securely. It is recommended to use the cables provided by Inovance. If a customized cable is used, check whether this cable is a shielded twisted pair cable that complies with the specifications. Route the motor cables and encoder cables through different routes. Ensure the servo motor and servo drive are grounded properly. Check whether the connectors at both ends of the encoder are in good contact and whether any pin retracts. Use a new encoder cable. If the fault persists after encoder cables are replaced, the encoder may be faulty. In this case, replace the servo motor. Check the encoder manual to see if H0F.29–H0F.33 are set to the correct values.

- E770.8: Full closed-loop encoder data transmit delay is too large
  Description:

  The encoder data transmit delay is set to exceed one current loop period.

Cause	Troubleshooting	Solution
1. The value of H01.59 is set too large. 2. Too many encoder data bits.	Power off and restart the drive.	Decrease the value of H01.59. Use an encoder with fewer data bits.

- E771.0: Communication handshake failure between interpolator and drive
  Description:

  Communication handshake failed between the interpolator and drive

Cause	Troubleshooting	Solution
Communication between T2 interpolator and motor is abnormal during power-on initialization.	Check whether power cycling is not performed after parameters are written to the interpolator. Check the wiring between the interpolator and motor.	Power off and on again. Check the wiring. If the alarm remains after several power cycling, replace the motor.

- E939.0: Motor power cable disconnected
  Description:

  At least one phase of the motor is disconnected.

Cause	Troubleshooting	Solution
1. One or two phases of the motor power cable are disconnected. 2. The actual current loop gain is set improperly.	Check the wiring of U/V/W power cables. The power cable is not disconnected. The current feedback and torque reference follow are abnormal. Perform inductive resistance auto-tuning and current loop auto-tuning again.	Check if the power cable are disconnected or in poor contact. Re-connect the power cable. Replace the servo motor. Perform inductive resistance auto-tuning and current loop auto-tuning again.

- E994.0: Station number conflict
  Description:

  CANlink station number conflict.

Cause	Troubleshooting	Solution
CANlink station number conflict.	Check the setpoint of H0E.00.	Rectify the value of H0E.00.

- EA33.0: Encoder read/write check error
  Description:

  Internal parameters of the encoder are abnormal.

Cause	Troubleshooting	Solution
1. The serial incremental encoder cable is disconnected or loose.	Check the wiring.	Check whether the encoder cables are connected incorrectly, disconnected, or in poor contact. If the motor cables and encoder cables are bundled together, separate them.
2. An error occurs when reading/writing the serial incremental encoder parameters.	If the fault persists after the servo drive is powered off and on repeatedly, the encoder is faulty.	Replace the servo motor.

- EA33.1: Fully closed-loop Inovance 2nd encoder data read/write error
  Description:

  Internal parameters of the encoder are abnormal.

Cause	Troubleshooting	Solution
1. The serial incremental encoder cable is disconnected or loose.	Check the wiring.	Check whether the encoder cables are connected incorrectly, disconnected, or in poor contact. If the motor cables and encoder cables are bundled together, separate them.
2. An error occurs when reading/writing the serial incremental encoder parameters.	If the fault persists after the servo drive is powered off and on repeatedly, the encoder is faulty.	Replace the servo motor.

- EA34.0: Abnormal Hall state
  Description:

  Hall state fault.

Cause	Troubleshooting	Solution
Hall signal output is all high or all low.	Check the wiring of the Hall sensor. Collect the states of the Hall sensor with the oscilloscope in InoDriverShop. Push the motor, and observe whether there is 0 or 7 in the states.	Check the U, V and W wiring of the Hall sensor. If the alarm persists after several power cycling, the Hall sensor must be faulty and you must replace it. Check whether the encoder shield is connected properly. If a phase of the Hall sensor is connected incorrectly, you can adjust the level active state of a single phase through H32.55.

- EA34.1: Dynamic Hall auto-tuning error
  Description:

  Dynamic Hall auto-tuning error

Cause	Troubleshooting	Solution
Anomaly was found during electrical angle evaluation.	Check whether the motor can move normally. Check whether the Hall signal output corresponds to the electrical angle change. Check whether the motor is equipped with a Hall sensor. Check the wiring of the Hall sensor.	Ensure that the motor can move on one side regardless of the limit. If the motor parameters are normal, but one Hall signal change does not correspond to a 60° electrical angle approximately after several tests, the Hall signal output must be abnormal and you must replace the Hall sensor. Check whether the motor is equipped with a Hall sensor. Check the wiring of the Hall sensor.

- EA34.2: Static Hall auto-tuning error
  Description:

  Static Hall auto-tuning error

Cause	Troubleshooting	Solution
Failed to enable static Hall auto-tuning.	Check whether the motor is connected to an incremental encoder. Check whether H32.62 is 1 when H0A.13 is set to 6.	Only motors with an incremental encoder support static Hall auto-tuning. If not, perform dynamic Hall auto-tuning again.

- EB00.0: Position deviation too large
  Description:

  The position deviation in the position control mode is larger than the setpoint of 6065h (Threshold of excessive position deviation).

Cause	Troubleshooting	Solution
1. U/V/W output phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The servo drive U/V/W cables or the encoder cable is disconnected.	Check the wiring.	Connect the cables again. The servo drive power cables must be connected in the correct order at both

Cause	Troubleshooting	Solution
		ends. If necessary, replace all cables and ensure a reliable connection.
3. The motor is stalled due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. Reference in the position control mode: H0b.13 (Input position reference counter) Reference in the speed control mode: H0b.01 (Speed reference) Reference in the torque control mode: H0b.02 (Internal torque reference) Check whether the reference is not 0 but the motor speed is 0 in the corresponding mode.	Rectify the mechanical-related problem.
4. The servo drive gain is too low.	Check the position loop gain and speed loop gain of the servo drive. 1st gain set: H08.00...H08.02 2nd gain set: H08.03...H08.05	Adjust the gain values manually or perform gain auto-tuning.
5. The position reference increment is too large.	Position control mode: In CSP mode, check the gear ratio 6091.01h/6091.02h to determine the position reference increment for an individual synchronization period and convert it to the speed information. In PP mode, check the gear ratio 6091.01h/6091.02h and determine the 6081h (Profile velocity). In HM mode, check the gear ratio 6091.01h/ 6091.02h, and determine 6099.01h and 6099.02h.	CSP: Decrease the position reference increment per synchronization period. The host controller should cover the position ramp when generating references. PP: Decrease the value 6081h or increase the acceleration/ deceleration ramp (6083h, 6084h). HM: Decrease 6099.01h and 6099.02h or increase the acceleration/ deceleration ramp (609Ah). Decrease the gear ratio according to actual conditions.

Cause	Troubleshooting	Solution
6. The value of 6065h is insufficient for the operating conditions.	Check the value of 6065h.	Increase the setpoint of 6065h.
7. The servo drive/motor is faulty.	Monitor the operation waveform through the oscilloscope function in the software tool: position references, position feedback, speed references, and torque references.	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB00.1: Position deviation overflow
  Description:

  The position deviation is too large.

Cause	Troubleshooting	Solution
1. U/V/W output phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The servo drive U/V/W cables or the encoder cable is disconnected.	Check the wiring.	Connect the cables again. The servo drive power cables must be connected in the correct order at both ends. If necessary, replace all cables and ensure a reliable connection.
3. The motor is stalled due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. References in the position control mode: H0b.13 (Input position reference counter). References in the speed control mode: H0b.01 (Speed reference). References in the torque control mode: H0b.02 (Internal torque reference). Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
4. The servo drive gain is too low.	Check the position loop gain and speed loop gain of the servo drive. 1st gain set:	Adjust the gain values manually or perform gain auto-tuning.

Cause	Troubleshooting	Solution
	H08.00...H08.02 2nd gain set: H08.03...H08.05	
5. The position reference increment is too large.	Position control mode: In CSP mode, check the gear ratio 6091.01h/6091.02h to determine the position reference increment for an individual synchronization period and convert it to the speed information. In PP mode, check the gear ratio 6091.01h/6091.02h and determine the 6081h (Profile velocity). In HM mode, check the gear ratio 6091.01h/6091.02h, and determine 6099.01h and 6099.02h.	CSP: Decrease the position reference increment per synchronization period. The host controller should cover the position ramp when generating references. PP: Decrease the value 6081h or increase the acceleration/deceleration ramp (6083h, 6084h). HM: Decrease 6099.01h and 6099.02h or increase the acceleration/deceleration ramp (609Ah). Decrease the gear ratio according to actual conditions.
6. The value of 6065h is insufficient for the operating conditions.	Check the value of 6065h.	Increase the setpoint of 6065h.
7. The servo drive/motor is faulty.	Monitor the operation waveform through the oscilloscope function in the software tool: position references, position feedback, speed references, and torque references.	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB01.0: Position reference increment too large
  Description:

  Position reference increment too large

Cause	Troubleshooting	Solution
The pulse reference increment exceeds the excessive reference threshold three times consecutively.	Check whether the baud rate of pulse reference input exceeds H0A.09.	Increase the value of H0A.09. Reduce the baud rate of pulse input.

- EB01.1: Individual position reference increment too large
  Description:

  The target position increment is too large.

Cause	Troubleshooting	Solution
The target position increment is too large.	Check the variation between two adjacent target positions using the software tool.	Check whether the maximum speed of the motor fulfills the application requirement. If yes, reduce the target position reference increment, which is to lower the profile reference speed. If not, replace the servo motor. Before switching the mode or enabling the servo drive, check whether the target position is aligned with current position feedback. The communication sequence of the host controller is abnormal, leading to slave data error. Check the communication sequence of the host controller.

- EB01.2: Position reference increment too large continuously
  Description:

  The target position increment is too large continuously.

Cause	Troubleshooting	Solution
The target position increment is too large continuously.	Check the variation between two adjacent target positions using the software tool.	Check whether the maximum speed of the motor fulfills the application requirement. If yes, reduce the target position reference increment, which is to lower the profile reference speed. If not, replace the servo motor. Before switching the mode or enabling the servo drive, check whether the target position is aligned with current position feedback. The communication sequence of the host controller is abnormal, leading to slave data error. Check the communication sequence of the host controller.

- EB01.3: Command overflow
  Description:

  The target position is still in the process of transmission when the servo limit or software position limit signal is activated and the 32-bit upper/lower limit is reached.

Cause	Troubleshooting	Solution
The target position is still in the process of transmission when the servo limit or software position limit signal is activated and the 32-bit upper/lower limit is reached.	Check whether the host controller continues sending commands after overtravel alarm is reported by the servo drive.	Detect the servo limit signal (bit0 and bit1 of 60FDh is recommended) through the host controller. Stop sending limit direction commands when an active servo limit signal is detected by the host controller.

- EB02.0: Position deviation exceeding threshold in fully closed-loop
  Description:

  The absolute value of position deviation in fully closed-loop mode exceeds the value of H0F.08 (Excessive position deviation threshold in fully closed-loop mode).

Cause	Troubleshooting	Solution
1. U/V/W output phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The servo drive U/V/W cables or the internal/ external encoder cable is disconnected.	Check the wiring.	Connect the cables again. The servo drive power cables must be connected in the correct order at both ends. If necessary, replace all cables and ensure a reliable connection.
3. The motor is stalled due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. References in the position control mode: H0b.13 (Input position reference counter). References in the speed control mode: H0b.01 (Speed reference). References in the torque control mode: H0b.02 (Internal torque reference). Check whether the reference value is not 0 but the motor	Rectify the mechanical-related problem.

Cause	Troubleshooting	Solution
	speed is 0 rpm in the corresponding mode.	
4. The servo drive gain is too low.	Check the position loop gain and speed loop gain of the servo drive. 1st gain set: H08.00...H08.02 2nd gain set: H08.03...H08.05	Adjust the gain values manually or use gain auto-tuning.
5. The input pulse frequency is high.	When the position reference source is pulse reference, check whether the input pulse frequency is too high or whether the acceleration/ deceleration time is set to 0 or an excessively low value.	Reduce the position reference frequency or the electronic gear ratio. When the host controller is used to output position pulses, you can set the acceleration time in the host controller. If the acceleration/ deceleration time cannot be set in the host controller, increase the values of H05.04 and H05.06.
6. The value of H0F.08 is insufficient for the operating conditions.	Check the value of H0F.08.	Increase the setpoint of H0F.08.
7. The servo drive/motor is faulty.	Monitor the operation waveform through the oscilloscope function in the software tool: position references, position feedback, speed references, and torque references.	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB02.1: Fully closed-loop position deviation overflow
  Description:

  The absolute value of the fully closed-loop position deviation is greater than 2^{31}.

Cause	Troubleshooting	Solution
1. U/V/W output phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The drive U/V/W cables or the encoder cable is disconnected.	Check the wiring.	Connect the cables again. The servo drive power cables must be connected in the correct order at both ends. If necessary, replace all cables and ensure a reliable connection.

Cause	Troubleshooting	Solution
3. The motor is stalled due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. References in the position control mode: H0b.13 (Input position reference counter). References in the speed control mode: H0b.01 (Speed reference). References in the torque control mode: H0b.02 (Internal torque reference). Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
4. The servo drive gain is too low.	Check the position loop gain and speed loop gain of the servo drive. 1st gain set: H08.00...H08.02 2nd gain set: H08.03...H08.05	Adjust the gain values manually or use gain auto-tuning.
5. The position reference increment is too large.	Position control mode: In IP/CSP mode, check the gear ratio 6091.01h/6091.02h to determine the position reference increment for an individual synchronization period and convert it to the speed information. In PP mode, check the gear ratio 6091.01h/6091.02h and determine the 6081h (Profile velocity). In HM mode, check the gear ratio 6091.01h/6091.02h, and determine 6099.01h and 6099.02h.	IP/CSP: Decreases the position reference increment per synchronization period. The host controller should cover the position ramp when generating references. PP: Decreases the value of 6081h or decreases the acceleration/deceleration ramp (6083h, 6084h). HM: Decreases 6099.01h and 6099.02h or decreases the acceleration/deceleration ramp (609Ah). Reduce the gear ratio as needed.
6. The value of H0F.08 is insufficient for the operating conditions.	Check the value of 6065h.	Increase the setpoint of 6065h.
7. The servo drive/motor is faulty.	Monitor the operation waveform through the oscilloscope function in the software tool: position references, position feedback, speed references, and torque references.	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB03.0: Electronic gear ratio beyond the limit-H05.02
  Description:

  The electronic gear ratio exceeds the limit: (0.001–4000 x Encoder resolution/ 10000).

Cause	Troubleshooting	Solution
The electronic gear ratio converted by converted exceeds the maximum gear ratio or is less than the minimum gear ratio.	Check if the electronic gear ratio is within the range of 0.001–4000 x Encoder resolution/10000.	Change the value of H05.02.

- EB03.1: Electronic gear ratio beyond the limit-Electronic gear ratio 1
  Description:

  The electronic gear ratio exceeds the limit: (0.001–4000 x Encoder resolution/ 10000).

Cause	Troubleshooting	Solution
Electronic gear ratio 1 exceeds the maximum gear ratio or is less than the minimum gear ratio.	Check if the electronic gear ratio is within the range of 0.001–4000 × Encoder resolution/10000.	Change the values of H05.07/H05.09.

- EB03.2: Electronic gear ratio beyond the limit-Electronic gear ratio 2
  Description:

  Electronic gear ratio 2 exceeds the limit: (0.001–4000 x Encoder resolution/10000).

Cause	Troubleshooting	Solution
Electronic gear ratio 2 exceeds the maximum gear ratio or is less than the minimum gear ratio.	Check if the group 2 electronic gear ratio is within the range of 0.001–4000 × Encoder resolution/10000.	Change the values of H05.11/H05.13.

- EB04.0: Large gantry position deviation
  Description:

  Large gantry position deviation

Cause	Troubleshooting	Solution
1. Large gantry position deviation. 2. The gantry position deviation is too large after mechanical homing enabling is off.	Check whether the gantry position deviation exceeds the threshold set in H14.45, or is related to any instrument or device.	Increase the value of H14.45.

- EB04.1: Gantry position deviation overrun

Description:

Gantry position deviation overrun

Cause	Troubleshooting	Solution
The deviation of two gantry axes exceeds the internal 32-bit data.	Check whether the gantry alignment mode is suitable. Check whether the position command of the two axes are the same and whether the mechanical structure is abnormal.	Check whether the gantry alignment mode is suitable. Check whether the position command of the two axes are the same and whether the mechanical structure is abnormal.

- ED02.0: Modbus communication timeout
  Description:

  Modbus communication timeout

Cause	Troubleshooting	Solution
Modbus communication timeout	Increase the value of H0E.83.	Determine the Modbus access cycle by frame grab.

- ED03.0: CANLink communication failure
  Description:

  The master is offline.

Cause	Troubleshooting	Solution
The master is offline.	Increase the heartbeat threshold of the master station. Check the wiring.	Capture frames to ensure that the master station is online.

- ED04.0: CANopen communication timeout
  Description:

  The slave reaches the time configured by the consumer or the node guarding time.

Cause	Troubleshooting	Solution
The slave reaches the time configured by the consumer or the node guarding time.	Check whether the heartbeat frame cycle of the host controller is normal by frame grab.	Check whether all CAN nodes are online, or check the CANopen configuration, reset the node or communication.

- ED05.0: CANopen communication initialized
  Description:

  After the motor is enabled, errors such as slave offline, heartbeat abnormal, load ratio too high, data frame loss, and false master reset occurred when NMT changes to the initialization state.

Cause	Troubleshooting	Solution
After the motor is enabled, errors such as slave offline, heartbeat abnormal, load ratio too high, data frame loss, and false master reset occurred when NMT changes to the initialization state.	Check whether the reset frame is received during operation by capturing frames.	Reset the NMT node. When changing the NMT, disable the output stage. Use shielded cables to prevent interference. Ground the servo drive properly. Ensure the load rate is proper. If asynchronous transmission is configured, ensure the suppression time is set properly. Ensure no false reset frame is triggered by the host controller. Ensure the termination resistor is installed.

- ED08.0: CANopen bus PDO transmission length error
  Description:

  The length of the content transmitted by PDO is inconsistent with the configured mapping length.

Cause	Troubleshooting	Solution
The length of the content transmitted by PDO is inconsistent with the configured mapping length.	Check whether the PDO transmission length is consistent with the configuration by capturing frames.	Re-configure the PDO and reset the node or communication.

- ED11.0: CANopen sync period error too large
  Description:

  The SYNC period error exceeds the setpoint

Cause	Troubleshooting	Solution
The SYNC period error exceeds the setpoint	Collect the synchronization signal using the software tool and calculate whether the cycle is higher than the fault threshold.	Check the settings of 60C2.01h and 60C2.02h and ensure the synchronization period is set properly. Ensure the synchronization period of the host controller is set correctly and consistent with the setting of 60C2h. Check the wiring between the slave and the master.

- EE09.0: Software position limit setting error

Description:

The lower limit of the software limit is equal to or larger than the upper limit.

Cause	Troubleshooting	Solution
The lower limit of the software position limit is equal to or larger than the upper limit.	Check the values of 607D.01h and 607D.02h.	Reset the values and ensure the former is smaller than the latter.

- EE09.1: Home setting error
  Description:

  The home offset exceeds the upper/lower limit.

Cause	Troubleshooting	Solution
1. The home offset is beyond the software limits, which are H0A.41 and H0A.43 (607C and 607D).	The home offset is outside the software position limit when the encoder works in the incremental mode, absolute linear mode, and single-turn absolute mode.	Set the home offset to a value within the software position limit.
2. The home offset is beyond the upper/lower limit in the rotation mode.	The home offset is outside the mechanical single-turn upper/lower limit when the encoder works in the rotation mode.	Set the home offset to a value within the mechanical single-turn upper/lower limit.

- EE09.2: Gear ratio beyond the limit
  Description:

  The electronic gear ratio exceeds the limit: (0.001, 4000 x Encoder resolution/ 10000).

Cause	Troubleshooting	Solution
The set electronic gear ratio exceeds the preceding range.	The gear ratio 6091.01h/ 6091.02h exceeds the preceding range.	Set the gear ratio within the required range.

- EEE0.0: gantry paired axis error
  Description:

  Gantry paired axis error

Cause	Troubleshooting	Solution
Gantry paired axis error	Check whether the gantry paired axis.	Eliminate the fault.

28.3.3.2 Internal Faults

When any one of the following fault occurs, contact Inovance for technical support.

- E111.0: Internal parameter error
- E602.0: Angle auto-tuning failure
- E220.0: Phase sequence incorrect
- EA40.0: Parameter auto-tuning failure

28.3.4 Description of Alarm Codes

- E108.0: Parameter write error
  Cause:

  Parameter values cannot be written to EEPROM.

Cause	Troubleshooting	Solution
An error occurs during parameter-writing.	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- E108.1: Parameter read error
  Cause:

  Parameter values cannot be read from EEPROM.

Cause	Troubleshooting	Solution
The parameter-read operation is abnormal, and the system indicates an EEPROM read failure.	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- E108.2: EEPROM write check error
  Cause:

  The check on the data written in EEPROM failed.

Cause	Troubleshooting	Solution
An error occurs during parameter-writing.	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- E108.3: EEPROM read check error
  Cause:

  The check on the data read in EEPROM failed.

Cause	Troubleshooting	Solution
An error occurs during parameter-reading.	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- E108.4: Single data stored too many times
  Cause:

  Single data is stored too frequently.

Cause	Troubleshooting	Solution
That may damage EEPROM over time.	Check H0b.90 and H0b.91. H0b.90 shows the parameter in question or object dictionaries (in hexadecimal). If H0b.91=15, H0b.90 shows internal variables of software. Check "Func Test 1" through the oscilloscope channel. Be sure to display it in hexadecimal. This channel displays the address that EEPROM is storing. Check the storage count through the oscilloscope channel "Func Test 2".	If the alarm is caused by manually modifying a certain parameter or object dictionary, there will be no frequent storage of a certain data during operation, and you can reset the fault. Check the abnormal parameter through H0b. 90 or oscilloscope channel, and find out the cause. For example, if the host controller program frequently writes parameters through SDO, you can modify the program to stop it or set H0E.01 to 0 (Do not access EEPROM when writing parameters or object dictionaries).

- E110.0: Frequency-division pulse output setting error
  Cause:

  The frequency-division output setpoint (H05.17) exceeds the encoder resolution.

Cause	Troubleshooting	Solution
The number of frequency divisions (quadrupled) exceeds the motor revolutions	Check the setpoint of H05.17.	Adjust the value of H05.17 on the basis of the motor revolutions.

- E120.3: The motor and drive do not match in the power
  Cause:

  the motor and drive do not match in the rated power.

Cause	Troubleshooting	Solution
The rated current/voltage of the motor is higher than that of the drive.	Check whether the rated motor current/voltage is larger than that of the drive.	Replace the motor or drive.

- E121.0: Invalid S-ON command
  Cause:

  A redundant S-ON signal is sent when some auxiliary functions are used.

Cause	Troubleshooting	Solution
The external S-ON signal is active when servo drive is enabled internally.	Check whether the following auxiliary functions are used: Check whether DI functions (H0d.02, H0d.03, and H0d.12) are used and whether FunIN.1 (S-ON signal) is active.	Deactivate the DI assigned with FunIN.1 (both hardware DI and virtual DI).

- E126.3: PR process segment write parameter out of limit
  Cause:

  PR process segment write parameter out of limit.

Cause	Troubleshooting	Solution
In the process segment mode, the written value exceeds the upper limit of the parameter.	Check the upper and lower limits of the parameter.	In the process segment mode, the written value exceeds the upper limit of the parameter.

- E510.0: Frequency division output overspeed
  Cause:

  The output pulse frequency exceeds the frequency upper limit allowed by the hardware (4 MHz) when pulse output is used (H05.38 = 0 or 1 or 2).

Cause	Troubleshooting	Solution
The MCU detects excessive pulse increment fed back by FPGA.	When H05.38 is set to 0 (Encoder frequency-division output), check whether the output pulse frequency corresponding to the motor speed upon fault exceeds the limit. Output pulse frequency (Hz) = Motor speed (rpm)/60 x H05.17.	Decrease the value of H05.17 (encoder frequency-division pulses) to allow the output pulse frequency, within the speed range required by the machine, to drop below the frequency upper limit allowed by the hardware.

Cause	Troubleshooting	Solution
	The input pulse frequency exceeds 2 MHz or interference exists in the pulse input pins when H05.38 is set to 1 (Reference pulse synchronous output). • High-speed pulse input pins:open-collector input terminals: PULLHI, PULSE+, PULSE-, SIGN+, SIGN-; single-phase maximum pulse frequency: 200 kHz. • High-speed pulse input pins: differential input terminals: HPULSE+, HPULSE-, HSIGN+, HSIGN-; maximum single-phase pulse frequency: 4 MHz.	Decrease the input pulse frequency to a value within the frequency upper limit allowed by hardware. **Note:** In this case, if you do not modify the electronic gear ratio, the motor speed will decrease. If the input pulse frequency is high but is still within the frequency upper limit allowed by the hardware, take anti-interference measures (use STP cable for pulse input and set pin filter parameter H0A.24 or H0A.30). This is to prevent false alarms caused by interference pulses superimposed to actual pulse references.

- E600.0: Inertia auto-tuning failure
  Cause:

  Vibration cannot be suppressed. You can set notch parameters (H09.12...H09.23) manually to suppress vibration.

  The auto-tuned values fluctuate dramatically. Increase the maximum operating speed, reduce the acceleration/deceleration time, and shorten the stroke of the lead screw during ETune operation.

  Mechanical couplings of the load are loose or eccentric. Rectify the mechanical faults.

  An alarm occurs during auto-tuning and causes interruption. Rectify the fault causes and perform inertia auto-tuning again.

  The vibration cannot be suppressed if the load carries large inertia. In this case, increase the acceleration/deceleration time to ensure the motor current is unsaturated.

  The position following-up is too poor. That is, the maximum speed of the motor is less than the speed setpoint of the inertia auto-tuning. Ensure that the speed setpoint is less than the maximum speed of the motor.

Cause	Troubleshooting	Solution
Continuous vibration occurs during auto-tuning. The auto-tuned values fluctuate dramatically. Mechanical couplings of the load are loose or eccentric. An alarm occurs during auto-tuning and causes interruption. The vibration cannot be suppressed if the load carries a large inertia. In this case, increase the acceleration/deceleration time first to ensure the motor current is unsaturated. The position following-up is too poor. That is, the maximum speed of the motor is less than the speed setpoint of the inertia auto-tuning.	1. Perform internal inspection to check whether the torque jitters upon stop (not FFT). Check whether three times more than the last auto-tuned value for variation less than 2.5 times; 0.5 times more than last auto-tuned value for variation above 5 times.	Rectify the fault and perform inertia auto-tuning again. For vibration that cannot be suppressed, enable vibration suppression. Ensure mechanical couplings are connected securely. During ETune operation, increase the maximum operating speed, reduce the acceleration/deceleration time, and shorten the stroke of the lead screw during ETune operation. Ensure that the speed setpoint is less than the maximum speed of the motor.

- E601.0: Homing alarm
  Cause:

  Homing time exceeds the setpoint.

Cause	Troubleshooting	Solution
1. The home switch is faulty.	There is only high-speed searching but no low-speed searching during homing. After high-speed searching, low-speed searching in the reverse direction applies.	If a hardware DI is used, check whether the corresponding DI function is allocated to a certain DI in group 2003h and check the wiring of this DI. Change the DI logic manually and observe the value of H0B.03 (monitored DI status) to monitor whether the servo drive receives corresponding DI level changes. If the home signal is Z signal but it cannot be found, check the condition of the Z signal.
2. The homing time limit is too short.	Check whether the value of H05.35h (Time limit for homing) is too small.	Increase the value of H05.35.
3. The speed in high-speed searching for the home switch signal is too low.	Check the distance between the start position of homing and the home switch. Then check whether the setpoint of 6099.01h (Speed in high-speed searching for the home switch signal) is too low, resulting in a long homing process.	Increase the value of 6099.01h.

- E601.1: Homing switch error
  Cause:

  The homing switch is set improperly.

Cause	Troubleshooting	Solution
The home switch is set improperly.	Check whether the limit signals at both sides are activated. Check whether the limit signal and the deceleration point signal/home signal are both activated. Check whether the positive and negative position limits are activated successively.	Set the position of the physical switch properly.

- E601.2: Homing mode setting error
  Cause:

  The homing method value is too large.

Cause	Troubleshooting	Solution
The homing method value is too large.	Check the homing method value (object dictionary 6098h).	Change the value of 6098h.

- E601.4: Gantry homing mode setting error
  Cause:

  Gantry homing mode setting error.

Cause	Troubleshooting	Solution
You have set a wrong homing mode for the gantry through H05.31.	Check the setting.	Change the setting.

- E602.9: Angle auto-tuning not done for incremental encoder motor
  Cause:

  Angle auto-tuning is not performed for the incremental encoder motor.

Cause	Troubleshooting	Solution
Angle auto-tuning is not performed for the incremental encoder, and corresponding alarm is enabled.	Check whether bit1 of H32.04 is set.	1. The alarm is automatically reset after the angle auto-tuning is completed. 2. If you do not need this alarm, reset bit1 of H32.04.

- E607.0: Large gantry torque deviation
  Cause:

  Gantry torque deviation is too large.

Cause	Troubleshooting	Solution
Large gantry torque deviation	Gantry torque deviation is too large.	Check the wiring of the gantry.

- E608.0: Master-to-slave parameter setting error
  Cause:

  Master-to-slave parameter setting error.

Cause	Troubleshooting	Solution
Master-to-slave parameter setting error	The parameter value exceeds the limit or the communication between drives is poor.	Check the setpoint of H14.03.

- E609.0: Data save timeout

Cause:

Wire breakage occurred when the software was downloading data.

Cause	Troubleshooting	Solution
Wire breakage occurred when the software was downloading data.	Check that the drive is connected to the software.	Download the data again.

- E609.1: Data save overflow
  Cause:

  Wire breakage occurred when the software was downloading data.

Cause	Troubleshooting	Solution
Wire breakage occurred when the software was downloading data.	Check that the drive is connected to the software.	Download the data again.

- E609.2: Failed to save data
  Cause:

  Failed to save data.

Cause	Troubleshooting	Solution
The FLASH memory chip or the interface between MCU and FLASH failed.	Power on multiple times and download data again.	If the problems persists, replace the drive.

- E609.3: Failed to erase data
  Cause:

  Failed to erase data.

Cause	Troubleshooting	Solution
The FLASH memory chip or the interface between MCU and FLASH failed.	Power on multiple times and download data again.	If the problems persists, replace the drive.

- E621.1: Overload current limiting torque attained
  Cause:

  Overload current limiting torque attained.

Cause	Troubleshooting	Solution
The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque. Acceleration/deceleration is too frequent or the load inertia is too large.	• Confirm the overload characteristics of the servo drive or motor. • Check whether the average load rate (H0b.12) keeps exceeding 100.0%. • Detect whether the value of H32.77 is set too high.	• Replace with a servo drive of higher capacity and a matching servo motor. • Reduce the load and increase the acceleration/deceleration time.

Cause	Troubleshooting	Solution
The motor and encoder cables are connected incorrectly or in poor contact.		
The gain adjustment is improper or the stiffness is too high.		
The motor is stalled due to mechanical factors, resulting in overload during operation.		
The servo drive is faulty.		

- E631.4: P-MOS short circuit
  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, the P-MOS short circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	Replace the servo drive. Turn off the brake switch H02.16.

- E631.5: N-MOS short circuit
  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, the N-MOS short circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	Replace the servo drive. Turn off the brake switch H02.16.

- E730.0: Encoder battery alarm
  Cause:

  The voltage of the absolute encoder battery is lower than 3.0 V.

Cause	Troubleshooting	Solution
The voltage of the absolute encoder battery is lower than 3.0 V.	Measure the battery voltage.	Use a new battery with the matching voltage.

Note

E731.0 and E733.0 can trigger E730.0. See E731.0 and E733.0 for other solutions.

- E730.1: Inovance 2nd encoder battery voltage low
  Cause:

  Inovance 2nd encoder battery voltage is lower than 3.0 V.

Cause	Troubleshooting	Solution
Inovance 2nd encoder battery voltage is too low.	Measure the battery voltage.	Use a new battery with the matching voltage.

- E831.1: AI1 zero offset too large
  Cause:

  The zero drift of AI1 exceeds 500 mV.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI1 input filter time.
2. The servo drive is faulty.	Disconnect AI1 and measure whether the actual terminal voltage exceeds 0.5 V.	If not, replace the servo drive.

- E831.2: AI2 zero offset too large
  Cause:

  The zero drift of AI2 exceeds 500 mV.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI2 input filter time.
2. The servo drive is faulty.	Disconnect AI2 and measure whether the actual terminal voltage exceeds 0.5 V.	If not, replace the servo drive.

- E834.1: AI1 overvoltage
  Cause:

  AI1 input voltage is greater than 11.5 V.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI1 input filter time.
2. The input voltage is too high.	Measure whether the actual terminal voltage exceeds 11.5 V.	Adjust the input voltage to a value lower than 11.5 V.

- E834.2: AI2 overvoltage

Cause:

AI2 input voltage is greater than 11.5 V.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI2 input filter time.
2. The input voltage is too high.	Measure whether the actual terminal voltage exceeds 11.5 V.	Adjust the input voltage to a value lower than 11.5 V.

- E900.0: DI emergency braking
  Cause:

  The logic of the DI terminal (including the hardware DI and virtual DI) allocated with DI function 34 (FunIN.34) is effective.

Cause	Troubleshooting	Solution
The DI function 34 (EmergencyStop) is triggered.	Check whether the logic of the DI allocated with DI function 34 (FunIN.34: Emergency stop) is valid.	Check the operation mode and clear the active DI braking signal without affecting the safety performance.

- E902.0: Invalid DI/VDI setting
  Description:

  DI function parameters are set to invalid values.

Cause	Troubleshooting	Solution
DI/VDI function parameters are set to invalid values.	Check whether DI function configure parameters in H03 and H17 are set to invalid values.	Set DI/VDI function parameters to valid values.

- E902.1: Invalid DO/VDO setting
  Description:

  DO/VDO function parameters are set to invalid values.

Cause	Troubleshooting	Solution
DO or VDO function selections are invalid.	Check whether DO function configure parameters in H04 and H17 are set to invalid values.	Set DO/VDO function parameters to valid values.

- E902.2: Invalid setting for torque reach
  Cause:

  The DO parameters set for torque reach in the torque control mode are invalid.

Cause	Troubleshooting	Solution
The DO parameters set for torque reach in the torque control mode are invalid.	Check whether the value of H07.22 is lower than or equal to the value of H07.23 (unit: 0.1%).	Set H07.22 to a value higher than that of H07.23.

- E909.0: Motor overload alarm
  Cause:

  The accumulative heat of the motor reaches 90% of the fault threshold.

Cause	Troubleshooting	Solution
1. The motor cables and encoder cable are connected improperly or in poor contact.	Check the wiring among the servo drive, servo motor and the encoder according to the correct wiring diagram.	Connect the cables according to the wiring diagram. It is recommended to use the provided cables. When customized cables are used, prepare and connect the customized cables according to the wiring instructions.
2. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque.	Confirm the overload characteristics of the servo drive or motor. Check whether the average load rate (H0b.12) keeps exceeding 100.0%.	Use a servo drive of higher capacity and a matching servo motor. Reduce the load and increase the acceleration/ deceleration time.
3. Acceleration/Deceleration is too frequent or the load inertia is too large.	Check the mechanical inertia ratio or perform inertia auto-tuning. View the value of H08.15 (load moment of inertia ratio). Confirm the individual operation cycle when the servo motor operates cyclically.	Increase the acceleration/ deceleration time.
4. Gains are improper or the stiffness level is too high.	Check whether the motor vibrates and generates unusual noise during operation.	Readjust the gain.
5. The servo drive model or motor model is set improperly.	View the model of the motor equipped with a serial-type encoder in H00.05 and the servo drive model in H01.10.	Read the servo drive nameplate and set the servo drive model (H01.10) and motor model properly.

Cause	Troubleshooting	Solution
6. The motor is stalled due to mechanical factors, resulting in overload during operation.	Check the running reference and motor speed (H0b.00) through drive commissioning software or keypad: • References in the position control mode: H0b.13 (Input position reference counter) • References in the speed control mode: H0b.01 (Speed reference) • References in the torque control mode: H0b.02 (Internal torque reference) Check whether the reference value is not 0 or is very large but the motor speed is 0 RPM in the corresponding mode.	Rectify the mechanical-related problem.
7. The servo drive is faulty.	Power off and on the servo drive.	Replace the servo drive.

- E910.0: Control circuit overvoltage
  Cause:

  The voltage of the control circuit exceeds the overvoltage threshold.

Cause	Troubleshooting	Solution
Overvoltage occurred on the control circuit of the drive.	Measure whether the input voltage in the control circuit cable is within the following range: 220 V servo drive: Value range: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V) 380 V servo drive: Value range: 380 V to 440 V Allowable deviation: –10% to +10% (342 V to 484 V) Check whether control circuit cables are connected properly and whether the voltage of control circuit cables (L1C, L2C) is within the specified range.	Re-connect or replace the cables.

- E920.0: Braking resistor overload
  Cause:

The accumulative heat of the braking resistor exceeds the set value.

Cause	Troubleshooting	Solution
1. The external braking resistor is connected improperly or disconnected.	Remove the external braking resistor and measure whether its resistance is "∞" (infinite). Measure whether the resistance between terminals P⊕ and C is "∞" (infinite).	Replace with a new external braking resistor. If the resistance measured is the same as the nominal value, connect the external braking resistor between terminals P ⊕ and C.
		Connect the external braking resistor between terminals P ⊕ and C with a proper cable.
2. The jumper between terminals P ⊕ and D is shorted or disconnected when the built-in braking resistor is used.	Measure whether resistance between P ⊕ and D is "∞" (infinite).	Ensure terminals P ⊕ and D are jumpered.
3. H02.25 (Braking resistor type) is set improperly when an external braking resistor is used.	• Check the setpoint of H02.25. • Check whether the resistance of the external braking resistor connected between P ⊕ and C is too large by comparing it with the value listed in Table "Specifications of the braking resistor". • Check whether the value of H02.27 is larger than the resistance of the external braking resistor between terminals P ⊕ and C.	Set H02.25 correctly. H02.25 = 1 (external, naturally ventilated) H02.25 = 2 (external, forced-air cooling)
4. The resistance of the external braking resistor is too large.		Select a braking resistor with suitable resistance.
5. The setpoint of H02.27 (Resistance of external braking resistor) is higher than the resistance of the external braking resistor used.		Set H02.27 according to the resistance of the external braking resistor used.
6. The input voltage of the main circuit is beyond the specified range.	Check whether the input voltage of the main circuit cable on the drive side is within the following range: • 220 V servo drive:Value range: 220 V to 240 VAllowable deviation: –10% to +10% (198 V to 264 V) • 380 V servo drive:Value range: 380 V to 440 VAllowable deviation: –10% to +10% (342 V to 484 V)	Replace or adjust the power supply according to the specified range.

Cause	Troubleshooting	Solution
7. The load moment of inertia ratio is too large.	Perform moment of inertia auto-tuning according to section "Inertia auto-tuning" in SV680N Series Servo Drive Function Guide or calculate the total mechanical inertia based on mechanical parameters. Check whether the actual load inertia ratio exceeds 30.	• Select an external braking resistor with large capacity and set H02.26 to a value consistent with the actual power. • Select a larger servo drive. • Reduce the load if allowed. • Increase the acceleration/ deceleration time if allowed. • Increase the motor operation cycle if allowed.
8. The motor speed is excessively high and deceleration is not done within the set time. The motor is in the continuous deceleration status during cyclic operation.	View the motor speed curve in cycle running and check whether the motor is in deceleration status for a long period.	
9. The capacity of the servo drive or the braking resistor is insufficient.	View the motor's single cycle speed curve and calculate whether maximum braking energy can be absorbed completely.	
10. The servo drive is faulty.	-	Replace the servo drive.

- E921.0: Dynamic brake resistor overload alarm
  Cause:

  The dynamic braking resistor is close to overload.

Cause	Troubleshooting	Solution
The accumulative heat of the dynamic braking resistor is close to the maximum thermal capacity of the resistor.	Check whether the value of H0b.98 exceeds 70%.	Ensure that the motor cannot be driven reversely in the dynamic braking state.

- E922.0: Resistance of the external braking resistor too small
  Cause:

  The value of H02.27 (resistance of external braking resistor) is lower than the value of H02.21 (permissible min. resistance of external braking resistor).

Cause	Troubleshooting	Solution
When an external braking resistor is used (H02.25 = 1 or 2), the resistance of this resistor is lower than the minimum resistance allowed by the servo drive.	Measure whether the resistance of the external braking resistor between terminals P ⊕ and C is lower than the value of H02.21 (Permissible minimum resistance of braking resistor).	• If yes, replace with an external braking resistor that matches the drive, set H02.27 to a value consistent with the resistance of this resistor, and connect this resistor between terminals P ⊕ and C. • If not, set H02.27 to a value consistent with the resistance of the external braking resistor used.

- E924.0: Regenerative transistor overtemperature
  Cause:

  The estimated temperature of the regenerative transistor is higher than H0A.49 (discharge overtemperature threshold).

Cause	Troubleshooting	Solution
1. The junction temperature of the regenerative transistor is too high. 2. The regenerative transistor will be turned off automatically after overload occurs.	The regenerative transistor temperature exceeds the threshold defined by H0A.49.	Control the number of times the discharge conduit is activated by, for example, increasing acceleration/ deceleration time, reducing gain, and using a drive with higher specifications.

- E940.0: Change of controlled motor is detected. It is recommended to restore factory settings before use
  Cause:

  Change of controlled motor is detected. It is recommended to restore factory settings before use

Cause	Troubleshooting	Solution
It is detected that the control type of the controlled motor has changed (for example, changing from rotary servo motor control to linear motor control). To ensure the normal functions and thresholds of the drive, it is recommended to restore the factory settings before use. The alarm is raised only once.	Check whether the value of H00.00 is changed.	It is recommended to restore the factory settings before use when any change is made in the controlled motor. If the fault remains, you can maintain the original parameter settings.

- E941.0: Parameter modifications activated at next power-on
  Cause:

  When the parameter effective mode of the drive is set to "Re-power-on", after the parameter value is changed, the servo drive prompts the user to power on again.

Cause	Troubleshooting	Solution
The parameters modified are those whose "Effective time" is "Next power-on".	Check whether parameters you modified are those whose "Effective Time" is "Next power-on".	Power off and on the servo drive again.

- E942.0: Parameter saved frequently
  Cause:

  The number of parameters modified at a time exceeds 700.

Cause	Troubleshooting	Solution
Too many parameters are modified and saved to EEPROM at a brief interval.	Check whether parameters are modified through the host controller at a brief interval.	Check the operation mode. For parameters that need not be saved to EEPROM, set H0E.01 to the correct value before the host controller perform write operation.

- E950.0: Forward overtravel alarm
  Cause:

  The logic of the DI allocated with FunIN.14: P-OT (positive limit switch) is valid.

Cause	Troubleshooting	Solution
1. The logic of the DI assigned with FunIN.14 (P-OT function 14, positive limit switch) is effective.	• Check whether a certain DI in group H03 is assigned with FunIN.14. • Check whether the logic of DI corresponding to the bit of H0b.03 (Monitored DI status) is effective.	Check the running mode. On the prerequisite of safety, send a reverse command or rotate the motor to deactivate the logic of the DI terminal allocated with DI function 14.
2. The servo position feedback reaches the positive software position limit.	Check whether the position feedback (H0b.17) is close to the value of H0A.41. Check whether the software position limit is set in H0A.40.	Ensure the servo drive references are proper, allowing the load travel range to be within the software position limit.

- E952.0: Reverse overtravel alarm
  Cause:

  The logic of the DI allocated with FunIN.15: N-OT (negative limit switch) is valid.

Cause	Troubleshooting	Solution
1. The logic of the DI assigned with FunIN.15 is effective.	• Check whether a certain DI in group H03 is assigned with FunIN.15. • Check whether the logic of DI corresponding to the bit of H0b.03 (Monitored DI status) is effective.	Check the operation mode. On the prerequisite of ensuring safety, send a forward run command or rotate the motor to deactivate the logic of DI assigned with FunIN.15.
2. The servo position feedback reaches the negative software position limit.	Check whether the position feedback (H0b.17) is close to the value of H0A.43. Check whether the software position limit is set in H0A.40.	Ensure the servo drive references are proper, allowing the load travel range to be within the software position limit.

- E954.0: Position command overflow
  Cause:

  Position reference overflow.

Cause	Troubleshooting	Solution
in PR mode, the position command is beyond the limit.	1. Check the position command. 2. Check the limit value.	Change the value of the position command and the limit.

- E956.0: Forward position reference overtravel in process segment position mode
  Cause:

  Forward position reference overtravel occurs in the process segment position mode.

Cause	Troubleshooting	Solution
Forward position reference overtravel occurs in the process segment position mode.	E956.0 occurs when the position reference exceeds the value of H22.04 when the motor runs forwardly in the process segment position mode.	Reduce the position reference to a value lower than the setpoint of H22.04.

- E958.0: Reverse position reference overtravel in process segment position mode
  Cause:

  Reverse direction position reference overtravel occurs in the process segment position mode.

Cause	Troubleshooting	Solution
Reverse direction position reference overtravel occurs in the process segment position mode.	E958.0 occurs when the position reference is less than the value of H22.06 when the motor runs reversely in the process segment position mode.	Increase the position reference to a value greater than the setpoint of H22.06.

- E971.0: Undervoltage alarm for voltage drop protection
  Cause:

  The bus voltage is lower than the undervoltage threshold.

  This alarm can be masked by setting bit1 of H0A.88 to 1.

Cause	Troubleshooting	Solution
The bus voltage is lower than the undervoltage threshold.	Check the bus voltage. This alarm can be masked by setting bit1 of H0A.88 to 1.	Check the power supply.

- E980.0: Frequency division output overflow
  Cause:

  Frequency division output overflow.

Cause	Troubleshooting	Solution
The frequency division output is too large. Calculation overflows.	Check if an E510.0 alarm has occurred and set H05.17 to a proper value so that E510.0 disappears.	Set H05.17 to a proper value or reduce the maximum operating speed.

- E990.0: Pulse input overspeed alarm
  Cause:

  Pulse input overspeed alarm.

Cause	Troubleshooting	Solution
The pulse position command input exceeds the maximum rotational speed for a period exceeding the time threshold of large pulse position command increment.	Check if the input pulse frequency is too high.	Reduce the frequency below 4M.

- E991.0: SIGN pulse connection error
  Cause:

  If 24V is connected to SIGN+, 0V is connected to SIGN-, and the current limiting resistor is not connected, that will lead to large current between SIGN+ and SIGN-, which generates large voltage on the measuring resistor, triggering an alarm.

Cause	Troubleshooting	Solution
Pulse SIGN input voltage is too high.	Check wiring of SIGN+ and SIGN-. There must be a current limiting resistor. Check if the 24V power supply voltage exceeds the specified value. Measure if the voltage between SIGN+ and SIGN- exceeds or is close to 24V.	Check wiring of SIGN+ and SIGN-. There must be a current limiting resistor. Check the power supply voltage for SIGN+ and SIGN-. If the voltage is too high, use a power supply within 24V.

- EA34.9: Hall is not configured
  Cause:

  Hall is not configured.

Cause	Troubleshooting	Solution
H00.26 is configured when dynamic Hall auto-tuning is enabled.	When H0A.13 = 6, check whether bit3 of H00.26 is set to 1. For a non-Hall sensor (bit3 of H00.26 is set to 0), check whether H0A.13 is set to 6 incorrectly.	For a Hall-enabled motor, you need to perform Hall auto-tuning (H0A.13=6) and set bit3 of H00.26 to 1. For a non-Hall motor, Hall auto-tuning is unavailable (H0A.13 cannot be set to 6).

- EA41.0: Torque ripple compensation failure
  Cause:

  Torque ripple compensation failure.

Cause	Troubleshooting	Solution
Auto-tuning torque fluctuation compensation failure	Check whether homing is not performed during cogging torque ripple auto-tuning of the incremental encoder. Confirm whether emergency stop or external fault interruption occurs during cogging torque ripple auto-tuning. Torque ripple compensation auto-tuning failed. Please try again.	Perform homing during cogging torque ripple auto-tuning of the incremental encoder. Avoid emergency stop or external fault interruption during cogging torque ripple auto-tuning. Torque ripple compensation auto-tuning failed. Please try again.

- E08.7: Error frame pre-warning
  Cause:

  Check the increment of the 0x300 register every certain time (determined by H16.44). When the increment reaches the threshold defined by H16.43 (error frame pre-warning switch/threshold), the keypad displays E08.7 and H30.30 (error frame

pre-warning count) + 1. If the incremental value is not greater than the set threshold in ten consecutive interval (defined in H16.44). the error frame pre-warning is cleared.

Related parameters:

1. H16.43 - error frame pre-warning switch/threshold

   0: Disabled; 1, 2, 3...: Enabled. The value is 1, 2, 3 ...; The default value is 4.
2. H16.44: error frame pre-warning sampling interval (in ms, default: 1000)
3. H30.30: error frame pre-warning count (increased by 1 per trigger)

Cause	Troubleshooting	Solution
Interference or poor IN port cable.	Replace the IN port cable of the alarm device and install a magnetic ring. Check whether the alarm persists.	Replace the IN cable of the alarm device and install a magnetic ring.

Note:

1. If you do not want the host controller to know the warning, set bit10 of H0C.72 to 1.
2. If there is interference and the error frame warning threshold is too small, all devices may display an error frame warning.
3. Check the error frame warning mode:

   a. Check H30.30 on the keypad.
   b. View H30-30 through SDO on the PLC software.

28.4 Handling of Faults and Alarms [Standard N]

28.4.1 List of Fault Codes

No. 1 non-resettable faults:

Table 28–5 List of No. 1 non-resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
E101	E101.0	Abnormal parameters in groups H02 and above	No.1	No	0x6320	0x01010101
	E101.1	Parameter error in group H00/H01	No.1	No	0x6320	0x11010101
	E101.2	Address error in read/ write operation after the number of parameters changes	No.1	No	0x6320	0x21010101

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
	E101.9	Parameter attribute initialization check error	No.1	No	0x6320	0x91010101
E102	E102.0	FPGA communication initialization error	No.1	No	0x7500	0x01020102
	E102.1	FPGA initialization not completed	No.1	No	0x7500	0x11020102
	E102.8	FPGA and MCU software version mismatch	No.1	No	0x7500	0x81020102
E104	E104.1	MCU running timeout (MCU break down)	No.1	No	0x7500	0x11040104
	E104.2	FPGA running timeout (FPGA break down)	No.1	No	0x7500	0x21040104
	E104.4	MCU command update timeout	No.1	No	0x7500	0x41040104
E120	E120.0	Unknown encoder model	No.1	No	0x7122	0x01200120
	E120.1	Unknown motor model	No.1	No	0x7122	0x11200120
	E120.2	Unknown drive model	No.1	No	0x7122	0x21200120
	E120.5	Motor and drive current mismatch	No.1	No	0x7122	0x51200120
	E120.6	FPGA and motor model mismatch	No.1	No	0x7122	0x61200120
	E120.7	Model check error	No.1	No	0x0120	0x71200120
	E120.8	Junction temperature parameter check error	No.1	No	0x0120	0x81200120
E136	E136.0	Encoder ROM motor parameter check error	No.1	No	0x7305	0x01360136
	E136.1	Encoder ROM motor parameter read error	No.1	No	0x7305	0x11360136
	E136.9	Dimension parameter Initialization error	No.1	No	0x7305	0x91360136
E138	E138.0	Accuracy compensation data error	No.1	No	0x0138	0x01380138
	E138.1	Cogging ripple compensation data check failure	No.1	No	0x0138	0x11380138
	E138.2	Gantry sync compensation data check failure	No.1	No	0x0138	0x21380138
	E138.3	Overload compensation data check failure	No.1	No	0x0138	0x31380138
E140	E140.0	Encryption chip check fault	No.1	No	0x0140	0x01400140
	E140.2	Wrong encryption chip version	No.1	No	0x0140	0x21400140
	E140.3	Encrypted chip damaged	No.1	No	0x0140	0x31400140

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
E201	E201.0	Phase-P overcurrent	No.1	No	0x2312	0x02010201
	E201.1	Phase-U overcurrent	No.1	No	0x2312	0x12010201
	E201.2	Phase-V overcurrent	No.1	No	0x2312	0x22010201
	E201.4	Phase-N overcurrent	No.1	No	0x2312	0x42010201
E210	E210.0	Output short-circuited to ground	No.1	No	0x2330	0x02100210
E234	E234.0	Runaway (protection scheme 1)	No.1	No	0x0234	0x02340234
	E234.1	Runaway (protection scheme 2)	No.1	No	0x0234	0x12340234
E308	E308.0	Pulse encoder phase A wire breakage	No.1	No	0x0308	0x03080308
	E308.1	Pulse encoder phase B wire breakage	No.1	No	0x0308	0x13080308
	E308.2	Pulse encoder phase Z wire breakage	No.1	No	0x0308	0x23080308
E603	E603.0	Gantry communication check failure	No.1	No	0x0603	0x06030603
	E603.1	Gantry communication timeout	No.1	No	0x0603	0x16030603
	E603.2	Drive failed to establish communication for a long time	No.1	No	0x0603	0x26030603
E606	E606.0	Gantry torque alignment timeout	No.1	No	0x0606	0x06060606
E619	E619.0	Absolute accuracy compensation parameter setting error	No.1	No	0x0619	0x06190619
	E619.1	Absolute accuracy compensation overflow	No.1	No	0x0619	0x16190619
E720	E720.0	Wrong encoder interface	No.1	No	0x0720	0x07200720
E740	E740.0	Absolute encoder communication timeout	No.1	No	0x7305	0x07400740
	E740.2	Absolute encoder error	No.1	No	0x7305	0x27400740
	E740.3	Absolute encoder single-turn calculation error	No.1	No	0x7305	0x37400740
	E740.6	Encoder write error	No.1	No	0x7305	0x67400740
	E740.8	BISSC register communication failure	No.1	No	0x7305	0x87400740
	E740.9	Encoder data transmit delay too long	No.1	No	0x7305	0x97400740
E755	E755.0	Nikon encoder communication fault	No.1	No	0x0FFF	0x07550755
E765	E765.0	Nikon encoder over-temperature or overspeed	No.1	No	0x0765	0x07650765

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
E770	E770.6	Fully closed-loop 2nd encoder initialization communication error	No.1	No	0x7305	0x67700770
	E770.7	Fully closed-loop Inovance 2nd encoder communication error	No.1	No	0x7305	0x77700770
E771	E771.0	Communication handshake failed between the interpolator and drive	No.1	No	0x0771	0x07710771
EA33	EA33.0	Encoder read/write check error	No.1	No	0x7305	0x0A330A33
	EA33.1	Fully closed-loop Inovance 2nd encoder data read/write error	No.1	No	0x7305	0X1A330A33
EA34	EA34.0	Abnormal Hall state	No.1	No	0x0A34	0x0A340A34
	EA34.1	Dynamic Hall auto-tuning error	No.1	No	0x0A34	0x1A340A34
	EA34.2	Static Hall auto-tuning error	No.1	No	0x0A34	0x2A340A34
EE12	EE12.0	EtherCAT initialization failure	No.1	No	0x0E12	0x0E120E12
EE16	EE16.0	MCU and ESC communication error	No.1	No	0x0E16	0xEE160E16
EEE0	EEE0.0	Gantry paired axis error	No.1	No	0x0EE0	0x0EE00EE0

No. 1 resettable faults:

Table 28–6 List of No. 1 resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
E126	E126.0	Process segment number error	No.1	Yes	0x0126	0x01260126
	E126.1	Internal operation mode error of the process segment	No.1	Yes	0x0126	0x11260126
	E126.2	Position reference type error in process segment position mode	No.1	Yes	0x0126	0x21260126
E150	E150.0	STO safety state applied	No.1	Yes	0x0150	0x01500150
	E150.1	STO input state abnormal	No.1	Yes	0x0150	0x11500150
	E150.2	Buffer 5 V supply error	No.1	Yes	0x0150	0x21500150
	E150.3	STO input circuit hardware diagnosis failure	No.1	Yes	0x0150	0x31500150
	E150.4	PWM Buffer hardware diagnosis failure	No.1	Yes	0x0150	0x41500150

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
	E150.5	STO input signal interference	No.1	Yes	0x0150	0x51500150
E208	E208.2	Encoder communication timeout	No.1	Yes	0x0208	0x22080208
	E208.4	FPGA current loop operation timeout	No.1	Yes	0x0208	0x42080208
E320	E320.0	Braking resistor overload	No.1	Yes	0x0320	0x03200320
	E320.1	External braking resistor surface temperature too high	No.1	Yes	0x0320	0x13200320
E321	E321.0	Dynamic brake resistor overload	No.1	Yes	0x0321	0x03210321
E400	E400.0	Main circuit overvoltage	No.1	Yes	0x3210	0x04000400
E410	E410.0	Main circuit undervoltage	No.1	Yes	0x3220	0x04100410
	E410.1	Main circuit de-energized	No.1	Yes	0x0410	0x14100410
E500	E500.0	Motor overspeed	No.1	Yes	0x8400	0x05000500
	E500.1	Speed feedback overflow	No.1	Yes	0x8400	0x15000500
	E500.2	FPGA position feedback pulse overspeed	No.1	Yes	0x0500	0x25000500
E602	E602.0	Angle auto-tuning failure	No.1	Yes	0x0602	0x06020602
	E602.1	Angle auto-tuning overtravel	No.1	Yes	0x0602	0x16020602
	E602.2	U/V/W phase sequence reversed	No.1	Yes	0x0602	0x26020602
	E602.3	Large encoder jitter during angle auto-tuning	No.1	Yes	0x0602	0x36020602
	E602.4	Auto-tuning failed. Auto-tuning timeout.	No.1	Yes	0x0602	0x46020602
	E602.5	Angle auto-tuning failed. Z signal not found.	No.1	Yes	0x0602	0x56020602
	E602.6	Angle auto-tuning does not converge	No.1	Yes	0x0602	0x66020602
E604	E604.0	Inconsistent settings of two gantry axes	No.1	Yes	0x0604	0x06040604
	E604.1	Gantry not set to position mode	No.1	Yes	0x0604	0x16040604
	E604.2	Gantry is running on an unsupported feature	No.1	Yes	0x0604	0x26040604
E605	E605.0	Speed too fast upon S-ON	No.1	Yes	0x0605	0x06050605
E612	E612.0	Rotor locked during phase sequence auto-tuning	No.1	Yes	0x0612	0x06120612
	E612.1	Overtravel occurred during phase sequence auto-tuning	No.1	Yes	0x0612	0x16120612

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
	E612.3	Large encoder jitter during phase sequence auto-tuning	No.1	Yes	0x0612	0x36120612
	E612.4	Phase sequence auto-tuning failed. Auto-tuning timeout.	No.1	Yes	0x0612	0x46120612
E620	E620.0	Motor overload	No.1	Yes	0x3230	0x06200620
	E620.1	Overload current limit mode, motor overloaded	No.1	Yes	0x3230	0x16200620
E621	E621.0	Overload current limiting torque attained	No.1	Yes	0x0621	0x06210621
E630	E630.0	Motor stall over-temperature protection	No.1	Yes	0x7121	0x06300630
E631	E631.1	24 V power supply or brake not connected	No.1	Yes	0x0631	0x16310631
	E631.2	P-MOS open circuit	No.1	Yes	0x0631	0x26310631
	E631.3	N-MOS disconnection	No.1	Yes	0x0631	0x36310631
E640	E640.0	High IGBT junction overtemperature	No.1	Yes	0x4210	0x06400640
	E640.1	Flywheel diode overtemperature	No.1	Yes	0x0640	0x16400640
E650	E650.0	Heatsink overtemperature	No.1	Yes	0x4210	0x06500650
E660	E660.0	Motor overtemperature	No.1	Yes	0x4210	0x06600660
E770	E770.0	Fully-closed loop input phase A wire breakage	No.1	Yes	0x7305	0x07700770
	E770.1	Fully-closed loop input phase B wire breakage	No.1	Yes	0x7305	0x17700770
	E770.2	Fully-closed loop input phase Z wire breakage	No.1	Yes	0x7305	0x27700770
	E770.3	Fully closed-loop external loop encoder communication timeout.	No.1	Yes	0x7305	0x37700770
	E770.8	Full closed-loop encoder data transmit delay is too large	No.1	Yes	0x7305	0x87700770
E939	E939.0	Motor power cables disconnected	No.1	Yes	0x0939	0x09390939
EB00	EB00.0	Excessive position deviation	No.1	Yes	0x8611	0x0B000B00

No. 2 resettable faults

Table 28–7 List of No. 2 resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
E122	E122.0	Multi-turn absolute encoder setting error	No.2	Yes	0x6320	0x01220122
	E122.1	Different DIs allocated with the same function	No.2	Yes	0x6320	0x11220122
	E122.2	DO function allocation error	No.2	Yes	0x0122	0x21220122
	E122.3	Upper limit in the rotation mode too high	No.2	Yes	0x6320	0x31220122
	E122.4	VDI function allocation error	No.2	Yes	0x0122	0x41220122
	E122.5	DI and VDI assigned with the same function	No.2	Yes	0x0122	0x51220122
	E122.6	Absolute function setting fault of 2nd encoder	No.2	Yes	0x6320	0x61220122
	E122.7	Fully closed-loop parameter setting error	No.2	Yes	0x6320	0x71220122
	E122.8	Interpolator version mismatch	No.2	Yes	0x6320	0x81220122
E420	E420.0	Main circuit phase loss	No.2	Yes	0x3130	0x04200420
E661	E661.0	STune failure	No.2	Yes	0x4210	0x06610661
E662	E662.0	ETune failure	No.2	Yes	0x0662	0x06620662
E664	E664.0	Resonance too strong	No.2	Yes	0x0664	0x06640664
E731	E731.0	Encoder multi-turn data lost	No.2	Yes	0x7305	0x07310731
	E731.1	Inovance second encoder multi-turn data lost	No.2	Yes	0x7305	0x17310731
E733	E733.0	Encoder multi-turn counting error	No.2	Yes	0x7305	0x07330733
	E733.1	Inovance 2nd encoder multi-turn counting error	No.2	Yes	0x7305	0x17330733
E735	E735.0	Encoder multi-turn counting overflow	No.2	Yes	0x7305	0x07350735
E760	E760.0	Encoder over-temperature	No.2	Yes	0x4210	0x07600760
EB00	EB00.1	Position deviation overflow	No.2	Yes	0x8611	0x1B000B00
EB01	EB01.1	Individual position reference increment too large	No.2	Yes	0x6320	0x1B010B01
	EB01.2	Position reference increment too large continuously	No.2	Yes	0x6320	0x2B010B01

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
	EB01.3	Reference overflow	No.2	Yes	0x6320	0x3B010B01
EB02	EB02.0	Position deviation too large in fully closed-loop mode	No.2	Yes	0x8611	0x0B020B02
	EB02.1	Fully closed-loop position deviation overflow	No.2	Yes	0x8611	0x1B020B02
EB03	EB03.0	Electronic gear ratio beyond the limit - H05.02	No.2	Yes	0x0B03	0x0B030B03
	EB03.1	Electronic gear ratio beyond the limit - Electronic gear ratio 1	No.2	Yes	0x0B03	0x1B030B03
	EB03.2	Electronic gear ratio beyond the limit -Electronic gear ratio 2	No.2	Yes	0x0B03	0x2B030B03
EB04	EB04.0	Large gantry position deviation	No.2	Yes	0x0B04	0x0B040B04
	EB04.1	Gantry position deviation overrun	No.2	Yes	0x0B04	0x1B040B04
ED02	ED02.0	Modbus communication timeout	No.2	Yes	0x0D02	0x0D020D02
EE08	EE08.0	Synchronization signal loss	No.2	Yes	0x0E08	0x0E080E08
	EE08.1	Status switchover error	No.2	Yes	0x0E08	0x1E080E08
	EE08.3	Network cable connected improperly	No.2	Yes	0x0E08	0x3E080E08
	EE08.4	Data frame loss protection error	No.2	Yes	0x0E08	0x4E080E08
	EE08.5	Data frame transfer error	No.2	Yes	0x0E08	0x5E080E08
	EE08.6	Data update timeout	No.2	Yes	0x0E08	0x6E080E08
EE09	EE09.0	Software position limit setting error	No.2	Yes	0x6320	0x0E090E09
	EE09.1	Home setting error	No.2	Yes	0x6320	0x1E090E09
	EE09.2	Gear ratio beyond the limit	No.2	Yes	0x6320	0x2E090E09
	EE09.3	No synchronization signal	No.2	Yes	0x6320	0x3E090E09
	EE09.5	PDO mapping beyond the limit	No.2	Yes	0x6320	0x5E090E09
EE10	EE10.0	Protection against MailBox setting error	No.2	Yes	0x0E10	0x0E100E10
	EE10.1	SM2 setting error	No.2	Yes	0x0E10	0x1E100E10
	EE10.2	SM3 setting error	No.2	Yes	0x0E10	0x2E100E10
	EE10.3	PDO watchdog setting error	No.2	Yes	0x0E10	0x3E100E10
	EE10.4	Protection against incomplete PLL	No.2	Yes	0x0E10	0x4E100E10

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
	EE10.5	PHY setting error	No.2	Yes	0x0E10	0x5E100E10
EE11	EE11.0	ESI check error	No.2	Yes	0x5530	0x0E110E11
	EE11.1	EEPROM bus read failure	No.2	Yes	0x5530	0x1E110E11
	EE11.2	EEPROM update failure	No.2	Yes	0x5530	0x2E110E11
	EE11.3	ESI and drive mismatch	No.2	Yes	0x5530	0x3E110E11
EE13	EE13.0	EtherCAT sync period setting error	No.2	Yes	0x6320	0x0E130E13
EE15	EE15.0	Large EtherCAT sync period error	No.2	Yes	0x0E15	0x0E150E15

28.4.2 List of Alarm Codes

Table 28–8 List of alarm codes

Warning code	Alarm subcode	Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
E108	E108.0	Storage parameter write error	No.3	Yes	0x5530	0x01080108
	E108.1	Storage parameter read error	No.3	Yes	0x5530	0x11080108
	E108.2	Invalid check on data written in EEPROM	No.3	Yes	0x5530	0x21080108
	E108.3	Invalid check on data read in EEPROM	No.3	Yes	0x5530	0x31080108
	E108.4	Single data is stored too many times	No.3	Yes	0x0108	0x41080108
E110	E110.0	Frequency-division pulse output setting error	No.3	Yes	0x0110	0x01100110
E120	E120.3	The motor and drive do not match in the power	No.3	Yes	0x7122	0x31200120
E121	E121.0	Invalid S-ON command	No.3	Yes	0x0121	0x01210121
E126	E126.3	PR process segment write parameter out of limit	No.3	Yes	0x0126	0x31260126
E510	E510.0	Frequency division pulse output overspeed	No.3	Yes	0x0510	0x05100510
E600	E600.0	Inertia auto-tuning failure	No.3	Yes	0x0600	0x06000600
E601	E601.0	Homing alarm	No.3	Yes	0x0601	0x06010601
	E601.1	Homing switch error	No.3	Yes	0x0601	0x16010601
	E601.2	Homing mode setting error	No.3	Yes	0x6320	0x26010601
	E601.4	Gantry homing mode setting error	No.3	Yes	0x0601	0x46010601

Warning code	Alarm subcode	Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
E602	E602.9	Angle auto-tuning not done for incremental encoder motor	No.3	Yes	0x0602	0x96020602
E607	E607.0	Large gantry torque deviation	No.3	Yes	0x0607	0x06070607
E608	E608.0	Master-to-slave parameter setting error	No.3	Yes	0x0608	0x06080608
E609	E609.0	Data save timeout	No.3	Yes	0x0609	0x06090609
	E609.1	Data save overflow	No.3	Yes	0x0609	0x16090609
	E609.2	Failed to save data	No.3	Yes	0x0609	0x26090609
	E609.3	Failed to erase data	No.3	Yes	0x0609	0x36090609
E621	E621.1	Overload current limiting torque attained	No.3	Yes	0x0621	0x16210621
E631	E631.4	P-MOS disconnection	No.3	Yes	0x0631	0x46310631
	E631.5	N-MOS disconnection	No.3	Yes	0x0631	0x56310631
E730	E730.0	Encoder battery alarm	No.3	Yes	0x7305	0x07300730
	E730.1	Inovance 2nd encoder battery voltage low	No.3	Yes	0x0730	0x17300730
E831	E831.1	AI1 zero offset too large	No.3	Yes	0x0831	0x18310831
	E831.2	AI2 zero offset too large	No.3	Yes	0x0831	0x28310831
E834	E834.1	AI1 overvoltage	No.3	Yes	0x0834	0x18340834
	E834.2	AI2 overvoltage	No.3	Yes	0x0834	0x28340834
E900	E900.0	DI emergency braking	No.3	Yes	0x0900	0x09000900
E902	E902.0	DI setting invalid	No.3	Yes	0x6320	0x09020902
	E902.1	DO setting invalid	No.3	Yes	0x0902	0x19020902
	E902.2	Torque reach setting invalid	No.3	Yes	0x0902	0x29020902
E909	E909.0	Motor overload	No.3	Yes	0x3230	0x09090909
E910	E910.0	Control circuit overvoltage	No.3	Yes	0x3210	0x09100910
E920	E920.0	Braking resistor overload	No.3	Yes	0x3210	0x09200920
E921	E921.0	Dynamic brake resistor overload alarm	No.3	Yes	0x3210	0x09210921
E922	E922.0	Resistance of the external braking resistor too small	No.3	Yes	0x6320	0x09220922
E924	E924.0	Regenerative transistor over-temperature	No.3	Yes	0x3230	0x09240924
E940	E940.0	Change of controlled motor is detected. It is recommended to restore factory settings before use	No.3	Yes	0x0940	0x09400940
E941	E941.0	Modified parameters activated at next power-on	No.3	No	0x6320	0x09410941

Warning code	Alarm subcode	Name	Fault level	Resettable	Error code	Auxiliary Code (203Fh)
E942	E942.0	Parameter storage too frequent	No.3	Yes	0x7600	0x09420942
E950	E950.0	Positive limit switch alarm	No.3	Yes	0x5443	0x09500950
E952	E952.0	Negative limit switch alarm	No.3	Yes	0x5444	0x09520952
E954	E954.0	Position reference overflow	No.3	Yes	0x0954	0x09540954
E956	E956.0	Forward position reference overtravel in process segment position mode	No.3	Yes	0x0956	0x09560956
E958	E958.0	Reverse position reference overtravel in process segment position mode	No.3	Yes	0x0958	0x09580958
E971	E971.0	Undervoltage alarm for voltage drop protection	No.3	Yes	0x3210	0x09710971
E980	E980.0	Frequency division output overflow	No.3	Yes	0x0980	0x09800980
EA34	EA34.9	Hall is not configured	No.3	Yes	0x0A34	0x9A340A34
EA41	EA41.0	Torque fluctuation compensation failure	No.3	Yes	0x0A41	0x0A410A41
EE08	EE08.7	Error frame pre-warning	No.3	Yes	0x0E08	0x7E080E08

28.4.3 Description of Fault Codes

28.4.3.1 Solutions to Faults

- E101.0: Abnormal parameters in groups H02 and above
  Cause:

  The total number of parameters changes, which generally occurs after software update.

  Values of parameters in groups H02 and above exceed the limit, which generally occurs after software update.

Cause	Troubleshooting	Solution
1. The actual value of the parameter exceeds the upper/lower limit of the parameter.	Read H0b.90 and H0b.91 and obtain the abnormal parameter group number.	1. Rectify the wrong value. 2. Restore default settings.
2. The voltage of the control circuit power supply drops instantaneously.	1. Check whether the control circuit (L1C, L2C) is in the process of power-off or	1. Restore default settings (H02.31 = 1), and write parameters again. 2. Enlarge

Cause	Troubleshooting	Solution
	instantaneous power failure occurs. 2. Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range: 220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: 10% to +10% (198 V to 264 V) 380 V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	the power capacity or replace with a power supply of higher capacity, restore default settings (H02.31 = 1) and write parameters again.
3. Instantaneous power failure occurs during parameter saving.	Check whether instantaneous power failure occurs when saving parameters.	Power on the system again, restore system parameters to default settings (H02.31 = 1), and write parameters again.
4. The number of write operations within a certain period of time exceeds the limit.	1. Check whether instantaneous power failure occurs during parameter storage. 2. Check whether parameters are updated frequently through the host controller.	1. If the servo drive is faulty, replace the servo drive. 2. Change the way of writing and write parameters again. 3. Power on the system again, restore system parameters to default settings (H02.31 = 1), and write parameters again.
5. The software is updated.	Check whether parameter values in group H02 and above exceed the upper/ lower limit due to software update.	Reset the servo drive model and servo motor model, and restore system parameters to default settings (H02.31 = 1).
6. The servo drive is faulty.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the servo drive.

- E101.1: parameter error in group H00/H01
  Cause:

  The total number of parameters changes, which generally occurs after software update. Values of parameters in groups H00 or H01 exceed the limit, which generally occurs after software update.

Cause	Troubleshooting	Solution
The servo drive detects whether parameter values in groups H00 and H01 exceed the upper/lower limit during initialization upon power-on. If yes, the keypad displays E101.1. Motor parameters in group H00 are read from the encoder. Servo drive parameters in group H01 are mapped based on the servo drive model defined by H01.10.	Read H0b.90 and H0b.91 and obtain the abnormal parameter group number. Check groups H00 and H01 to find the parameter whose value exceeds the limit. Confirm whether this parameter range is abnormal.	Replace the motor or drive.

- E101.2: Address error in read/write operation after the number of parameters changes
  Cause:

  Address error in read/write operation after the number of parameters changes.

Cause	Troubleshooting	Solution
The total number of parameters changes after software update, leading to address error in read/write operation.	Read H0b.90 and H0b.91 and obtain the abnormal parameter group number.	1. Rectify the wrong value. 2. Restore default settings.

- E101.9: Parameter attribute initialization check error
  Cause:

  Parameter attribute initialization check error.

Cause	Troubleshooting	Solution
Parameter attribute initialization error	Check whether H0A.99 has been written.	Restore factory settings. If the problems persists after several power cycles, replace the drive.

- E102.0: FPGA communication initialization error
  Cause:

  FPGA and MCU version mismatch.

Cause	Troubleshooting	Solution
The communication between MCU and FPGA cannot be established.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.

- E102.1: FPGA initialization start error
  Cause:

FPGA failed.

Cause	Troubleshooting	Solution
FPGA cannot start.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.

- E102.8: FPGA and MCU software version mismatch
  Cause:

  FPGA and MCU version mismatch.

Cause	Troubleshooting	Solution
The software versions of MCU and FPGA are inconsistent.	1. Check whether the MCU version (H01.00) is 9xx.x (the fourth digit displayed on the keypad is 9). 2. Check whether the FPGA version (H01.01) is 9xx.x (the fourth digit displayed on the keypad is 9).	Contact Inovance for technical support. Update the FPGA or MCU software.

- E104.1: MCU running timeout (MCU break down)
  Cause:

  The access to MCU times out.

Cause	Troubleshooting	Solution
1. FPGA failure.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.
2. FPGA and HOST communication handshaking error.		
3. Access timeout occurs between HOST and the coprocessor.		

- E104.2: FPGA running timeout (FPGA break down)
  Cause:

  The MCU torque interrupt scheduling time is abnormal. This fault is reported only during commissioning.

Cause	Troubleshooting	Solution
1.FPGA failure.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.
2. FPGA and MCU communication handshaking error.		

- E104.4: MCU command update timeout
  Cause:

Take the moment when interrupt starts as the starting time, if the time when commands are written to MCU is larger than the time when position and speed regulators are started by FPGA, an alarm will be reported.

Cause	Troubleshooting	Solution
The system reports that the encoder communication time is set improperly or the command calculation time is too long.	The fault persists after the servo drive is powered off and on repeatedly.	1. Hide the unnecessary functions. 2. Replace the servo drive.

- E120.0: Unknown encoder model
  Cause:

  The motor is incompatible with the encoder.

Cause	Troubleshooting	Solution
1. The product (motor or servo drive) code does not exist.	Read the nameplates of the servo drive and motor to check whether SV680N series servo drive and 26-bit servo motor are used. Meanwhile, check whether H00.00 (motor code) is set to 14102. Check the servo drive code (H01.02) to see whether this servo drive code exists.	If the motor code is unknown, set H00.00 to 14102 when the SV680N series servo drive and 23-bit servo motor are used. If the drive code is unknown, check it against the nameplate of the drive. If the drive model is incorrect, contact our technicians.
2. The power rating of the motor does not match that of the servo drive.	Check whether the servo drive code (H01.02) matches the serial-type motor code (H00.05).	Replace the unmatched products.

- E120.1: Unknown motor model
  Cause:

  The motor model does not exist.

Cause	Troubleshooting	Solution
The motor model defined by H00.00 is abnormal	Check whether the value of H00.00 matches the used motor.	Rectify the value of H00.00.

- E120.2: Unknown drive model
  Cause:

  The servo drive detects the servo drive model defined by H01.10 during initialization upon power-on. If the servo drive model does not exist, E120.2 occurs.

Cause	Troubleshooting	Solution
H01.10 is set incorrectly.	Check the value of H01.10.	Replace the servo drive.

- E120.5: Motor and drive current mismatch
  Cause:

  The rated output of the servo drive is far higher than the rated current of the motor. You must use a servo drive of lower rated output or a motor with higher rated current.

Cause	Troubleshooting	Solution
The internal scaling value is abnormal.	Check whether the servo drive model is correct. If the set current sampling coefficient is too large, calculation overflow will occur.	Replace the servo drive.

- E120.6: FPGA and motor model mismatch
  Cause:
  - The motor model is set improperly, causing mismatch and malfunction of the servo drive.
  - The motor model is set properly, but the motor encoder is not supported by the servo drive.

Cause	Troubleshooting	Solution
FPGA software version does not match the setting of H00.00.	Check whether the FPGA software version (H01.01) supports the motor model set by H00.00.	Update the FPGA software to support the motor model or replace the motor.

- E120.7: Model check error
  Cause:

  The servo drive model parameter cannot be identified.

Cause	Troubleshooting	Solution
Model parameter CRC check failed.	Check that the model parameter is present.	Write the model parameter again.

- E120.8: Junction temperature parameter check error
  Cause:

  The junction temperature parameter is identified incorrectly.

Cause	Troubleshooting	Solution
Junction temperature parameter CRC check failed.	Check that the junction temperature parameter is present.	Rewrite the junction temperature parameter.

- E122.0: Multi-turn absolute encoder setting error

Cause:

The motor does not match the absolute position mode or the motor code is set improperly.

Cause	Troubleshooting	Solution
The motor does not match in the absolute position mode or the motor SN is set improperly.	1. Check the motor nameplate to see whether the motor is configured with a multi-turn absolute encoder. 2. Check whether H00.00 (motor code) is set properly.	Reset H00.00 (motor code) according to the motor nameplate or use a suitable motor.

- E122.1: Different DIs assigned with the same function
  Cause:

  The same function is assigned to different DIs.

  The DI function No. exceeds the maximum number allowed for DI functions.

Cause	Troubleshooting	Solution
1. The same function is assigned to different DIs.	Check whether parameters in groups H03 (H03.02, H03.04...H03.20) and H17 (H17.00, H17.02...H17.30) are assigned with the same non-zero DI function No.	Assign different DI function numbers to parameters in groups H03 or H17, and then restart the control circuit to activate the assignment, or switch off the S-ON signal and send a "RESET" signal to activate the assignment.
2. The DI function No. exceeds the maximum setting number allowed for DI functions.	Check whether the MCU program is updated.	Restore system parameters to default values (H02.31 = 1) and restart the servo drive.

- E122.2: Different DOs assigned with the same function
  Cause:

  The DO function No. exceeds the maximum number allowed for DO functions.

Cause	Troubleshooting	Solution
The DO function No. exceeds the maximum number allowed for DO functions.	Check whether DO function numbers defined by H04.00 and H04.02 are abnormal.	Set the correct DO function No.

- E122.3: Upper limit in the rotation mode invalid
  Cause:

The upper limit (reference range) of the mechanical single-turn position exceeds 2^{31} in the absolute position rotation mode.

Cause	Troubleshooting	Solution
The upper limit (reference range) of the mechanical single-turn position exceeds 2^{31} in the absolute position rotation mode.	Check the setting of the mechanical gear ratio, the upper limit of mechanical single-turn position and the electronic gear ratio when the servo drive runs in the absolute rotation mode (H02.01 = 2).	Reset the mechanical gear ratio, the upper limit of mechanical single-turn position and the electronic gear ratio to ensure the upper limit of the mechanical single-turn position (reference range) does not exceed 2^{31}.

- E122.4: Different VDIs assigned with the same function
  Cause:

  The same function is assigned to different VDIs. The VDI function No. exceeds the maximum number allowed for VDI functions.

Cause	Troubleshooting	Solution
1. The same function is assigned to different VDIs.	Check whether parameters in groups H03 (H03.02, H03.04...H03.20) and H17 (H17.00, H17.02...H17.30) are assigned with the same non-zero DI function No.	Assign different DI function numbers to parameters in groups H03 or H17, and then restart the control circuit to activate the assignment, or switch off the S-ON signal and send a "RESET" signal to activate the assignment.
2. The VDI function No. exceeds the maximum number allowed for VDI functions.	Check whether the MCU program is updated.	Restore system parameters to default values (H02.31 = 1) and restart the servo drive.

- E122.5: DI and VDI assigned with the same function
  Cause:

  The same function is assigned to different VDIs. The VDI function No. exceeds the maximum number allowed for VDI functions.

Cause	Troubleshooting	Solution
Two or more DIs and VDIs are assigned with the same function No.	Check whether DI function numbers set in groups H03 and H17 are repetitive.	Change any repetitive number.

- E122.6: Absolute function setting fault of the 2nd encoder
  Cause:

  The motor does not match the absolute mode.

Cause	Troubleshooting	Solution
The motor does not match the absolute mode.	Check the motor nameplate to see whether the motor is configured with a multi-turn absolute encoder.	Set H0F.02 to 0.

- E122.7: Fully closed-loop parameter setting error
  Cause:

  In fully closed-loop applications, the inner loop is set to rotation mode.

Cause	Troubleshooting	Solution
When H0F.00 is not 0, set H02.01 to 2 (absolute position rotation mode).	Check the value of H02.01 if fully closed-loop is used.	Set the value of H02.01 to 2 if fully closed-loop is used.

- E122.8: Interpolator version mismatch
  Cause:

  Interpolator version mismatch

Cause	Troubleshooting	Solution
The T2 interpolator does not match the motor.	Check whether H00.50 is consistent with H00.51, and they are not 65535.	1. Check whether the interpolator is misused. 2. For the alarm caused by replacing the interpolator, write the corresponding factory parameters into the interpolator.

- E126.0: Process segment number error
  Cause:

  The process segment number is not 1000 or any other value from 0 to 15 in the process segment mode.

Cause	Troubleshooting	Solution
The process segment number is not 1000 or any other value from 0 to 15 in the process segment mode.	Check whether the value of H22.00 exceeds the specified range of process segment number (0–15 or 1000).	Write 0...15 to H22.00 in the technology segment mode.

- E126.1: Process segment internal operation mode error
  Cause:

  The process segment operation mode is not 0, 1, 2, 3, 7, or 8.

Cause	Troubleshooting	Solution
The process segment operation mode is not 0, 1, 2, 3, 7, or 8.	Check whether the values of bit0 to bit3 of the parameter defined by the process segment at fault are 0, 1, 2, 3, 7, and 8.	Set the technology segment operation mode to 0, 1, 2, 3, 7, and 8 in the technology segment mode.

- E126.2: Position reference type error in process segment position mode
  Cause:

  The position reference type in the process segment position mode is not 00 (absolute reference) or 10 (incremental mode).

Cause	Troubleshooting	Solution
The position reference type in the process segment position mode is not 00 (absolute reference) or 10 (incremental mode).	Check whether the value of bit6 or bit7 of the parameter defined by the process segment at fault is 00 or 10.	Set the position reference type in the process segment position mode to 00 (absolute reference) or 10 (incremental reference).

- E135.0: Chip 3.3V signal diagnosis error
  Cause:

  The two chips diagnose whether the supply voltage of each other is within the allowed range of 3.0 V to 3.6 V.

Cause	Troubleshooting	Solution
The chip voltage is out of the range of 3.0 V to 3.6 V.	Perform a power cycle to check if the fault is eliminated.	Replace the servo drive.

- E136.0: Encoder ROM motor parameter check error
  Cause:

  When reading parameters in the encoder ROM, the servo drive detects that no parameters are saved there or parameter values are inconsistent with the setpoints.

Cause	Troubleshooting	Solution
1. The servo Servo drive model does not match the motor model.	View the servo drive and servo motor nameplates to check whether the SV680N series servo drive and servo motor are used.	Replace the servo drive and motor.
2. A parameter check error occurs or no parameter is saved in the ROM of the serial incremental encoder.	1. Check whether the encoder cable provided by Inovance is used. For cable specifications, see "Matching Cables". The cable must be connected securely without scratching, breaking or poor contact on both ends. 2. Measure signals PS+, PS-, +5V and GND on both ends of the encoder cable and observe whether signals at both ends are consistent. For signal pin assignment, see the section related to wiring.	1. Use the encoder cable provided by Inovance. Ensure motor terminals are connected securely and servo drive screws are tightened properly. Use a new encoder cable if necessary. 2. Route encoder cables and power cables (RST, UVW) through different routes.
3. The servo drive is faulty.	The fault persists after the servo drive is restarted.	Replace the servo drive.

- E136.1: Encoder ROM motor parameter read error
  Cause:

  The encoder cable is not connected properly.

  A communication error occurs on the encoder due to interference.

Cause	Troubleshooting	Solution
The encoder cable connections are incorrect or loosened.	Check encoder wiring. Check for strong vibration, which loosens the encoder cable and even damages the encoder.	1. Connect the encoder cables according to the correct wiring diagram. 2. Re-connect encoder cables and ensure encoder terminals are connected securely.
The servo drive is faulty.	The fault persists after the servo drive is restarted.	Replace the servo drive.
Encoder communication is interfered with.	Check whether E136.1 occurs occasionally.	Install a magnetic ring. Route the power cable and communication cable separately.

- E136.9: Dimension parameter Initialization error
  Cause:

  Encoder read-write error causes 32-bit dimensional compatibility initialization error.

Cause	Troubleshooting	Solution
Encoder read-write error causes 32-bit dimensional compatibility initialization error.	Check whether H32.50 is set to enable compatibility.	1. If the encoder communication error still occurs after you disable compatibility, takes measures accordingly. 2. If power-on is normal after you disable compatibility. turn on the alarm and contact the technical support personnel of Inovance.

- E138.0: Accuracy compensation data error
  Cause:

  Check failed because accuracy compensation data is lost.

Cause	Troubleshooting	Solution
1. Check failed because accuracy compensation data is lost.	Read the drive compensation data from the commissioning software and observe whether the data is normal.	1. Compensate again through the commissioning software and power off to restart. 2. If the alarm remains, contact the manufacturer.
2. FLASH hardware failure.		

- E138.1: Cogging ripple compensation data check failure
  Cause:

  Check failed because cogging ripple compensation data is lost.

Cause	Troubleshooting	Solution
1. Check failed because cogging ripple compensation data is lost.	Read data through InoDriverShop.	1. Compensate again and power off to restart. 2. If the alarm remains, contact the manufacturer.
2. FLASH hardware failure.		

- E138.2: Gantry sync compensation data check failure
  Cause:

  Check failed because gantry synchronization compensation data is lost.

Cause	Troubleshooting	Solution
1. Check failed because gantry synchronization compensation data is lost.	Read data through InoDriverShop.	1. Compensate again and power off to restart. 2. If the alarm remains, contact the manufacturer.
2. FLASH hardware failure.		

- E138.3: Overload compensation data check failure
  Cause:

  Check failed because overload compensation data is lost.

Cause	Troubleshooting	Solution
1. Check failed because overload compensation data is lost.	Read data through InoDriverShop.	1. Compensate again and power off to restart. 2. If the alarm remains, contact the manufacturer.
2. FLASH hardware failure.		

- E140.0: encryption chip check error
  Cause:

  Encryption chip check failure

Cause	Troubleshooting	Solution
Encryption software is not flashed.	Check whether the error persists after restart.	Ask the manufacturer to flash the encryption software.

- E140.2: wrong encryption chip version
  Cause:

  The MCU failed to establish communication with the encryption chip.

Cause	Troubleshooting	Solution
Encryption software is not flashed.	Check whether the error persists after restart.	Ask the manufacturer to flash the encryption software.

- E140.3: Encryption chip damaged
  Cause:

  The MCU failed to establish communication with the encryption chip.

Cause	Troubleshooting	Solution
The MCU failed to establish communication with the encryption chip.	Check whether the error persists after restart.	Ask the manufacturer to flash the encryption software.

- E150.0: STO safety state applied
  Cause:

  The STO input protection applies (safety state).

Cause	Troubleshooting	Solution
STO is triggered because either or both of two 24 V inputs are disconnected.	1. Check whether the STO function is activated.	It does not affect normal operation. After the STO terminal is back to normal, clear the fault using the fault reset function.
	2. Check whether the STO power supply is normal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
	3. The fault persists after preceding causes are rectified.	Replace the servo drive.

- E150.1: STO input state abnormal
  Cause:

  The single-channel input of STO is ineffective.

Cause	Troubleshooting	Solution
1. STO input power supply is abnormal.	Check whether the STO power supply is normal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
2. STO input resistor is abnormal.	After STO is triggered, only one STO signal is sent to MCU after the 24 V power supply is cut off due to input resistor drift.	Replace the servo drive.
3. STO is ineffective.	The fault persists after preceding causes are rectified.	Replace the servo drive.

- E150.2: Buffer 5 V voltage detection error
  Cause:

  The MCU monitors the 5 V power supply of the PWM Buffer to detect whether overvoltage or undervoltage occurs. If the voltage is abnormal, E150.2 occurs.

Cause	Troubleshooting	Solution
The 5 V voltage supplied to the STO Buffer is abnormal due to undervoltage or overvoltage.	Check whether the fault can be removed by a restart. If not, the 5V voltage supplied to the Buffer is abnormal.	Replace the servo drive.

- E150.3: STO input circuit hardware diagnosis failure
  Cause:

  The photocoupler of the front hardware circuit for STO input is inspected. If the photocoupler is short-circuited, the servo will display E150.3.

Cause	Troubleshooting	Solution
Direct connection occurs on the upstream optocoupler of STO1 or STO2.	The fault persists and the keypad displays E150.3 after restart.	Replace the servo drive.

- E150.4: PWM buffer hardware diagnosis failure
  Cause:

  An error occurs on the PWM Buffer integrated circuit during initialization detection upon power-on (the PWM signal cannot be blocked).

Cause	Troubleshooting	Solution
STO Buffer power-on test error.	The fault persists and the keypad displays E150.4 after restart.	Replace the servo drive.

- E150.5: STO input signal interference
  Cause:

The STO input signal is interfered with, but the interference does not meet the noise filtering conditions set in H0A.73.

Cause	Troubleshooting	Solution
Poor contact of the STO terminal or unstable external 24V input voltage may lead to STO misoperation or malfunction.	Check whether the 24V input voltage of the STO terminal is unstable and disconnected repeatedly.	Replace the 24V power supply.

- E201.0: Phase-P overcurrent
  Cause:

  An excessively high current flows through the positive pole of the DC-AC circuit.

Cause	Troubleshooting	Solution
1. Gains are set improperly and the motor oscillates.	Check whether vibration or sharp noise occurs during start and operation of the motor, or view "Current feedback" in the software tool.	1. The motor parameters are set improperly, modify the motor parameters. 2. The current loop parameters are set improperly, re-adjust the current loop parameters. 3. Improper speed loop parameters cause vibration. 4. Servo drive operates improperly. Replace it.
2. The encoder cable is aged or corroded, or connected incorrectly or loosely.	Check whether the encoder cable provided by Inovance is used. Check whether the cable is aging, corroded, or connected loosely. Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.17h (Electrical angle) changes as motor shaft rotates.	Re-solder, tighten or replace the encoder cable.

Cause	Troubleshooting	Solution
3. The servo drive is faulty.	1. Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.17 (Electrical angle) changes as motor shaft rotates. 2. Disconnect the motor cable but the fault persists after the servo drive is powered off and on again. 3. Check whether resistance of the external braking resistor is too small or the braking resistor is short-circuited (between terminals P ⊕ , C).	1. Use an external braking resistor of matching resistance. Perform wiring again. 2. Replace the servo drive.
4. Overcurrent occurs on the external braking resistor.	Check whether resistance of the external braking resistor is too small or the braking resistor is short-circuited (between terminals P, C).	Use an external braking resistor of matching resistance. Perform wiring again.

- E201.1: Phase-U overcurrent
  Cause:

  A current higher than the threshold is collected in the phase-U current.

Cause	Troubleshooting	Solution
Motor cables are in poor contact. Motor cables are grounded. U/V/W cables of the motor are short-circuited.	Check whether the servo drive power cables and motor cables on the U, V, and W sides of the servo drive are loose. After confirming the servo drive power cables and motor cables are connected properly, measure whether the insulation resistance between the servo drive U/V/W side and the PE cable is at MΩ level.	Tighten the cables that are loose or disconnected. Replace the motor in case of poor insulation.
4. The motor is damaged due to over-temperature.	Disconnect the motor cables and check whether short circuit occurs among U, V, and W phases and whether burrs exist in the wiring. Disconnect the motor cables and measure whether the resistance among U, V, and W phases of motor cables is balanced.	Connect the motor cables correctly. Replace the motor if the resistance is unbalanced.

- E201.2: Phase-V overcurrent
  Cause:

  A current higher than the threshold is collected in the phase-V current.

Cause	Troubleshooting	Solution
Motor cables are in poor contact. Motor cables are grounded. U/V/W cables of the motor are short-circuited.	Check whether the servo drive power cables and motor cables on the U, V, and W sides of the servo drive are loose. After confirming the servo drive power cables and motor cables are connected properly, measure whether the insulation resistance between the servo drive U/V/W side and the PE cable is at MΩ level.	Tighten the cables that are loose or disconnected. Replace the motor in case of poor insulation.
4. The motor is damaged due to over-temperature.	Disconnect the motor cables and check whether short circuit occurs among U, V, and W phases and whether burrs exist in the wiring. Disconnect the motor cables and measure whether the resistance among U, V, and W phases of motor cables is balanced.	Connect the motor cables correctly. Replace the motor if the resistance is unbalanced.

- E201.4: Phase-N overcurrent
  Cause:

  An excessively high current flows through the negative pole of the DC-AC circuit.

Cause	Troubleshooting	Solution
1. Gains are set improperly and the motor oscillates.	Check whether vibration or sharp noise occurs during start and operation of the motor, or view "Current feedback" in the software tool.	Adjust the gains.
2. The encoder cable is aged or corroded, or connected incorrectly or loosely.	Check whether the encoder cable provided by Inovance is used and whether the cable is aging, corroded, or connected loosely.	Re-solder, tighten or replace the encoder cable.
3. Overcurrent occurs on the braking resistor.	Check whether resistance of the external braking resistor is too small or the braking resistor is short-circuited (between terminals P ⊕ , C).	Use a braking resistor of matching resistance. Perform wiring again.

Cause	Troubleshooting	Solution
4. Overcurrent is caused by the superposition of the braking current and phase current.	Check if the drive accelerates abruptly during braking. Check if the voltage feedback exceeds the release threshold through the Inovance drive commissioning platform, and if the torque command increases abruptly.	Increase the acceleration/ deceleration time.
5. The servo drive is faulty.	Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.17 (Electrical angle) changes as motor shaft rotates. Disconnect the motor cable but the fault persists after the servo drive is powered off and on again.	Replace the servo drive.

- E208.2: Encoder communication timeout
  Cause:

  The FPGA detected a communication timeout with the encoder.

Cause	Troubleshooting	Solution
The servo drive fails to receive the data fed back by the encoder in three consecutive cycles.	Check whether H00.00 (Motor code) is set properly. Check whether the encoder cable is connected incorrectly, damaged, interfered with, or too long. Check whether the encoder version (H00.04) is set properly. It may be set to 0 or 65535 incorrectly. (You only need to check the version in the case of an Inovance encoder.) 4. Check whether the encoder is faulty (see H0B.28 for details). Check bit12 of H0b.30.	Modify the motor model according to the nameplate or use a suitable motor. Replace the cable or take additional anti-interference measures. If the cable is too long, you can change the value of H01.60. Perform a power cycle to read the version again. Use H0D.20 or perform a power cycle to check whether the fault persists. The servo drive operates improperly. Replace it.

- E208.4: FPGA current loop calculation timeout
  Cause:

  The operating time of the current loop exceeds the interval threshold.

Cause	Troubleshooting	Solution
FPGA operation timeout.	Internal fault code H0b.45 = 4208: Current loop operation timeout	Disable some unnecessary functions, such as notch and speed observer, to reduce the operating load of the current loop. Modify the value of H01.60, which may lead to slow response and noise of the motor.

- E210.0: Output short-circuited to ground
  Cause:

  An abnormal motor phase current or bus voltage is detected during power-on self-testing.

  - The DC bus voltage exceeds the discharge threshold.
  - The phase U current of size C/D/E models is greater than 1/4 of H01.07.
  - Overcurrent occurs on phase-P and phase-N of servo drives in size A and B.

Cause	Troubleshooting	Solution
1. The servo drive power cables (U/V/W) are short-circuited to ground.	Disconnect the motor cables and measure whether the servo drive power cables (U/V/W) are short-circuited to ground (PE).	Connect the cables again or replace the servo drive power cables.
2. The motor is short-circuited to ground.	After confirming the servo drive power cables and motor cables are connected properly, measure whether the insulation resistance between the servo drive U/V/W side and the PE cable is at MΩ level.	Replace the motor.
3. The servo drive is faulty.	Disconnect the power cables from the servo drive, but the fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.
4. The motor speed is too high during phase-to-ground detection.	Check whether the motor is in the generating status during power-on.	Reduce the motor speed to less than 10 rpm.
5. Control circuit bus voltage is greater than the discharge threshold.	Check whether the bus voltage is higher than the bus discharge threshold (H01.41) when the fault is logged.	Set the discharge threshold correctly.

- E234.0: Runaway (protection scheme 1)

Cause:

The torque reference direction is opposite to the speed feedback direction in the torque control mode.

The speed feedback direction is in reverse to the speed reference direction in the position or speed control mode.

Cause	Troubleshooting	Solution
1. The UVW cables are connected incorrectly.	Check whether the servo drive power cables are connected in the correct sequence at both ends.	Connect the UVW cables according to the correct sequence.
2. The interference signal causes an error in the initial phase detection of the motor rotor upon power-on.	The UVW phase sequence is correct. But E234.0 occurs when the servo drive is enabled.	Power off and on the servo drive again.
3. The encoder model is wrong or the wiring is incorrect.	View the servo drive and servo motor nameplates to check whether the devices used are Inovance SV680N-INT series servo drive and 26-bit servo motor.	Replace with a mutually-matching servo drive and servo motor. For use of SV680N-INT series servo drive and 26-bit servo motor, set H00.00 to 14102. Check the motor model, encoder type, and encoder cable connection again.
4. The encoder cable is aged or corroded, or connected incorrectly or loosely.	Check whether the encoder cable provided by Inovance is used and whether the cable is aging, corroded, or connected loosely. Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.10 (Electrical angle) changes as motor shaft rotates.	Re-solder, tighten or replace the encoder cable.
5. The gravity load in vertical axis applications is too heavy.	Check whether the load of the vertical shaft is too large. Adjust brake parameters H02.09...H02.12 and check whether the fault is cleared.	Reduce the load of the vertical axis, increase the stiffness level, or hide this fault without affecting the safety performance and normal use.
6. Improper parameter settings lead to excessive vibration.	The stiffness level is set to an excessively high value, leading to excessive vibration.	Set a proper stiffness level to avoid excessive vibration.

- E234.1: Runaway (protection scheme 2)
  Cause:

The torque reference direction is opposite to the speed feedback direction in the torque control mode. The speed feedback direction is in reverse to the speed reference direction in the position or speed control mode.

Troubleshooting

Cause	Troubleshooting	Solution
1. The motor output is limited due to torque limit or current saturation.	Check whether the motor is operating beyond its capacity or torque is limited.	Relax the torque limit, reduce acceleration/ deceleration and operation speed, or use a motor with matching capacity.
2. Host controller command direction is incorrect or position increment is too large.	Check whether 607Ah and 6064h are aligned in the host controller program. Check whether the command of the host controller changes abnormally. Check whether the electronic gear ratio of the servo drive is set to an excessively large value.	Align 607Ah and 6064h. Set a proper electronic gear ratio.
3: Collision.	Check whether a collision occurs. Check whether the commands of the host controller are properly planned and whether the trajectory overlap that of any other mechanism.	Optimize the command planning of the host controller, increase the safety distance between mechanisms and increase the zero-speed stop safe distance for DB-less models.
4. The working conditions triggered the runaway alarm.	Check whether there is a waveform consistent with the runaway conditions. Check whether the load of the vertical shaft is too heavy and check whether the torque is limited in the non-torque mode.	If the load of the vertical shaft is too heavy and the brake is not applied in a timely manner, adjust the brake parameters H02.09 to H02.12 or increase the stiffness. Release the runaway threshold and set proper parameters to avoid excessive vibration. Ensure to take additional protection measures to mask runaway alarms, such as torque limit or changing the No. 2 fault to DB stop or coast to stop.

Cause	Troubleshooting	Solution
5. Electrical angle error.	Check whether the UVW phase sequence is correct. Check whether the encoder cable and power cable belong to the same motor. Check whether the electrical angle is auto-tuned. Check whether Hall is installed correctly. Check whether there is any deviation between the electrical angle and absolute position feedback of the same physical position before and after runaway or after a period of operation.	Connect the cables correctly. Perform angle auto-tuning again. Install the Hall sensor correctly. Perform electrical angle auto-tuning for several times and power on to check the electrical angle.
6. Power cable and encoder cable failure, motor and drive damage	Inspect the power cable and encoder cable for aging and corrosion, loose joints, and broken wire cores. Check the encoder cable for shield failure, reading head contamination, and power cable interference. Check whether the motor and drive components are damaged.	Re-solder, tighten or replace the power cable or encoder cable. Replace the motor and drive.

- E308.0: Pulse encoder phase A wire breakage
  Cause:

  Pulse encoder phase A wire breakage.

Cause	Troubleshooting	Solution
1. Phase A of the encoder is wired improperly.	Check encoder wiring.	Reconnect the encoder and power off and restart.
2. The motor is set to a model with a pulse encoder.	Check whether the motor code H00.00 is set correctly and matches the connected encoder.	Check whether the motor code H00.00 is set correctly and matches the connected encoder.

- E308.1: Pulse encoder phase B wire breakage
  Cause:

  Pulse encoder phase B wire breakage.

Cause	Troubleshooting	Solution
Phase B of the encoder is wired improperly.	Check encoder wiring.	Reconnect the encoder and power off and restart.

- E308.2: Pulse encoder phase Z wire breakage

Cause:

Pulse encoder phase Z wire breakage.

Cause	Troubleshooting	Solution
1. Phase Z of the encoder is wired improperly.	Check the wiring.	Connect the encoder again.
2. The connected encoder does not have phase Z.	Check the encoder manual.	Re-install the motor and select an AB two-phase encoder on the encoder configuration page.

- E320.0: Braking resistor overload
  Cause:

  The braking resistor is overloaded.

Cause	Troubleshooting	Solution
The accumulative heat of the braking resistor exceeds the maximum thermal capacity of the braking resistor.	Check whether the value of H0b.67 exceeds 100%.	Check if large discharge current is present due to high bus voltage. Ensure that the motor cannot be driven reversely. Replace the servo drive.



In applications where the motor drives a vertical axis or is driven by the load, set H0A.12 to 0 to hide the runaway fault.

- E320.1: External braking resistor surface temperature too high
  Cause:

  The accumulative heat of the built-in braking resistor is too great.

Cause	Troubleshooting	Solution
The accumulative heat of the built-in braking resistor is too great.	Cut off the power and check the braking resistor for over-temperature.	Check if large discharge current is present due to high bus voltage. Ensure that the motor cannot be driven reversely. Replace the servo drive.

- E321.0: Dynamic brake resistor overload
  Cause:

  The dynamic braking resistor is overloaded.

Cause	Troubleshooting	Solution
The accumulative heat of exceed braking resistor exceeds the maximum thermal capacity of the resistor.	Check whether the value of H0b.98 exceeds 100%.	Ensure that the motor cannot be driven reversely in the dynamic braking state.

- E400.0: Main circuit overvoltage
  Cause:

  The DC bus voltage between P ⊕ and N ⊖ exceeds the overvoltage threshold.

  220 V servo drive: Normal value 310 V Overvoltage threshold 420 V.

  380 V servo drive: Normal value 540 V Overvoltage threshold 760 V.

Cause	Troubleshooting	Solution
1. The voltage input to the main circuit is too high.	Check the power input specifications of the servo drive and measure whether the voltage input to main circuit cables (R S T) on the drive side is within the following range: 220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V) 380 V servo drive: Value range: 380 V–440 V Allowable deviation: –10% to +10% (342 V to 484 V)	Replace or adjust the power supply according to the specified range.
2. The power supply is unstable or affected by lightning.	Check whether the power supply is unstable, affected by lightning, or complies with the preceding range.	Connect a surge protection device (SPD) and switch on the power supplies of the control circuit and the main circuit. If the fault persists, replace the servo drive.
3. The braking resistor fails.	If the built-in braking resistor is used (H02.25 = 0), check whether terminals P ⊕ and D are jumpered. If yes, measure the resistance between terminals C and D to ensure that the resistor works normally. If an external braking resistor is used (H02.25 = 1 or 2), measure the resistance of the external braking	If the resistance is "∞" (infinite), the braking resistor is disconnected internally. If you use a built-in braking resistor with insufficient discharge capability, use an external braking resistor (H02.25 = 1 or 2) instead and remove the jumper between terminals P⊕ and D. The resistance of the external

Cause	Troubleshooting	Solution
	resistor connected between terminals P⊕ and C. For details, See table "Specifications of the braking resistor" in SV680N Series Servo Drive Commissioning Guide.	braking resistor can be equal to or smaller than the built-in one and the power must not be smaller than the built-in one. If you use an external braking resistor which is damaged or has insufficient power, replace it with a new one with larger power and connect the new one between terminals P ⊕ and C. Set H02.26 (Power of external braking resistor) and H02.27 (Resistance of external braking resistor) to values consistent with the specifications of the external braking resistor used.
4. The resistance of the external braking resistor is too large, resulting in insufficient energy absorption during braking.	Measure the resistance of the external braking resistor connected between terminals P ⊕ and C. Compare the measured value with the recommended value.	Connect a new external braking resistor with recommended resistance between terminals P ⊕ and C. Set H02.26 (Power of external braking resistor) and H02.27 (Resistance of external braking resistor) to values consistent with the specifications of the external braking resistor used.
5. The motor is in abrupt acceleration/deceleration status and the maximum braking energy exceeds the energy absorption value.	Confirm the acceleration/ deceleration time during running and measure the DC bus voltage between P ⊕ and N to check whether the voltage exceeds the fault threshold during deceleration.	After confirming the input voltage of the main circuit is within the specified range, increase the acceleration/ deceleration time if the operating conditions allow.

Cause	Troubleshooting	Solution
6. The bus voltage sampling value deviates greatly from the measured value.	Check whether H0b.26 (Bus voltage) is within the following range: 220 V servo drive: H0b.26 > 420 V 380 V servo drive: H0b.26 > 760 V Measure whether the DC bus voltage N between P ⊕ and N ⊖ is normal and less than the value of H0b.26.	Contact Inovance for technical support.
7. The servo drive is faulty.	The fault persists after the main circuit is powered off and on repeatedly.	Replace the servo drive.

- E410.0: Main circuit undervoltage
  Cause:

  The DC bus voltage between P ⊕ and N ⊖ is lower than the undervoltage threshold.

  220 V servo drive: Normal value: 310 V Undervoltage threshold: 200 V (180 V for S5R5 models)

  380 V servo drive: Normal value 540 V Overvoltage threshold 380 V.

Cause	Troubleshooting	Solution
1. The power supply of the main circuit is unstable or power failure occurs.	Check the power input specifications of the servo drive and measure whether the input voltage at the power supply side of the main circuit cables and R/S/T on the drive side is within the following range: 220 V servo drive: Value range: 220 V–240 V Allowable deviation: –10% to +10% (198 V to 264 V) Measure the voltages of all the three phases.	Increase the capacity of the power supply.
2. Instantaneous power failure occurs.		
3. The voltage of the power supply drops during operation.	Monitor the power supply voltage and check whether the main circuit power supply is applied to other devices, resulting in insufficient power capacity and voltage drop.	

Cause	Troubleshooting	Solution
4. A three-phase servo drive is connected to a single-phase power supply, leading to phase loss.	Check whether the main circuit is wired correctly and whether phase loss detection (H0A.00) is hidden.	Replace the cables and wire the power cables correctly Three-phase: RST.
5. The servo drive is faulty.	Check whether H0b.26 (Bus voltage) is within the following range: 220 V servo drive: H0b.26 < 200 V 380 V servo drive: H0b.26 < 380 V The fault persists after the main circuit is powered off and on repeatedly.	Replace the servo drive.

- E410.1: Main circuit de-energized
  Cause:

  Phase loss occurs on the three-phase servo drive.

Cause	Troubleshooting	Solution
The power supply is disconnected during operation..	Check the power input specifications of the servo drive and measure whether the input voltage at the power supply side of the main circuit cables and R/S/T on the drive side is within the following range: 220 V servo drive: Value range: 220 V–240 V Allowable deviation: –10% to +10% (198 V to 264 V) 380 V servo drive: Effective value: 380 to 440 V Allowable deviation: –10% to +10% (342 V to 484 V) Measure the voltages of all the three phases.	Increase the capacity of the power supply.
	Monitor the power supply voltage and check whether the main circuit power supply is applied to other devices, resulting in insufficient power capacity and voltage drop.	

Cause	Troubleshooting	Solution
	Check whether 200B.1Bh (Bus voltage) is within the following range: 200 V servo drive: H0b.26h < 200 V. 400 V servo drive: H0b.26h＜ 400 V. The fault persists after the main circuit is powered off and on repeatedly.	Replace the servo drive.
	Check the wiring of the main circuit.	Replace the cables and wire the power cables correctly Three-phase: RST /L1 L2 L3.

- E420.0: Main circuit phase loss
  Cause:

  Drive three-phase input phase abnormal.

Cause	Troubleshooting	Solution
1. The three-phase input cables are connected improperly.	Check whether RST cables on the drive side and non-drive side are in good condition and connected properly.	Replace the cables and connect the main circuit cables properly.
2. A single-phase power supply is used for a three-phase servo drive.	Check the specifications of the power supply and measure whether the voltage input to the main circuit is within the following range: 220 V servo drive: Value range: 220 V–240 V Allowable deviation: –10% to +10% (198 V to 264 V) 380 V servo drive: Effective value: 380 to 440 V Allowable deviation: –10% to +10% (342 V to 484 V) Measure the voltages of all the three phases.	Servo drives of 0.75 kW (H01.10 = 5) can be supplied by single-phase power supplies. If the input voltage complies with the specifications, set H0A.00 (power input phase loss protection) to 2 (inhibit phase loss faults and alarms). If input voltage is outside the specified range, replace or adjust the power supply.
3. The three-phase power supply is unbalanced or the voltages of the three phases are too low.		

- E500.0: motor overspeed
  Cause:

  The actual feedback speed of the motor exceeds the overspeed threshold.

Cause	Troubleshooting	Solution
1. The UVW phase sequence of the motor is incorrect.	Check whether the servo drive power cables are connected in the correct sequence at both ends.	Connect the UVW cables according to the correct sequence.
2. H0A.08 is set improperly.	Check whether the overspeed threshold is lower than the maximum speed. Overspeed threshold = 1.2 x Maximum motor speed (H0A.08 = 0) Overspeed threshold = H0A.08 (H0A.08 ≠ 0, and H0A.08 < 1.2 x Maximum motor speed)	Re-set the overspeed threshold according to the mechanical requirements.
3. The input reference exceeds the overspeed threshold.	Check whether the motor speed corresponding to the input reference exceeds the overspeed threshold. • Position control mode:In CSP mode, check the gear ratio 6091.01h/6091.02h to determine the position reference increment for an individual synchronization period and convert it to the speed information.In PP mode, check the gear ratio 6091.01h/6091.02h and determine the 6081h (Profile velocity).In HM mode, check the gear ratio 6091.01h/6091.02h, and determine 6099.01h and 6099.02h. • Speed control mode:Check the gear ratio (6091h), target velocity (60FFh), speed limits (H06.06 to H06.09), and the maximum profile velocity (607Fh). • Torque control mode:View the speed limit defined by H07.17 and check the corresponding speed limit.	• Position control mode:CSP: Decrease the position reference increment per synchronization period. The host controller should cover the position ramp when generating references.PP: Decrease the value 6081h or increase the acceleration/ deceleration ramp (6083h, 6084h).HM: Decrease 6099.01h and 6099.02h or increase the acceleration/ deceleration ramp (609Ah). Decrease the gear ratio according to actual conditions. • Speed mode:Decrease the target velocity, speed limit, and gear ratio. In PV mode, increase the speed ramp (6083h and 6084h). In CSV mode, the host controller should cover the speed ramp. • Torque control mode:Set the speed limit to a value lower than the overspeed threshold.
4. The motor speed overshoots.	Check whether the speed feedback exceeds the overspeed threshold by	Adjust the gain or mechanical running conditions.

Cause	Troubleshooting	Solution
	using Inovance servo commissioning software.	
5. The servo drive is faulty.	The fault persists after the servo drive is powered off and on again.	Replace the servo drive.
6. Encoder data error.	Check whether there is interference, whether encoder type selection is incorrect, or whether encoder parameter settings are incorrect.	• Take interference shielding measures, such as magnetic rings and shielding cables. • Check whether the encoder type is selected correctly. If not, replace the encoder type correctly. • Set the encoder parameters properly according to encoder manual.
7. The selected motor type is incorrect.	Check whether the type of the motor is set improperly. For example, the linear motor is set to a rotary motor or the rotary motor is set to a linear motor.	Replace the actual motor with the correct type or change the value of H00.00 to the correct motor type.

- E500.1: Speed feedback overflow
  Cause:

  The FPGA speed measurement overflows.

Cause	Troubleshooting	Solution
1. FPGA internal speed overflows.	Check whether the servo drive power cables are connected in the correct sequence at both ends.	Connect the UVW cables according to the correct sequence.
2. The motor speed overshoots.	Check whether the speed feedback exceeds the overspeed threshold by using Inovance servo commissioning software. Overspeed threshold: 16384 rpm for a rotary motor, 8192 rpm for a DDR motor, and 16384 mm/s for a linear motor.	Adjust the gain or mechanical running conditions.

Cause	Troubleshooting	Solution
3. Encoder data error.	Check whether there is interference, whether encoder type selection is incorrect, or whether encoder parameter settings are incorrect.	• Take interference shielding measures, such as magnetic rings and shielding cables. • Check whether the encoder type is selected correctly. If not, replace the encoder type correctly. • Set the encoder parameters properly according to encoder manual.
4. The selected motor type is incorrect.	Check whether the type of the motor is set improperly. For example, the linear motor is set to a rotary motor or the rotary motor is set to a linear motor.	Replace the actual motor with the correct type or change the value of H00.00 to the correct motor type.

- E500.2: FPGA position feedback pulse overspeed
  Cause:

  The MCU has detected that the position feedback increment from the FPGA is too large.

Cause	Troubleshooting	Solution
1. The MCU has detected that the position feedback increment from the FPGA is too large.	Check whether the value of H0b.17 changes abruptly.	Modify the value of H0A.70 (Overspeed threshold), which is 0 by default. Use the maximum speed of the motor as the threshold for large feedback increment.
2. Encoder data error.	Check whether there is interference, whether encoder type selection is incorrect, or whether encoder parameter settings are incorrect.	• Take interference shielding measures, such as magnetic rings and shielding cables. • Check whether the encoder type is selected correctly. If not, replace the encoder type correctly. • Set the encoder parameters properly according to encoder manual.
3. The selected motor type is incorrect.	Check whether the type of the motor is set improperly. For example, the linear motor is set to a rotary motor or the rotary motor is set to a linear motor.	Replace the actual motor with the correct type or change the value of H00.00 to the correct motor type.

- E602.0: Angle auto-tuning failure
  Cause:

  Unusual jitter occurs on the encoder feedback during angle auto-tuning.

Cause	Troubleshooting	Solution
1. Locked-rotor occurred in mechanical equipment.	Stop the motor and push it to check whether locked-rotor occurred.	If yes, eliminate the problem and perform angle auto-tuning (phase sequence auto-tuning) again.
2. The data fed back by the encoder is abnormal.	Push the motor and observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement?	If you determine that the feedback data of the encoder is abnormal, replace the encoder and perform angle auto-tuning (phase sequence auto-tuning) again.

Cause	Troubleshooting	Solution
3. U, V and W power cables are incorrectly connected or disconnected.	Check the wiring. Use a multimeter to check wire breakage.	If any improper connection is found, reconnect the cables perform angle auto-tuning (phase sequence auto-tuning) again.
4. The drive/motor is faulty.	If none of the above solves the problem, contact the manufacturer.	If none of the above solves the problem, contact the manufacturer.

- E602.1: Angle auto-tuning overtravel
  Cause:

  Angle auto-tuning overtravel.

Cause	Troubleshooting	Solution
The moving distance during angle auto-tuning is too large. 1. The setting of auto-tuning parameters does not match the load characteristics, and large impact occurred during auto-tuning, resulting in an overtravel alarm. 2. The data fed back by the encoder is abnormal. A false alarm is raised.	• Check whether the displacement is really too large, and whether overtravel is caused by the setting of auto-tuning parameters. • Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is the feedback operation continuous? Is the observed displacement consistent with the actual displacement?	• If the movement during auto-tuning is too large, the overtravel can be avoided by manually reducing the current rising slope (H32.21 closed-loop pre-positioning method) (H32.31 position locking method) or the maximum auto-tuning current (H32.20 closed-loop pre-positioning method) (H32.30 position locking method). • If the encoder feedback data is abnormal, replace the encoder, and then identify the angle/phase sequence again.

- E602.2: U/V/W phase sequence reversed
  Cause:

  A wrong U/V/W phase sequence is detected during angle auto-tuning.

Cause	Troubleshooting	Solution
The system indicates the UVW wiring is wrong to avoid the motor from losing control.	Check U/V/W wiring through phase sequence auto-tuning.	• After phase sequence is corrected, perform angle auto-tuning again. • Exchange cables of any two phases and perform angle auto-tuning again.

- E602.3: Large encoder jitter during angle auto-tuning
  Cause:

Large encoder jitter during angle auto-tuning

Cause	Troubleshooting	Solution
Encoder feedback data has large jitter.	Check whether the encoder jitters abnormally at standstill.	• Check the wiring of the encoder. • Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. • Manually increase H32.14/ H32.16 (inching angle auto-tuning) and H32.34/H32.36 (position locking angle auto-tuning).

- E602.4: Auto-tuning failed. Auto-tuning timeout.
  Cause:

  Auto-tuning failed. Auto-tuning timeout.

Cause	Troubleshooting	Solution
If the angle auto-tuning process is not completed in 30 seconds, a timeout alarm is raised. 1. Due to external disturbance (such as vibration of other parts on the bench), the completion condition of angle auto-tuning cannot be met. 2. The feedback data of the encoder is subjected to poor characteristics, interference or anomaly, and the completion condition of angle auto-tuning cannot be met.	• Check for vibrating parts on the bench. • Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement? Is there abnormal jitter during standby?	• Check whether the encoder cable shield is connected properly. If the encoder data is abnormal, replace the encoder, and then auto-tune the angle/phase sequence again. • Adjust the angle auto-tuning parameters properly and reduce the completion conditions of angle auto-tuning. For example, you can increase the operation/standstill evaluation threshold of angle auto-tuning as appropriate.

- E602.5: Angle auto-tuning failed. Z signal not found.
  Cause:

  Angle auto-tuning failed. Z signal not found.

Cause	Troubleshooting	Solution
1. The encoder configuration is incorrect. The connected motor encoder has no Z signal.	Check whether the encoder has a Z signal.	Check the wiring of the encoder. Ensure the shielded cables are effectively connected. Check the polarity configuration of Z signal. If the encoder data is abnormal, replace the encoder and then identify the angle again.
2. The Z signal polarity is set incorrectly.	Check if the polarity of the Z signal is configured correctly. Check bit 13 of H00.26.	
3. The data fed back by the encoder is abnormal. No Z signal is present.	Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement?	

- E602.6: Angle auto-tuning does not converge
  Cause:

  Angle auto-tuning does not converge.

Cause	Troubleshooting	Solution
1. External disturbance (such as vibration of other parts on the bench) is present. 2. Parameters are set incorrectly.	Check for vibrating parts on the bench. Check whether the angle gain is set too large.	• Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. • For the position lock method, you can reduce the angle gain (H32.37) manually. • For the jog method, you can manually reduce the operation evaluation threshold (H32.13/H32.15) or increase the standstill evaluation threshold (H32.14/H32.16).

- E603.0: Gantry communication CRC failure
  Cause:

  Gantry communication CRC failure.

Cause	Troubleshooting	Solution
Gantry communication keeps abnormal.	Check the gantry wiring and electromagnetic environment.	Check the gantry wiring and electromagnetic environment.

- E603.1: Gantry communication timeout
  Cause:

  Gantry communication timeout.

Cause	Troubleshooting	Solution
The gantry communication signal is abnormal or the gantry cable is in poor contact.	Check the gantry wiring and electromagnetic environment. Check whether H14.01 is 1.	Check the gantry wiring and electromagnetic environment.

Note

If the slave axis disconnects the communication between drives without communicating with the host controller, the alarm EE15.0 will be raised.

- E603.2: Drive failed to establish communication for a long time
  Cause:

  The drive failed to establish communication for a long time.

Cause	Troubleshooting	Solution
Gantry communication is disconnected or communication has not been established for a long time.	Check the gantry wiring and electromagnetic environment. Check whether H14.01 is 1.	Check the gantry wiring and electromagnetic environment.

- E604.0: Inconsistent settings of two gantry axes
  Cause:

  Inconsistent settings of two gantry axes.

Cause	Troubleshooting	Solution
Inconsistent parameter settings of two gantry axes.	Check parameter settings.	Correct the settings.

- E604.1: Gantry not set to position mode
  Cause:

  The gantry is not set to the position mode.

Cause	Troubleshooting	Solution
When gantry is enabled, the drive does not run in the position mode.	When gantry is enabled, check whether the drive runs in the position mode.	Switch the drive to the position mode.

- E604.2: Gantry is running on an unsupported feature
  Cause:

  The gantry is running on an unsupported feature.

Cause	Troubleshooting	Solution
Gantry is running on an unsupported feature.	Check whether the gantry configuration parameters meet the requirements of the current control scheme. For example: Rigid gantry control scheme 2 does not support "torque alignment mode", "homing torque pre-alignment" and "gantry alignment deviation compensation value auto-tuning".	Check whether the gantry configuration parameters meet the requirements of the current control scheme and make corrections accordingly.

- E605.0: Motor speed too high upon S-ON
  Cause:

  The motor speed exceeds the rated speed when the servo drive in size A/B is switched on.

Cause	Troubleshooting	Solution
The motor speed exceeds the rated speed when the servo drive is switched on.	Check if the drive is enabled when the motor has been driven.	Switch on the drive when the motor is standstill.

- E606.0: Gantry torque alignment timeout
  Cause:

  Gantry torque alignment times out.

Cause	Troubleshooting	Solution
Gantry torque alignment times out.	Check whether the alignment time exceeds the alarm threshold set by H14.30.	Increase the alarm threshold to see if the relevant parameters are set properly.

- E612.0: Rotor locked during phase sequence auto-tuning
  Cause:

  Locked-rotor occurred during phase sequence auto-tuning.

Cause	Troubleshooting	Solution
1. Locked-rotor occurred in mechanical equipment.	Stop the motor and push it to check whether locked-rotor occurred.	If yes, eliminate the problem and perform angle auto-tuning (phase sequence auto-tuning) again.
2. The data fed back by the encoder is abnormal.	Push the motor and observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement?	If you determine that the feedback data of the encoder is abnormal, replace the encoder and perform angle auto-tuning (phase sequence auto-tuning) again.
3. U, V and W power cables are incorrectly connected or disconnected.	Check the wiring. Use a multimeter to check wire breakage.	If any improper connection is found, reconnect the cables perform angle auto-tuning (phase sequence auto-tuning) again.
4. The drive/motor is faulty.	If none of the above solves the problem, contact the manufacturer.	If none of the above solves the problem, contact the manufacturer.

- E612.1: Overtravel occurred during phase sequence auto-tuning
  Cause:

  Overtravel occurred during phase sequence auto-tuning.

Cause	Troubleshooting	Solution
1. The setting of auto-tuning parameters does not match the load characteristics, and large impact occurred during auto-tuning, resulting in an overtravel alarm.	Check whether the displacement is really too large, and whether overtravel is caused by the setting of auto-tuning parameters.	If the movement during auto-tuning is too large, you can manually reduce the current rising slope (H32.21).
2. The data fed back by the encoder is abnormal. A false alarm is raised.	Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is the feedback operation continuous? Is the observed displacement consistent with the actual displacement?	If the encoder feedback data is abnormal, replace the encoder, and then identify the angle/phase sequence again.

- E612.3: Large encoder jitter during phase sequence auto-tuning
  Cause:

  Large encoder jitter during phase sequence auto-tuning.

Cause	Troubleshooting	Solution
Encoder feedback data has large jitter.	Check whether the encoder jitters abnormally at standstill.	Check the wiring of the encoder. Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. Manually increase H32.24/ H32.25.

- E612.4: Phase sequence auto-tuning failed. Auto-tuning timeout.
  Cause:

  Phase sequence auto-tuning failed. Auto-tuning timeout.

Cause	Troubleshooting	Solution
1. If the phase sequence auto-tuning process is not completed in 30 seconds, a timeout alarm is raised. 2. Due to external disturbance (such as vibration of other parts on the bench), the completion condition of angle auto-tuning cannot be met. 3. The feedback data of the encoder is subjected to poor characteristics, interference or anomaly, and the completion condition of angle auto-tuning cannot be met.	Check for vibrating parts on the bench. Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement? Is there abnormal jitter during standby?	Check whether the encoder cable shield is connected properly. If the encoder data is abnormal, replace the encoder, and then auto-tune the phase sequence again. Adjust the phase sequence auto-tuning parameters properly and reduce the completion conditions of the auto-tuning. For example, you can increase the operation/standstill evaluation threshold as appropriate.

- E619.0: Absolute accuracy compensation parameter setting error
  Cause:

  The accuracy compensation interval is set to 0.

Cause	Troubleshooting	Solution
1. The accuracy compensation interval(H33.64) is set to 0. 2. Inovance communication encoder DDL: 1) The distance from the mechanical home to the correction home exceeds the upper limit of the encoder (encoder unit: 23^{34}). 2) The length of correction exceeds the upper limit of the encoder (2^{34}). 3. Homing mode record error. The value of H33.70 is not in {-2, -1, 1, 2, 4, 6, 17, 18, 24, 28, 33, 34}.	1. Check whether H33.64 is set to 0. 2. Check whether the distance between the mechanical home and the correction home (start position) exceeds the limit (encoder unit: 2^{34}). 3. Check whether the value of H33.70 is in {-2, -1, 1, 2, 4, 6, 17, 18, 24, 28, 33, 34}.	Set the correct compensation interval. Set the distance between the mechanical home and the correction home properly. Set H33.70 correctly.

- E619.1: Absolute accuracy compensation overflow
  Cause:

  1. The input quadrature pulse frequency (quadruple) is greater than 1/(H33.7 x 25 ns).

  2. The number of compensated pulses at a time is greater than 1.

Cause	Troubleshooting	Solution
1. The input quadrature pulse frequency (quadruple) is greater than 1/(H33.74 x 25 ns).	Check the motor speed at the alarm time.	Reduce motor speed.
2. The number of compensated pulses at a time is greater than 1.	Check the compensation table to see if there is a length greater than 1 index interval.	Load the correct error compensation table.

- E620.0: Motor overload
  Cause:

  The accumulative heat of the motor reaches the fault threshold.

Cause	Troubleshooting	Solution
1. The motor and encoder cables are connected improperly.	Check the wiring between the servo drive, servo motor and the encoder according to the correct “wiring diagram”.	Connect cables according to the correct wiring diagram. It is recommended to use the cables provided by Inovance. When customized cables are used, prepare and connect the customized cables according to the wiring instructions.
2. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque.	Check the overload characteristics of the servo drive or servo motor. Check whether the average load rate (H0b.12) of the servo drive keeps exceeding 100.0%.	Use a servo drive of higher capacity and a matching servo motor. Reduce the load and increase the acceleration/deceleration time.
3. The acceleration/ deceleration is too frequent or the load inertia is too large.	Calculate the mechanical inertia ratio or perform inertia auto-tuning. View the value of H08.00 (Load moment of inertia ratio). Confirm the individual operation cycle when the servo motor operates cyclically.	Increase the acceleration/ deceleration time during single-cycle running.
4. Gains are improper or the stiffness level is too high.	Check whether the motor vibrates and generates unusual noise during operation.	Readjust the gain.
5. The servo drive model or motor model is set improperly.	Check the motor model (H00.00) and drive model (H01.10) stored in the bus encoder.	Check the servo drive nameplate and set the servo drive model (H01.10) and motor model properly

Cause	Troubleshooting	Solution
		according to section "Servo Drive Model and Nameplate" in SV680-INT Series Servo Drive Hardware Guide.
6. The motor stalls due to mechanical factors, resulting in overload during operation.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter) • References in the speed control mode: H0b.01 (Speed reference) • References in the torque control mode: H0b.02 (Internal torque reference) Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
7. The servo drive is faulty.	The fault persists after the servo drive is powered off and on again.	Replace the servo drive.

Note

When E620.0 occurs, stop the servo drive for at least 30s before further operations.

- E620.1: Overload current limit mode, motor overloaded
  Cause:

  Overload current limit mode, motor overloaded.

Cause	Troubleshooting	Solution
1. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque.	• Confirm the overload characteristics of the servo drive or motor. • Check whether the average load rate (H0b.12) keeps exceeding 100.0%.	• Replace with a servo drive of higher capacity and a matching servo motor. • Reduce the load and increase the acceleration/ deceleration time.
2. The acceleration/ deceleration is too frequent or the load inertia is too large.		

Cause	Troubleshooting	Solution
3. The motor and encoder cables are connected improperly.		
4. Gains are improper or the stiffness level is too high.		
5. The motor stalls due to mechanical factors, resulting in overload during operation.		
6. The servo drive is faulty.		

- E621.0: Overload current limiting torque attained
  Cause:

  Overload current limiting torque is attained.

Cause	Troubleshooting	Solution
1. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque.	Confirm the overload characteristics of the servo drive or motor. Check whether the average load rate (H0b.12) keeps exceeding 100.0%.	• Replace with a servo drive of higher capacity and a matching servo motor. • Reduce the load and increase the acceleration/ deceleration time.
2. The acceleration/ deceleration is too frequent or the load inertia is too large.		
3. The motor and encoder cables are connected improperly.		
4. Gains are improper or the stiffness level is too high.		
5. The motor stalls due to mechanical factors, resulting in overload during operation.		
6. The servo drive is faulty.		

- E630.0: motor rotor locked over-temperature
  Cause:

  The actual motor speed is lower than 10rpm but the torque reference reaches the limit, and such status lasts for the time defined by H0A.32.

Cause	Troubleshooting	Solution
1. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque.	Perform motor trial run without load and check cable connections and the phase sequence.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The motor parameters (especially the number of pole pairs) are set improperly, or motor angle auto-tuning is not performed, or motor power is greater than drive power.	View parameters in group H00 to check whether the number of pole pairs are set properly. Perform angle auto-tuning on the motor several times and check whether the value of H00.28 is consistent during angle auto-tuning. Check whether the motor and drive match in the power.	Modify motor parameter values or replace the drive.
3. The communication commands are being disturbed.	Check whether jitter occurs on the commands sent from the host controller and whether EtherCAT communication is being disturbed.	Check whether the communication line between the host controller and the servo drive is being disturbed.
4. The motor is stalled due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter) • References in the speed control mode: H0b.01 (Speed reference) • References in the torque control mode: H0b.02 (Internal torque reference) Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode. Check the current feedback (torque reference) waveform.	Check whether any mechanical part gets stuck or eccentric.

Note

When the fault occurs, stop the servo drive for at least 30s before further operations.

- E631.1: 24 V or brake not connected
  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
The brake or the 24 power supply is not connected when the internal brake feature is used.	Check whether 24 V power supply or the brake is not connected when H02.16 is set to 1.	If you use the internal brake, connect the brake cable and 24 power supply.
2. DO or VDO configuration 9: Brake function, and the function is not enabled by H04.24.	2. DO or VDO configuration 9: Brake function, and H04.24 = 0.	If you use a DO brake, set H0E-10 to 1.

- E631.2: P-MOS open circuit
  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, P-MOS open circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	Replace the servo drive. Turn off the brake switch H02.16.

- E631.3: N-MOS open circuit
  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, N-MOS open circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	Replace the servo drive. Turn off the brake switch H02.16.

- E640.0: IGBT over-temperature
  Cause:

  The IGBT temperature reaches the fault threshold defined by H0A.18.

Cause	Troubleshooting	Solution
1. The ambient temperature is too high. 2. The servo drive is restarted repeatedly to reset the overload fault.	Measure the ambient temperature and view the fault records (set H0b.33 and view H0b.34) to check whether an overload fault/ alarm is reported (E620.0, E630.0, E650.0, E909.0, E920.0, E922.0).	Improve the cooling conditions of the servo drive to lower down the ambient temperature. Change the fault reset method. After overload occurs, wait for 30s before reset. Increase the capacities of the servo drive and servo motor. Increase the acceleration/ deceleration time and reduce the load.
3. The fan is damaged.	Check whether the fan works properly during operation.	Replace the servo drive.
4. The servo drive is installed in a wrong direction and the clearance between servo drives is improper.	Check whether the servo drive is installed properly.	Install the servo drive according to the installation requirements.
5. The servo drive is faulty.	The fault persists even though the servo drive is restarted five minutes after power-off.	Replace the servo drive.

Note

When the fault occurs, stop the servo drive for at least 30s before further operations.

- E640.1: Flywheel diode overtemperature
  Cause:

  The temperature of the flywheel diode reaches the fault threshold defined by H0A.18.

Cause	Troubleshooting	Solution
1. The ambient temperature is too high. 2. The servo drive is restarted repeatedly to reset the overload fault.	Measure the ambient temperature and view the fault records (set H0b.33 and view H0b.34) to check whether an overload fault/ alarm is reported (E620.0, E630.0, E650.0, E909.0, E920.0, E922.0).	Improve the cooling conditions of the servo drive to lower down the ambient temperature. Change the fault reset method. After overload occurs, wait for 30s before reset. Increase the capacities of the servo drive and servo motor. Increase the acceleration/ deceleration time and reduce the load.
3. The fan is damaged.	Check whether the fan works properly during operation.	Replace the servo drive.
4. The servo drive is installed in a wrong direction and the clearance between servo drives is improper.	Check whether the servo drive is installed properly.	Install the servo drive according to the installation requirements.
5. The servo drive is faulty.	The fault persists even though the servo drive is restarted five minutes after power-off.	Replace the servo drive.

Note

When the fault occurs, stop the servo drive for at least 30s before further operations.

- E650.0: Heatsink overtemperature
  Cause:

  The temperature of the servo drive power module is higher than the overtemperature threshold.

Cause	Troubleshooting	Solution
1. The ambient temperature is too high. 2. The servo drive is restarted repeatedly to reset the overload fault.	Measure the ambient temperature. View the fault log. (set H0b.33 and view H0b.34). Check whether an overload fault or alarm (E620.0, E630.0, E650.5, E909.0, E920.0, E922.0) occurs.	Improve the cooling conditions of the servo drive to lower down the ambient temperature. Change the fault reset method. After overload occurs, wait for 30s before reset. Increase the capacities of the servo drive and servo motor. Increase the acceleration/ deceleration time and reduce the load.
3. The fan is damaged.	Check whether the fan works properly during operation.	Replace the servo drive.
4. The servo drive is installed in a wrong direction and the clearance between servo drives is improper.	Check whether the servo drive is installed properly.	Install the servo drive according to the installation requirements.
5. The servo drive is faulty.	The fault persists even though the servo drive is restarted five minutes after power-off.	Replace the servo drive.

Note

When the fault occurs, stop the servo drive for at least 30s before further operations.

- E660.0: Motor overtemperature
  Cause:
  - The temperature of the air-cooled motor is too high.
  - PTC was turned on by mistake through H00.26.

Cause	Troubleshooting	Solution
• The temperature of the air-cooled motor is too high. • PTC was turned on by mistake through H00.26.	Measure whether the temperature of the air-cooled motor is too high. Check whether PTC is enabled on the drive, but the motor has no PTC hardware. Or check whether PTC is connected properly. For an Inovance motor, the temperature threshold is 130°C. For a third-party motor, measure the PTC resistance and determine the motor temperature based on the resistance specifications.	• Cool the motor down. • Check whether PTC is enabled on the drive, but the motor has no PTC hardware. • Check whether PTC is connected properly.

- E661.0: STune failure
  Cause:

  During STune operation, the gain drops to the lower limit. Position loop gain < 5 Speed loop gain < 5 Model loop gain < 10.

Cause	Troubleshooting	Solution
During ETune operation, the gain drops to the lower limit: Position loop gain < 5 Speed loop gain < 5 Model loop gain < 10.	Check if vibration resonance is properly suppressed in the system. The torque vibration amplitude exceeds the setpoint of H09.11.	Set the notch manually. Modify the electronic gear ratio to improve the command resolution, or increase the command filter time constant or in the parameter configuration interface. Check whether the current of the machine fluctuates periodically. Set H09.58 to 1 to clear resonance suppression parameters, and perform STune again.

- E662.0: ETune failure
  Cause:

  Check whether resonance that occurred during ETune operation cannot be suppressed.

Cause	Troubleshooting	Solution
Check whether resonance that occurred during ETune operation cannot be suppressed.	Check whether there is abnormal noise or torque fluctuation during operation.	Set the notch manually when vibration cannot be suppressed automatically. Modify the electronic gear ratio to improve the command resolution, increase the command filter time constant or in the parameter configuration interface. Increase the value of H09.11 as appropriate. Check whether the current of the machine fluctuates periodically. Check whether the positioning threshold is too low. Increase the reference acceleration/deceleration time.

- E664.0: Resonance too strong
  Cause:

  Resonance occurs on the servo system and the torque fluctuation amplitude is higher than the value of H09.54.

Cause	Troubleshooting	Solution
Resonance occurs on the servo system and the torque fluctuation amplitude is higher than the value of H09.54.	Check whether there is abnormal noise or torque fluctuation during operation.	Check whether the inertia ratio or loop gain parameters are set properly. Check whether resonance parameters are set properly. Increase the value of H09.54 or set H09.54 to 0 to disable this function.

- E720.0: Wrong encoder interface
  Cause:

  The drive does not support the selected encoder interface.

Cause	Troubleshooting	Solution
The drive does not support the selected encoder interface.	Check whether H32.01 and H0F.06 are set properly. If the gantry function is turned on, check whether the gantry function conflicts with the master encoder or full closed-loop encoder setting.	Check whether the signal cable required by the current encoder interface scheme exceeds the upper limit of a single interface. Modify H32.01 and H0F.01.

- E731.0: Encoder multi-turn data lost
  Cause:

  Encoder multi-turn data is lost.

Cause	Troubleshooting	Solution
1. The battery of the first encoder is not connected during power-off.	Check whether the battery is connected during power-off.	Set H0d.20 to 1 to clear the fault.
2. The battery voltage of the first encoder is lower than 2.9 V.	Measure the battery voltage.	Use a new battery with the matching voltage.
3. The first encoder is interfered with by a strong magnetic field.	Check whether the encoder is in a strong magnetic field.	Remove the magnetic field and set H0d.20 to 1 to clear the error.

- E731.1: Inovance second encoder multi-turn data lost
  Cause:

  Inovance 2nd encoder multi-turn data is lost.

Cause	Troubleshooting	Solution
1. The battery of the Inovance second encoder is not connected during power-off.	Check whether the battery is connected during power-off.	Set H0d.20 to 1 to clear the fault.
2. The Inovance second encoder battery voltage is lower than 2.9 V.	Measure the battery voltage.	Use a new battery with the matching voltage.
3. The Inovance second encoder is interfered with by a strong magnetic field.	Check whether the encoder is in a strong magnetic field.	Remove the magnetic field and set H0d.20 to 1 to clear the error.

- E733.0: Encoder multi-turn counting error
  Cause:

  An encoder multi-turn counting error occurs.

Cause	Troubleshooting	Solution
The encoder is faulty.	Set H0d.20 to 2 to clear the fault, but E733.0 persists after restart.	Replace the motor.

- E733.1: Inovance 2nd encoder multi-turn counting error.
  Cause:

  Inovance second encoder multi-turn counting error

Cause	Troubleshooting	Solution
Inovance 2nd encoder error	Set H0d.20 to 3 to clear the fault, but E733.1 persists after restart.	Replace the motor.

- E735.0: Encoder multi-turn counting overflow
  Cause:

  A multi-turn counting overflow occurs on the absolute encoder.

Cause	Troubleshooting	Solution
The number of forward revolutions exceeds 32767 or the number of reverse revolutions exceeds 32768.	Check whether the value of H0b.70 (Number of absolute encoder revolutions) is 32767 or 32768 when the servo drive works in the absolute linear mode (H02.01 = 1).	Set H0d.20 to 2 to power on again. Perform homing if necessary.

- E740.0: Absolute encoder communication timeout
  Cause:

  The encoder realtime communication timeout state is set in 100 consecutive current loop cycles.

Cause	Troubleshooting	Solution
1. The encoder cable is connected improperly or in poor contact.	Check the wiring of the encoder and power on the servo drive again. Check whether the value of HJ30.16 (Encoder feedback mode) exceeds 100.	Check the wiring of the encoder and power on the servo drive again.
2. The motor type is set incorrectly.	Check the setting of the motor type parameter.	Check whether the encoder type is consistent with the setting. Power on the servo drive again.
3. The encoder is damaged.	Replace the encoder.	Replace the encoder.

- E740.2: Absolute encoder error
  Cause:

During non-real-time communication (power-on initialization and reading ROM): encoder communication timeout, stop bit error, CRC error, data field error and position count error.

During real-time communication: The above-mentioned errors occur for N (set by H0A_50) consecutive times.

Cause	Troubleshooting	Solution
1. The encoder cable is abnormal. The communication with encoder suffers from interference.	Check whether the value of H0b.28 is not 0. Check whether the signal transmission is interfered with.	Check whether the servo drive and motor are grounded properly. You can wind a magnetic ring on the encoder cable to reduce interference and use a twisted pair.
2. The data length of the third party encoder is set incorrectly.	Check the encoder manual to see if H00.43/H00.44 are set to the correct values.	Check the encoder manual and set the encoder data length correctly.

- E740.3: Absolute encoder single-turn calculation error
  Cause:

  Internal fault of the encoder.

Cause	Troubleshooting	Solution
Internal fault of the encoder.	Check whether bit7 of H0b.28 is set to 1.	Check whether the encoder version (H00-04) is proper. Check whether encoder cables are in proper condition. Replace the motor.

- E740.6: Encoder data write error
  Cause:

  The attempt to write the encoder data fails.

Cause	Troubleshooting	Solution
An error occurs when writing the position offset after angle auto-tuning.	Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	Use a new encoder cable. If the fault persists after the encoder cable is replaced, the encoder may be faulty. In this case, replace the servo motor.

- E740.8: BiSS-C register communication failure
  Cause:

  Non-real-time communication: encoder communication timeout, stop bit error, CRC error, data field error.

Cause	Troubleshooting	Solution
1. The BiSS-C read head is loose, and the distance between the head and the scale does not meet the installation requirements.	Check the head for abnormal illumination of the indicator. Check whether the indicator is lit when the head is at a certain position.	Reinstall the read head. Replace the scale. Replace the read head.
2. BiSS-C scale is contaminated.		
3. The BiSS-C encoder read head is damaged.		

- E740.9: Encoder data transmit delay is too long
  Cause:

  The encoder data transmit delay is set to exceed one current loop period.

Cause	Troubleshooting	Solution
1. The value of H01.59 is set too large.	Check if the fault persists after a power cycle.	Decrease the value of H01.59.
2. Too many encoder data bits.		Use an encoder with fewer data bits.

- E755.0: Nikon encoder communication fault
  Cause:

  Nikon encoder communication failure.

Cause	Troubleshooting	Solution
Nikon encoder communication error	Perform a power cycle to check if the error is still reported.	Manually reset the encoder error through H0d.21. If the error remains, check the encoder and its wiring.

- E760.0: Encoder overtemperature
  Cause:

  The temperature of the absolute encoder is too high.

Cause	Troubleshooting	Solution
The temperature of the absolute encoder is too high.	Measure the encoder temperature or the motor temperature, which must not exceed 120°C. Note that you are measuring the temperature of the housing, which is is 20°C to 40°C lower than the internal temperature.	Switch off the S-ON signal to wait for the encoder to cool down.

- E765.0: Nikon encoder over-temperature or overspeed

Cause	Troubleshooting	Solution
Motor overtemperature	Check if the ambient temperature or the average load rate is too high.	Switch off the S-ON signal to wait for the encoder to cool down.

- E770.0: Fully-closed loop input phase A wire breakage
  Cause:

  Fully-closed phase A input differential voltage wire breakage.

Cause	Troubleshooting	Solution
Fully-closed phase A input differential voltage wire breakage.	Measure the phase A differential voltage to check if it is below 2.5 V.	Adjust the fully-closed loop phase A input voltage.

- E770.1: Fully-closed loop input phase B wire breakage
  Cause:

  Fully-closed phase B input differential voltage wire breakage.

Cause	Troubleshooting	Solution
Fully-closed phase B input differential voltage wire breakage.	Measure the phase B differential voltage to check if it is below 2.5 V.	Adjust the fully-closed loop phase B input voltage.

- E770.2: Fully-closed loop input phase Z wire breakage
  Cause:

  Fully-closed phase Z input differential voltage wire breakage.

Cause	Troubleshooting	Solution
Fully-closed phase Z input differential voltage wire breakage	Measure the phase Z differential voltage to check if it is below 2.5 V.	Adjust the fully-closed loop phase Z input voltage.

- E770.3: fully closed-loop external loop encoder communication timeout
  Cause:

  Fully closed-loop external loop encoder communication timeout.

Cause	Troubleshooting	Solution
Fully closed-loop external loop encoder communication timeout.	Check the wiring.	Check the wiring.

- E770.6: Fully closed-loop Inovance 2nd encoder initialization communication error
  Cause:

  The Inovance second encoder failed to initialize.

Cause	Troubleshooting	Solution
1. The encoder cable connections are incorrect or loosened.	Check encoder wiring. Check for strong vibration, which loosens the encoder cable and even damages the encoder.	Connect the encoder cables according to the correct wiring diagram. Re-connect encoder cables and ensure encoder terminals are connected securely.
2. The servo drive is faulty.	The fault persists after the servo drive is restarted.	Replace the servo drive.

- E770.7: Fully closed-loop 2nd encoder communication error
  Cause:

  Second encoder communication failed.

Cause	Troubleshooting	Solution
1. The encoder is wired improperly. 2. The encoder cable is connected loosely. 3. The encoder Z signal suffers from interference. 4. The encoder is faulty. 5. Check whether H0F.29–H0F.33 are set correctly.	Check encoder wiring. Check for strong vibration, which loosens the encoder cable and even damages the encoder. Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. Check whether ambient devices are generating interference and whether multiple interference sources are present in the cabinet. Make servo drive stay in "rdy" status and rotate motor shaft counterclockwise (CCW) manually and observer whether H0b.17 (electrical angle) increases/decreases smoothly. Turning one circle corresponds to five 0–360° (for Z series motors). For X series motors, turning one circle corresponds to four 0–360°. If H0b.17 changes abnormally during motor rotating, the encoder is faulty. If no alarm is reported during motor shaft rotating but an alarm is reported during servo drive running, interference may exist. Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change. Check the encoder manual to see if H0F.29–H0F.33 are set to the correct values.	Connect the cables again according to the correct wiring diagram. Connect the cables again and ensure encoder terminals are connected securely. It is recommended to use the cables provided by Inovance. If a customized cable is used, check whether this cable is a shielded twisted pair cable that complies with the specifications. Route the motor cables and encoder cables through different routes. Ensure the servo motor and servo drive are grounded properly. Check whether the connectors at both ends of the encoder are in good contact and whether any pin retracts. Use a new encoder cable. If the fault persists after encoder cables are replaced, the encoder may be faulty. In this case, replace the servo motor. Check the encoder manual to see if H0F.29–H0F.33 are set to the correct values.

- E770.8: Full closed-loop encoder data transmit delay is too large

Cause:

The encoder data transmit delay is set to exceed one current loop period.

Cause	Troubleshooting	Solution
1. The value of H01.59 is set too large.	The fault persists after a power cycle.	Decrease the value of H01.59.
2. Too many encoder data bits.		Use an encoder with fewer data bits.

- E771.0: Communication handshake failure between interpolator and drive
  Cause:

  Communication handshake failed between the interpolator and drive.

Cause	Troubleshooting	Solution
Communication between T2 interpolator and motor is abnormal during power-on initialization.	• Check whether power cycling is not performed after parameters are written to the interpolator. • Check the wiring between the interpolator and motor.	• Power off and on again. • Check the wiring. If the alarm remains after several power cycling, replace the motor.

- E939.0: Motor power cable disconnected
  Cause:

  At least one phase of the motor is disconnected.

Cause	Troubleshooting	Solution
1. One or two phases of the motor power cable are disconnected. 2. The actual current loop gain is set improperly.	Check the wiring of U/V/W power cables. The power cable is not disconnected. The current feedback and torque reference follow are abnormal. Perform inductive resistance auto-tuning and current loop auto-tuning again.	Check whether the power cables are disconnected or in poor contact. Re-connect the power cables. Replace the servo motor. Perform inductive resistance auto-tuning and current loop auto-tuning again.

- EA33.0: Encoder read/write check error
  Cause:

  Internal parameters of the encoder are abnormal.

Cause	Troubleshooting	Solution
1. The serial incremental encoder cable is disconnected or loose.	Check the wiring.	Check whether the encoder cables are connected incorrectly, disconnected, or in poor contact. If the motor cables and encoder cables are bundled together, separate them.
2) An error occurs when reading/writing the RS485 encoder parameters.	If the fault persists after the servo drive is powered off and on repeatedly, the encoder is faulty.	Replace the servo motor.

- EA33.1: Fully closed-loop Inovance 2nd encoder data read/write error
  Cause:

  Internal parameters of the encoder are abnormal.

Cause	Troubleshooting	Solution
1. The serial incremental encoder cable is disconnected or loose.	Check the wiring.	Check whether the encoder cables are connected incorrectly, disconnected, or in poor contact. If the motor cables and encoder cables are bundled together, separate them.
2) An error occurs when reading/writing the RS485 encoder parameters.	If the fault persists after the servo drive is powered off and on repeatedly, the encoder is faulty.	Replace the servo motor.

- EA34.0: Abnormal Hall state
  Cause:

  Hall signal output is all high or all low.

Cause	Troubleshooting	Solution
Hall signal output is all high or all low.	Check the wiring of the Hall sensor. Collect the states of the Hall sensor with the oscilloscope in InoDriverShop. Push the motor, and observe whether there is 0 or 7 in the states.	Check the U, V and W wiring of the Hall sensor. If the alarm persists after several power cycling, the Hall sensor must be faulty and you must replace it. Check whether the encoder shield is connected properly. If a phase of the Hall sensor is connected incorrectly, you can adjust the level active state of a single phase through H32.55.

- EA34.1: Dynamic Hall auto-tuning error
  Cause:

  Dynamic Hall auto-tuning error.

Cause	Troubleshooting	Solution
Anomaly was found during electrical angle evaluation.	Check whether the motor can move normally. Check whether the Hall signal output corresponds to the electrical angle change. Check whether the motor is equipped with a Hall sensor. Check the wiring of the Hall sensor.	Ensure that the motor can move on one side regardless of the limit. If the motor parameters are normal, but one Hall signal change does not correspond to a 60° electrical angle approximately after several tests, the Hall signal output must be abnormal and you must replace the Hall sensor. Check whether the motor is equipped with a Hall sensor. Check the wiring of the Hall sensor.

- EA34.2: Static Hall auto-tuning error
  Cause:

  Static Hall auto-tuning error

Cause	Troubleshooting	Solution
Failed to enable static Hall auto-tuning.	1: Check whether the motor is connected to an incremental encoder.	Only motors with an incremental encoder support static Hall auto-tuning.
	2. Check whether H32.62 is 1 when H0A.13 is set to 6.	If not, perform dynamic Hall auto-tuning again.

- EB00.0: Position deviation too large
  Cause:

  The position deviation in the position control mode is larger than the setpoint of 6065h (Threshold of excessive position deviation).

Cause	Troubleshooting	Solution
1. U/V/W output phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The servo drive U/V/W cables or the encoder cable is disconnected.	Check the wiring.	Connect the cables again. The servo drive power cables must be connected in the correct order at both

Cause	Troubleshooting	Solution
		ends. If necessary, replace all cables and ensure a reliable connection.
3. The motor stalls due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter) • References in the speed control mode: H0b.01 (Speed reference) • References in the torque control mode: H0b.02 (Internal torque reference) Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
4. The gain values are too low.	Check the position loop gain and speed loop gain of the servo drive. 1st gain set: H08.00...H08.02 2nd gain set: H08.03...H08.05	Adjust the gain values manually or perform gain auto-tuning.
5. The position reference increment is too large.	Position control mode: • In CSP mode, check the gear ratio 6091.01h/6091.02h to determine the position reference increment for an individual synchronization period and convert it to the speed information. • In PP mode, check the gear ratio 6091.01h/6091.02h and determine the 6081h (Profile velocity). • In HM mode, check the gear ratio 6091.01h/6091.02h, and determine 6099.01h and 6099.02h.	• CSP: Decrease the position reference increment per synchronization period. The host controller should cover the position ramp when generating references. • PP: Decrease the value 6081h or increase the acceleration/deceleration ramp (6083h, 6084h). • HM: Decrease 6099.01h and 6099.02h or increase the acceleration/deceleration ramp (609Ah). • Decrease the gear ratio according to actual conditions.

Cause	Troubleshooting	Solution
6. The value of 6065h is insufficient for the operating conditions.	Check the value of 6065h.	Increase the setpoint of 6065h.
7. The servo drive/motor is faulty.	Monitor the operation waveform through the oscilloscope function in the software tool: position references, position feedback, speed references, and torque references.	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB00.1: Position deviation overflow
  Cause:

  The position deviation is too large.

Cause	Troubleshooting	Solution
1. U/V/W output phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The servo drive U/V/W cables or the encoder cable is disconnected.	Check the wiring.	Connect the cables again. The servo drive power cables must be connected in the correct order at both ends. If necessary, replace all cables and ensure a reliable connection.
3. The motor stalls due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter). • References in the speed control mode: H0b.01 (Speed reference). • References in the torque control mode: H0b.02 (Internal torque reference). Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
4. The gain values are too low.	Check the position loop gain and speed loop gain of the servo drive.	Adjust the gain values manually or perform gain auto-tuning.

Cause	Troubleshooting	Solution
	• 1st gain set: H08.00... H08.02 • 2nd gain set: H08.03... H08.05	
5. The position reference increment is too large.	Position control mode: • In CSP mode, check the gear ratio 6091.01h/ 6091.02h to determine the position reference increment for an individual synchronization period and convert it to the speed information. • In PP mode, check the gear ratio 6091.01h/6091.02h and determine the 6081h (Profile velocity). • In HM mode, check the gear ratio 6091.01h/ 6091.02h, and determine 6099.01h and 6099.02h.	• CSP: Decrease the position reference increment per synchronization period. The host controller should cover the position ramp when generating references. • PP: Decrease the value 6081h or increase the acceleration/deceleration ramp (6083h, 6084h). • HM: Decrease 6099.01h and 6099.02h or increase the acceleration/deceleration ramp (609Ah). Decrease the gear ratio according to actual conditions.
6. The value of 6065h is insufficient for the operating conditions.	Check the value of 6065h.	Increase the setpoint of 6065h.
7. The servo drive/motor is faulty.	Monitor the operation waveform through the oscilloscope function in the software tool: position references, position feedback, speed references, and torque references.	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB01.1: Individual position reference increment too large
  Cause:

  The target position increment is too large.

Cause	Troubleshooting	Solution
The target position increment is too large.	Check the variation between two adjacent target positions using the software tool.	Check whether the maximum speed of the motor fulfills the application requirement. If yes, reduce the target position reference increment, which is to lower the profile reference speed. If not, replace the servo motor. Before switching the mode or enabling the servo drive, check whether the target position is aligned with current position feedback. The communication sequence of the host controller is abnormal, leading to slave data error. Check the communication sequence of the host controller.

- EB01.2: Position reference increment too large continuously
  Cause:

  The target position increment is too large continuously.

Cause	Troubleshooting	Solution
The target position increment is too large continuously.	Check the variation between two adjacent target positions using the software tool.	Check whether the maximum speed of the motor fulfills the application requirement. If yes, reduce the target position reference increment, which is to lower the profile reference speed. If not, replace the servo motor. Before switching the mode or enabling the servo drive, check whether the target position is aligned with current position feedback. The communication sequence of the host controller is abnormal, leading to slave data error. Check the communication sequence of the host controller.

- EB01.3: Command overflow
  Cause:

  The target position is still in the process of transmission when the servo limit or software position limit signal is activated and the 32-bit upper/lower limit is reached.

Cause	Troubleshooting	Solution
The target position is still in the process of transmission when the servo limit or software position limit signal is activated and the 32-bit upper/lower limit is reached.	Check whether the host controller continues sending commands after overtravel alarm is reported by the servo drive.	Detect the servo limit signal (bit0 and bit1 of 60FDh is recommended) through the host controller. Stop sending limit direction commands when an active servo limit signal is detected by the host controller.

- EB02.0: Position deviation exceeding threshold in fully closed-loop
  Cause:

  The absolute value of position deviation in fully closed-loop mode exceeds the value of H0F.08 (Excessive position deviation threshold in fully closed-loop mode).

Cause	Troubleshooting	Solution
1. U/V/W output phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The servo drive U/V/W cables or the encoder cable is disconnected.	Check the wiring.	Connect the cables again. The servo drive power cables must be connected in the correct order at both ends. If necessary, replace all cables and ensure a reliable connection.
3. The motor stalls due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter). • References in the speed control mode: H0b.01 (Speed reference). • References in the torque control mode: H0b.02 (Internal torque reference).	Rectify the mechanical-related problem.

Cause	Troubleshooting	Solution
	Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	
4. The gain values are too low.	Check the position loop gain and speed loop gain of the servo drive. • 1st gain set: H08.00... H08.02 • 2nd gain set: H08.03... H08.05	Adjust the gain values manually or use gain auto-tuning.
5. The input pulse frequency is high.	When the position reference source is pulse reference, check whether the input pulse frequency is too high or whether the acceleration/deceleration time is set to 0 or an excessively low value.	Reduce the position reference frequency or the electronic gear ratio. When the host controller is used to output position pulses, you can set the acceleration time in the host controller. If the acceleration/deceleration time cannot be set in the host controller, increase the values of H05.04 and H05.06.
6. The value of H0F.08 is insufficient for the operating conditions.	Check the value of H0F.08.	Increase the setpoint of H0F.08.
7. The servo drive/motor is faulty.	Monitor the operation waveform through the oscilloscope function in the software tool: position references, position feedback, speed references, and torque references.	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB02.1: Fully closed-loop position deviation overflow
  Cause:

  The absolute value of the fully closed-loop position deviation is greater than 2^{31}.

Cause	Troubleshooting	Solution
1. UVW phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The servo drive UVW cables or the encoder cables are disconnected.	Check the wiring.	Connect the cables again. The drive power cables must be connected in the correct order at both ends. If necessary, replace all cables

Cause	Troubleshooting	Solution
		and ensure a reliable connection.
3. The motor stalls due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter). • References in the speed control mode: H0b.01 (Speed reference). • References in the torque control mode: H0b.02 (Internal torque reference). Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
4. The gain values are too low.	Check the position loop gain and speed loop gain of the servo drive. • 1st gain set: H08.00... H08.02 • 2nd gain set: H08.03... H08.05	Adjust the gain values manually or perform gain auto-tuning.
5. The position reference increment is too large.	Position control mode: • In IP/CSP mode, check the gear ratio 6091.01h/ 6091.02h to determine the position reference increment for an individual synchronization period and convert it to the speed information. • In PP mode, check the gear ratio 6091.01h/6091.02h and determine the 6081h (Profile velocity). • In HM mode, check the gear ratio 6091.01h/ 6091.02h, and determine 6099.01h and 6099.02h.	• IP/CSP: Decreases the position reference increment per synchronization period. The host controller should cover the position ramp when generating references. • PP: Decreases the value of 6081h or decreases the acceleration/deceleration ramp (6083h, 6084h). • HM: Decreases 6099.01h and 6099.02h or decreases the acceleration/ deceleration ramp (609Ah). Reduce the gear ratio as needed.

Cause	Troubleshooting	Solution
6. The value of H0F.08 is insufficient for the operating conditions.	Check the value of 6065h.	Increase the setpoint of 6065h.
7. The servo drive/motor is faulty.	Monitor the operating waveform using the oscilloscope function of Inovance commissioning software and check whether the operating waveform includes the following information: position reference, position feedback, speed reference, torque reference	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB03.0: Electronic gear ratio beyond the limit - H05.02
  Cause:

  The electronic gear ratio exceeds the limit: [0.001, 4000 x Encoder resolution/ 10000].

Cause	Troubleshooting	Solution
The electronic gear ratio converted by converted exceeds the maximum gear ratio or is less than the minimum gear ratio.	Check if the electronic gear ratio is within the range of 0.001–4000 × Encoder resolution/10000.	Change the value of H05.02.

- EB03.1: Electronic gear ratio beyond the limit - Electronic gear ratio 1
  Cause:

  The electronic gear ratio exceeds the limit: [0.001, 4000 × Encoder resolution/ 10000].

Cause	Troubleshooting	Solution
Electronic gear ratio 1 exceeds the maximum gear ratio or is less than the minimum gear ratio.	Check if electronic gear ratio 1 is within the range of 0.001–4000 × Encoder resolution/10000.	Change the values of H05.07/H05.09.

- EB03.2: Electronic gear ratio beyond the limit - Electronic gear ratio 2
  Cause:

  Electronic gear ratio 2 exceeds the limit: [0.001, 4000 × Encoder resolution/ 10000].

Cause	Troubleshooting	Solution
Electronic gear ratio 2 exceeds the maximum gear ratio or is less than the minimum gear ratio.	Check if electronic gear ratio 2 is within the range of 0.001–4000 × Encoder resolution/10000.	Change the values of H05.11/H05.13.

- EB04.0: Large gantry position deviation
  Cause:

  Gantry position deviation is too large.

Cause	Troubleshooting	Solution
Gantry position deviation is too large. The gantry position deviation is too large after mechanical homing enabling is off.	Check whether the gantry position deviation exceeds the threshold set in H14.45, or is related to any instrument or device.	Increase the value of H14.45.

- EB04.1: Gantry position deviation overrun
  Cause:

  Gantry position deviation overruns.

Cause	Troubleshooting	Solution
The deviation of two gantry axes exceeds the internal 32-bit data.	Check whether the gantry alignment mode is suitable. Check whether the position command of the two axes are the same and whether the mechanical structure is abnormal.	Check whether the gantry alignment mode is suitable. Check whether the position command of the two axes are the same and whether the mechanical structure is abnormal.

- ED02.0: Modbus communication timeout
  Cause:

  Modbus communication timeout

Cause	Troubleshooting	Solution
Modbus communication timeout.	Increase the value of H0E.83.	Determine the Modbus access cycle by frame grab.

- EE08.0: Synchronization (SYNC) signal loss
  Cause:

  The SYNC signal is turned off when the EtherCAT network is in the OP state.

Cause	Troubleshooting	Solution
The SYNC signal is not generated due to hardware errors.	Check whether the SYNC signal period is 0 using the oscilloscope in the software tool.	Replace the servo drive. Contact Inovance for maintenance.
The data received by the slave is abnormal during synchronous communication.	Check whether the STP is used as the communication cable. Check whether the servo drive is well grounded. Check the Ethernet port of the servo drive is damaged.	Use the STP cable. Connect the cable according to the wiring instructions. Check the network connection status through the first LED on the left.
The data transmitted by the master is abnormal during synchronous communication.	The synchronous clock of the host controller is not activated. Excessive error occurs on the synchronization clock of the host controller.	Measure the synchronization cycle through an actual oscilloscope or the oscilloscope tool in the Inovance servo commissioning software. If the synchronization cycle is 0, the host controller synchronous clock is not activated. In this case, check whether the network cables connected to each slave come in from the IN port and out from the OUT port. If yes, restart the network. If the network cable is connected in the correct sequence, restart the network. If the synchronization period is not 0 and within the permissible fluctuation range (2 μs) of the drive, increase the synchronization loss threshold of the slave (H0E.32h).
When the servo drive is enabled, the network status switches from OP to non-OP.	Check whether the network status switches from OP to non-OP.	Check the network status switchover program of the host controller.

- EE08.1: Status switchover error
  Cause:

  When the servo drive is enabled, the EtherCAT network status switches from OP to other status.

Cause	Troubleshooting	Solution
This fault is caused by mal-operation of the master or the operator.	Check whether the master switches the network status when the servo drive is enabled.	Check the network status switchover program of the host controller.
The data received by the slave is abnormal during synchronous communication.	Check whether the STP is used as the communication cable. Check whether the servo drive is well grounded. Check the Ethernet port of the servo drive is damaged.	Use the STP cable. Connect the cable according to the wiring instructions. Check the network connection status through the first LED on the left.
The data transmitted by the master is abnormal during synchronous communication.	The synchronous clock of the host controller is not activated. Excessive error occurs on the synchronization clock of the host controller.	Measure the synchronization cycle through an actual oscilloscope or the oscilloscope tool in the Inovance servo commissioning software. If the synchronization cycle is 0, the host controller synchronous clock is not activated. In this case, check whether the network cables connected to each slave come in from the IN port and out from the OUT port. If yes, restart the network. If the network cable is connected in the correct sequence, restart the network. If the synchronization period is not 0 and within the permissible fluctuation range (2 μs) of the drive, increase the synchronization loss threshold of the slave (H0E.32h).
When the servo drive is enabled, the network status switches from OP to non-OP.	Check whether the network status switches from OP to non-OP.	Check the network status switchover program of the host controller.

- EE08.3: Network cable connected improperly
  Cause:

  The network cable of the servo drive is connected improperly. (The low 16 bits of H0E.29 represents the number of IN port loss events. The high 16 bits of H0E.29 represents the number of OUT port loss events.)

Cause	Troubleshooting	Solution
The physical connection of the data link is unstable or the process data is lost due to plug-in/plug-out of the network cable.	Check whether the network cable of the servo drive is connected securely. Check whether strong vibration occurs on site. Check whether the network cable was unplugged. Check whether the network cable used is the one designated by Inovance.	Check the connection of the network port through the change of the H0E.29 value. Use a new network cable that can connect reliably.

- EE08.4 Data frame loss protection error
  Cause:

  PDO data is corrupted due to EMC interference or an inferior network cable.

Cause	Troubleshooting	Solution
The data is lost due to EMC interference, poor quality of the network cable or improper connection.	Check whether the high 16 bits of H0E.25 have values that are increased.	• Check whether the servo drive is grounded properly and rectify the EMC problem. • Check whether the network cable used is the one designated by Inovance. • Check whether the network cable is connected properly.

- EE08.5: data frame transfer error
  Cause:

  The upstream slave detects that the data frame has been corrupted and marked, which is then transferred to the downstream slave, leading to an alarm.

Cause	Troubleshooting	Solution
The upstream station detects that the data frame has been corrupted and marked, which is then transfered to the slave, leading to an alarm.	Check whether a processing unit error occurs due to transfer error (H0E.27) or invalid frames (H0E.28) upon occurrence of the fault, and check whether no counting is performed in RX-ERR of Port0.	Check the upstream slave to locate the fault cause.

- EE08.6: Data update timeout
  Cause:

  The slave is in the OP status and does not receive the data frame in a long time.

Cause	Troubleshooting	Solution
The data frame is lost or aborted in the upstream slave or the master performance is not up to standard.	Check through the software tool whether the phase difference between SYNC and IRQ exceeds the value of H0E.22 multiplied by the communication period.	• Check whether the operating load of the master CPU is excessive. Increase the communication time or set H0E-22 to a larger value. • Check whether link loss occurs on the upstream slave.

- EE09.0: Software position limit setting error
  Cause:

  The lower limit of the software limit is equal to or larger than the upper limit.

Cause	Troubleshooting	Solution
The lower limit of the software limit is equal to or larger than the upper limit.	Check the values of 607D.01h and 607D.02h.	Reset the values and ensure the former is smaller than the latter.

- EE09.1: Home setting error
  Cause:

  The home offset exceeds the upper/lower limit.

Cause	Troubleshooting	Solution
1) The home offset is beyond the software limit.	The home offset is outside the software position limit when the encoder works in the incremental mode, absolute linear mode, and single-turn absolute mode.	Set the home offset to a value within the software position limit.
2) The home offset is beyond the upper/lower limit in the rotating mode.	The home offset is outside the mechanical single-turn upper/lower limit when the encoder works in the rotation mode.	Set the home offset to a value within the mechanical single-turn upper/lower limit.

- EE09.2: Gear ratio beyond the limit
  Cause:

  The electronic gear ratio exceeds the limit: (0.001, 4000 x Encoder resolution/ 10000).

Cause	Troubleshooting	Solution
The electronic gear ratio setpoint exceeds the limit: (0.001, 4000 x Encoder resolution/10000).	The gear ratio 6091.01h/ 6091.02h exceeds the preceding range.	Set the gear ratio within the required range.

- EE09.3: No synchronization signal

Cause:

The MCU does not receive the synchronization signal when the servo communication is switched to OP status.

Cause	Troubleshooting	Solution
1) The communication synchronization clock is configured improperly.	Use another master (such as Beckhoff or Omron PLC) and perform tests to compare between different masters.	Rectify improper configurations.
2) The IN/OUT port for EtherCAT communication is connected reversely.	Check the connection of the IN and OUT ports.	Connect the IN and OUT ports in the correct sequence.
3) The slave controller chip is damaged.	If the fault persists after the master is replaced, measure the synchronization signal generated by the slave controller integrated circuit with an oscilloscope. If there is no signal, the slave controller integrated circuit is damaged.	Return to the factory for maintenance.
4) The MCU pins are damaged.	Test the synchronization signal generated by the slave controller integrated circuit with an oscilloscope. If there is a signal, the pins of the MCU integrated circuit are damaged.	Return to the factory for maintenance.

- EE09.5: PDO mapping beyond the limit
  Cause:

  The mapping objects in TPDO or RPDO exceeds 40 bytes.

Cause	Troubleshooting	Solution
The mapping objects in TPDO or RPDO exceeds 40 bytes.	Check the number of self-indexes configured in 1600h or 1A00h.	The mapping objects in TPDO or RPDO must not exceed 40 bytes.

- EE10.0: Protection against MailBox setting error
  Cause:
  - Check if the SM channel is enabled.
  - Check if the read-write direction is configured correctly.
  - Check if it is the Mailbox mode (single-cache mode).
  - Check if the length of the received data is between the minimum and maximum set lengths.
  - Check if the address of the received data is between the minimum and maximum set addresses.

- Check the read-write mailbox memory for overlap.

Cause	Troubleshooting	Solution
1. The master station is configured incorrectly. 2. The slave XML file is incorrect.	Fault code is displayed on the panel.	Check the configuration of SM0 and SM1 channels for errors.

- EE10.1: SM2 setting error
  Cause:
  - PDO mapping object dictionary index exceeds the set maximum (0x1600–0x170A).
  - When SM2 is not enabled, the length of SM and the length of RxPDO are not equal to 0.
  - The length of the RxPDO does not match.
  - Not writing.
  - In the preop state, the address of RxPDO is not in the set address field (maximum and minimum addresses), or in a non-preop state, the address of SM2 is equal to the starting address of RxPDO.
  - The memory of SM2 overlaps with adjacent SM1 or SM3.

Cause	Troubleshooting	Solution
The master station is configured incorrectly. The slave XML file is incorrect.	Check the configuration of SM2 for errors. Check whether the index of the RxPDO mapping object dictionary is out of bounds (the maximum index is 0x0A).	Ensure that the SM2 channel is configured correctly. The index of the RxPDO mapping object dictionary is correct.

- EE10.2: SM3 setting error
  Cause:
  - PDO mapping object dictionary index exceeds the set maximum (0x1A00–0x1B0A).
  - When SM3 is not enabled, the length of SM and the length of TxPDO are not equal to 0.
  - The length of the TxPDO does not match.
  - Not reading.
  - In the preop state, the address of TxPDO is not in the set address field (maximum and minimum addresses), or in a non-preop state, the address of SM3 is equal to the starting address of TxPDO.
  - Buffer overruns. The memory of SM2 overlaps SM3 and SM0 or SM1.

Cause	Troubleshooting	Solution
The master station is configured incorrectly. The slave XML file is incorrect.	Check the configuration of SM3 for errors. Check whether the index of the TxPDO mapping object dictionary is out of bounds (the maximum index is 0x1A).	Ensure that the SM3 channel is configured correctly. The index of the TxPDO mapping object dictionary is correct.

- EE10.3: PDO watchdog setting error
  Cause:
  - The watchdog is enabled but the count is 0.
  - The watchdog is not enabled but the count is non-zero.

Cause	Troubleshooting	Solution
The watchdog is enabled but the count is 0. The watchdog is not enabled but the count is non-zero.	The settings of the master station is incorrect.	Make sure the watchdog time is configured correctly.

- EE10.4: Protection against incomplete PLL (no sync signal)
  Cause:

  During SAFEOP-to-OP, DC is enabled, but not running.

Cause	Troubleshooting	Solution
During SAFEOP_2_OP, DC is enabled, but not running.	The settings of the master station is incorrect.	Make sure a sync0 signal is generated.

- EE10.5: PHY setting error
  Cause:

  An error occurred during PHY chip configuration in power-on initialization, and the PHY cannot work normally.

Cause	Troubleshooting	Solution
The PHY chip is damaged, or the pin is falsely or continuously soldered.	The alarm persists in spite of a power cycle.	Return to the factory for maintenance.

- EE11.0: ESI check error
  Cause:

  The attempt to load the XML file fails during EtherCAT communication.

Cause	Troubleshooting	Solution
The XML file is not downloaded.	Check whether the XML version displayed in H0E.96 is normal.	Download the XML file.
The servo drive is faulty. The XML file is modified unexpectedly.	The XML version number is not empty.	H0E. 37 is set to 1 and power on and off again.

- EE11.1: EEPROM read failure
  Cause:

  The EEPROM communication of external EtherCAT devices fails.

Cause	Troubleshooting	Solution
The EtherCAT data in the EEPROM cannot be read.	This fault persists after the servo drive is powered off and on several times.	Replace the servo drive.

- EE11.2: EEPROM update failure
  Cause:

  The communication is normal but the message in the EEPROM is wrong or lost.

Cause	Troubleshooting	Solution
The EtherCAT data in the EEPROM cannot be updated.	This fault persists after the servo drive is powered off and on several times.	Replace the servo drive.

- EE11.3: ESI and drive mismatch

Cause	Troubleshooting	Solution
1. The downloaded XML file is not compatible with the drive. 2. The servo drive is faulty. The XML file is modified unexpectedly.	Check whether the XML version displayed in H0E.96 is normal.	Download the XML file.

- EE12.0: EtherCAT initialization failure

Cause	Troubleshooting	Solution
1. The device configuration file is not programmed.	The slave ID is null when the host controller scans the slave.	Program the device configuration file.
2. The servo drive is faulty.	The servo drive is faulty.	Replace the servo drive.

- EE13.0: EtherCAT sync period setting error
  Cause:

  The synchronization period is not an integer multiple of 125 μs or 250 μs after the network switches to the OP mode.

Cause	Troubleshooting	Solution
The synchronization cycle is not a integral multiple of 125 μs or 250 μs.	Check the setting of the synchronization period in the controller.	Modify the synchronization cycle to an integral multiple of 125 μs or 250 μs.

- EE15.0: Excessive EtherCAT sync period error
  Cause:

  The synchronization cycle error exceeds the threshold.

Cause	Troubleshooting	Solution
Excessive error occurs to the synchronization cycle of the controller.	• Measure the synchronization cycle of the controller. • Through a digital oscilloscope. • Measure the synchronization cycle of the controller by using the oscilloscope function in the software tool.	Increase the value of H0E.32.

Note

You can clear the fault or restart the power supply 30s after overload occurs.

- EE16.0: MCU and ESC communication error
  Cause:

  MCU and ESC communication timeout

Cause	Troubleshooting	Solution
MCU and ESC communication timeout	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.

- EEE0.0: gantry paired axis error
  Cause:

  Gantry paired axis error.

Cause	Troubleshooting	Solution
Gantry paired axis error.	Check whether the gantry paired axis.	Eliminate the fault.

28.4.3.2 Internal Faults

When any one of the following fault occurs, contact Inovance for technical support.

- E111.0: Internal parameter error
- E602.0: Angle auto-tuning failure
- E220.0: Phase sequence incorrect
- EA40.0: Parameter auto-tuning failure

28.4.4 Description of Alarm Codes

- E108.0: Parameter write error
  Cause:

  Parameter values cannot be written to EEPROM.

Cause	Troubleshooting	Solution
Parameter writing error	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- E108.1: Parameter read error
  Cause:

  Parameter values cannot be read from EEPROM.

Cause	Troubleshooting	Solution
The parameter-read operation is abnormal, and the system indicates an EEPROM read failure.	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- E108.2: EEPROM write check error
  Cause:

  The check on the data written in EEPROM failed.

Cause	Troubleshooting	Solution
A check error occurs after parameter writing.	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- E108.3: EEPROM read check error
  Cause:

  The check on the data read in EEPROM failed.

Cause	Troubleshooting	Solution
An error occurs during parameter-reading.	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- E108.4: Single data stored too many times
  Cause:

  Single data is stored too frequently.

Cause	Troubleshooting	Solution
That may damage EEPROM over time.	Check H0b.90 and H0b.91. H0b.90 shows the parameter in question or object dictionaries (in hexadecimal). If H0b.91=15, H0b.90 shows internal variables of software. 2. Check "Func Test 1" through the oscilloscope channel. Be sure to display it in hexadecimal. This channel displays the address that EEPROM is storing. 3. Check the storage count through the oscilloscope channel "Func Test 2".	If the alarm is caused by manually modifying a certain parameter or object dictionary, there will be no frequent storage of a certain data during operation, and you can reset the fault. Check the abnormal parameter through H0b. 90 or oscilloscope channel, and find out the cause. For example, if the host controller program frequently writes parameters through SDO, you can modify the program to stop it or set H0E.01 to 0 (Do not access EEPROM when writing parameters or object dictionaries).

- E110.0: Frequency-division pulse output setting error
  Cause:

  The frequency-division output setpoint (H05.17) exceeds the encoder resolution.

Cause	Troubleshooting	Solution
The number of frequency divisions (quadrupled) exceeds the motor revolutions	Check the setpoint of H05.17.	Adjust the value of H05.17 on the basis of the motor revolutions.

- E120.3: The motor and drive do not match in the power
  Cause:

  the motor and drive do not match in the rated power.

Cause	Troubleshooting	Solution
The rated current/voltage of the motor is higher than that of the drive.	Check whether the rated motor current/voltage is larger than that of the drive.	Replace the motor or drive.

- E121.0: Invalid S-ON command
  Cause:

  A redundant S-ON signal is sent when some auxiliary functions are used.

Cause	Troubleshooting	Solution
The external S-ON signal is active when servo drive is enabled internally.	Check whether auxiliary functions (H0d.02, H0d.03, and H0d.12) are used and DI function 1 (FunIN.1: S-ON, S-ON signal) is active.	Deactivate the DI assigned with FunIN.1 (both hardware DI and virtual DI).

- E126.3: PR process segment write parameter out of limit
  Cause:

  In the process segment mode, the written value exceeds the upper limit of the parameter.

Cause	Troubleshooting	Solution
In the process segment mode, the written value exceeds the upper limit of the parameter.	Check the upper and lower limits of the parameter.	In the process segment mode, the written value exceeds the upper limit of the parameter.

- E510.0: Frequency division pulse output overspeed
  Cause:

  The output pulse frequency exceeds the frequency upper limit allowed by the hardware (4 MHz) when pulse output is used (H05.38 = 0 or 1 or 2).

Cause	Troubleshooting	Solution
The MCU detects excessive pulse increment fed back by FPGA.	When 1.H05.38 is set to 0 (encoder frequency-division output) or 2 (2nd encoder frequency-division output), check whether the output pulse frequency corresponding to the motor speed upon fault exceeds the limit. Output pulse frequency (Hz) = Motor speed (rpm)/60 x H05.17. The input pulse frequency exceeds 2 MHz or interference exists in the pulse input pins when 2.H05.38 is set to 1 (Reference pulse synchronous output). Low speed pulse input pins: open-collector input terminals: PULLHI, PULSE+, PULSE-, SIGN+, SIGN-; maximum pulse frequency: 200 kHz. High-speed pulse input pins: differential input terminals: HPULSE+, HPULSE-, HSIGN+, HSIGN-; maximum pulse frequency: 4 MHz.	1. Decrease the value of H05.17 (encoder frequency-division pulses) to allow the output pulse frequency, within the speed range required by the machine, to drop below the frequency upper limit allowed by the hardware. 2. Decrease the input pulse frequency to a value within the frequency upper limit allowed by hardware. In this case, if you do not modify the electronic gear ratio, the motor speed will decrease. If the input pulse frequency is high but is still within the frequency upper limit allowed by the hardware, take anti-interference measures (use STP cable for pulse input and set pin filter parameter H0A.24 or H0A.30). This is to prevent false alarms caused by interference pulses superimposed to actual pulse references.

- E600.0: Inertia auto-tuning failure
  Cause:

  Vibration cannot be suppressed. You can set notch parameters (H09.12...H09.23) manually to suppress vibration.

  The auto-tuned values fluctuate dramatically. Increase the maximum operating speed, reduce the acceleration/deceleration time, and shorten the stroke of the lead screw during ETune operation.

  Mechanical couplings of the load are loose or eccentric. Rectify the mechanical faults.

  An alarm occurs during auto-tuning and causes interruption. Rectify the fault causes and perform inertia auto-tuning again.

  The vibration cannot be suppressed if the load carries large inertia. In this case, increase the acceleration/deceleration time to ensure the motor current is unsaturated.

The position following-up is too poor. That is, the maximum speed of the motor is less than the speed setpoint of the inertia auto-tuning. Ensure that the speed setpoint is less than the maximum speed of the motor.

Cause	Troubleshooting	Solution
1. Continuous vibration occurs during auto-tuning. 2. The auto-tuned values fluctuate dramatically. 3. Mechanical couplings of the load are loose or the mechanism is eccentric. 4. A warning occurs during auto-tuning, interrupting the operation. 5. The vibration cannot be suppressed if the load carries large inertia. In this case, increase the acceleration/deceleration time to ensure the motor current is unsaturated. 6. The position following-up is too poor. That is, the maximum speed of the motor is less than the speed setpoint of the inertia auto-tuning.	Perform internal inspection to check whether the torque jitters upon stop (not FFT. Check whether three times more than the last auto-tuned value for variation less than 5 times; 0.5 times more than last auto-tuned value for variation above 5 times.	1. Rectify the fault and perform auto-tuning again. Rectify the fault causes and perform inertia auto-tuning again. 2. For vibration that cannot be suppressed, enable vibration suppression. 3. Ensure mechanical couplings are connected securely. 4. Increase the maximum operating speed, reduce the acceleration/deceleration time, and shorten the stroke of the lead screw during ETune operation. 5. Ensure that the speed setpoint is less than the maximum speed of the motor.

- E601.0: Homing alarm
  Cause:

  Homing time exceeds the setpoint.

Cause	Troubleshooting	Solution
1. The home switch is faulty.	There is only high-speed searching but no low-speed searching during homing. After high-speed searching, low-speed searching in the reverse direction applies.	If a hardware DI is used, check whether the corresponding DI function is allocated to a certain DI in group 2003h and check the wiring of this DI. Change the DI logic manually and observe the value of H0B.03 (monitored DI status) to monitor whether the servo drive receives corresponding DI level changes. If the home signal is Z signal but it cannot be found, check the condition of the Z signal.
2. The homing time limit is too short.	Check whether the value of H05.35h (Time limit for homing) is too small.	Increase the value of H05.35.
3. The speed in high-speed searching for the home switch signal is too low.	Check the distance between the start position of homing and the home switch. Then check whether the setpoint of 6099.01h (Speed in high-speed searching for the home switch signal) is too low, resulting in a long homing process.	Increase the value of 6099.01h.

- E601.1: Homing switch error
  Cause:

  The homing switch is set improperly.

Cause	Troubleshooting	Solution
The home switch is set improperly.	Check whether the limit signals at both sides are activated. Check whether the limit signal and the deceleration point signal/home signal are both activated. Check whether the positive and negative position limits are activated successively.	Set the position of the physical switch properly.

- E601.2: Homing mode setting error
  Cause:

  The homing method value is too large.

Cause	Troubleshooting	Solution
The homing method value is too large.	Check the homing method value (object dictionary 6098h).	Change the value of 6098h.

- E601.4: Gantry homing mode setting error
  Cause:

  Gantry homing mode setting error.

Cause	Troubleshooting	Solution
You have set a wrong homing mode for the gantry through H05.31.	Check the setting.	Change the setting.

- E602.9: Angle auto-tuning not done for incremental encoder motor
  Cause:

  Angle auto-tuning is not performed for the incremental encoder motor.

Cause	Troubleshooting	Solution
Angle auto-tuning is not performed for the incremental encoder, and corresponding alarm is enabled.	Check whether bit1 of H32.04 is set.	1. The alarm is automatically reset after the angle auto-tuning is completed. 2. If you do not need this alarm, reset bit1 of H32.04.

- E607.0: Large gantry torque deviation
  Cause:

  Gantry torque deviation is too large.

Cause	Troubleshooting	Solution
Large gantry torque deviation	Gantry torque deviation is too large.	Check the wiring of the gantry.

- E608.0: Master-to-slave parameter setting error
  Cause:

  Master-to-slave parameter setting error.

Cause	Troubleshooting	Solution
Master-to-slave parameter setting error	The parameter value exceeds the limit or the communication between drives is poor.	Check the setpoint of H14.03.

- E609.0: Data save timeout
  Cause:

  Wire breakage occurred when the software was downloading data.

Cause	Troubleshooting	Solution
Wire breakage occurred when the software was downloading data.	Check that the drive is connected to the software.	Download the data again.

- E609.1: Data save overflow
  Cause:

  Wire breakage occurred when the software was downloading data.

Cause	Troubleshooting	Solution
Wire breakage occurred when the software was downloading data.	Check that the drive is connected to the software.	Download the data again.

- E609.2: Failed to save data
  Cause:

  Failed to save data.

Cause	Troubleshooting	Solution
The FLASH memory chip or the interface between MCU and FLASH failed.	Power on multiple times and download data again.	If the problems persists, replace the drive.

- E609.3: Failed to erase data
  Cause:

  Failed to erase data.

Cause	Troubleshooting	Solution
The FLASH memory chip or the interface between MCU and FLASH failed.	Power on multiple times and download data again.	If the problems persists, replace the drive.

- E621.1: Overload current limiting torque attained
  Cause:

  Overload current limiting torque attained.

Cause	Troubleshooting	Solution
1. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque. 2. The acceleration/ deceleration is too frequent or the load inertia is too large. 3. The motor and encoder cables are connected incorrectly or in poor contact. 4. The gain adjustment is improper or the stiffness is too high. 5. The motor is stalled due to mechanical factors, resulting in overload during operation. 6. The servo drive is faulty.	1. Confirm the overload characteristics of the servo drive or servo motor. Check whether the average load rate (H0b.12) of the servo drive keeps exceeding 100.0%. 2. Detect whether the value of H3277 is set too high.	1. Replace with a servo drive of higher capacity and a matching servo motor, or reduce the load and increase the acceleration/ deceleration time.

- E631.4: P-MOS short circuit
  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, the P-MOS short circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	1. Replace the servo drive. 2. Turn off the brake switch H02.16.

- E631.5: N-MOS short circuit
  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, the N-MOS short circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	1. Replace the servo drive. 2. Turn off the brake switch H02.16.

- E730.0: Encoder battery alarm
  Cause:

  The voltage of the absolute encoder battery is lower than 3.0 V.

Cause	Troubleshooting	Solution
The voltage of the absolute encoder battery is lower than 3.0 V.	Measure the battery voltage.	Use a new battery with the matching voltage.

Note

E731.0 and E733.0 can trigger E730.0. See E731.0 and E733.0 for other solutions.

- E730.1: Inovance 2nd encoder battery voltage low
  Cause:

  Inovance 2nd encoder battery voltage is lower than 3.0 V.

Cause	Troubleshooting	Solution
Inovance 2nd encoder battery voltage is too low.	Measure the battery voltage.	Use a new battery with the matching voltage.

- E831.1: AI1 zero offset too large
  Cause:

  The zero drift of AI1 exceeds 500 mV.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI1 input filter time.
2. The servo drive is faulty.	Disconnect AI1 and measure whether the actual terminal voltage exceeds 0.5 V.	If not, replace the servo drive.

- E831.2: AI2 zero offset too large
  Cause:

  The zero drift of AI2 exceeds 500 mV.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI2 input filter time.
2. The servo drive is faulty.	Disconnect AI2 and measure whether the actual terminal voltage exceeds 0.5 V.	If not, replace the servo drive.

- E834.1: AI1 overvoltage
  Cause:

  AI1 input voltage is greater than 11.5 V.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI1 input filter time.
2. The input voltage is too high.	Measure whether the actual terminal voltage exceeds 11.5 V.	Adjust the input voltage to a value lower than 11.5 V.

- E834.2: AI2 overvoltage
  Cause:

  AI2 input voltage is greater than 11.5 V.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI2 input filter time.
2. The input voltage is too high.	Measure whether the actual terminal voltage exceeds 11.5 V.	Adjust the input voltage to a value lower than 11.5 V.

- E900.0: DI emergency braking
  Cause:

  The logic of the DI terminal (including the hardware DI and virtual DI) allocated with DI function 34 (FunIN.34) is effective.

Cause	Troubleshooting	Solution
The DI function 34 (EmergencyStop) is triggered.	Check whether the logic of the DI allocated with DI function 34 (FunIN.34: Emergency stop) is valid.	Check the operation mode and clear the active DI braking signal without affecting the safety performance.

- E902.0: Invalid DI/VDI setting
  Cause:

  DI function parameters are set to invalid values.

Cause	Troubleshooting	Solution
DI or VDI function selections are invalid.	Check whether DI function configure parameters in H03 and H17 are set to invalid values.	Set DI/VDI function parameters to valid values.

- E902.1: Invalid DO/VDO setting
  Cause:

  DO/VDO function parameters are set to invalid values.

Cause	Troubleshooting	Solution
DO or VDO function selections are invalid.	Check whether DI function configure parameters in H04 and H17 are set to invalid values.	Set DO/VDO function parameters to valid values.

- E902.2: Invalid setting for torque reach
  Cause:

  The DO parameters set for torque reach in the torque control mode are invalid.

Cause	Troubleshooting	Solution
The DO parameters set for torque reach in the torque control mode are invalid.	Check whether the value of H07.22 is lower than or equal to the value of H07.23 (unit: 0.1%).	Set H07.22 to a value higher than that of H07.23.

- E909.0: Motor overload alarm
  Cause:

  The accumulative heat of the motor reaches 90% of the fault threshold.

Cause	Troubleshooting	Solution
1. The motor cables and encoder cable are connected improperly or in poor contact.	Check the wiring among the servo drive, servo motor and the encoder according to the correct wiring diagram.	Connect cables according to the correct wiring diagram. It is recommended to use the cables provided by Inovance. When customized cables are used, prepare and connect the customized cables according to the wiring instructions.
2. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque.	Confirm the overload characteristics of the servo drive or motor. Check whether the average load rate (H0b.12) keeps exceeding 100.0%.	Use a servo drive of higher capacity and a matching servo motor. Reduce the load and increase the acceleration/ deceleration time.
3. Acceleration/Deceleration is too frequent or the load inertia is too large.	Check the mechanical inertia ratio or perform inertia auto-tuning. View the value of H08.15 (load moment of inertia ratio). Confirm the individual operation cycle when the servo motor operates cyclically.	Increase the acceleration/ deceleration time.
4. Gains are improper or the stiffness level is too high.	Check whether the motor vibrates and generates	Readjust the gain.

Cause	Troubleshooting	Solution
	unusual noise during operation.	
5. The servo drive model or motor model is set improperly.	View the model of the motor equipped with a serial-type encoder in H00.05 and the servo drive model in H01.10.	Read the servo drive nameplate and set the servo drive model (H01.10) and motor model properly.
6. The motor is stalled due to mechanical factors, resulting in overload during operation.	Check the running reference and motor speed (H0b.00) through Inovance servo commissioning software or keypad: • References in the position control mode: H0b.13 (Input position reference counter) • References in the speed control mode: H0b.01 (Speed reference) • References in the torque control mode: H0b.02 (Internal torque reference) Check whether the reference value is not 0 or is very large but the motor speed is 0 RPM in the corresponding mode.	Rectify the mechanical-related problem.
7. The servo drive is faulty.	Power off and on the servo drive.	Replace the servo drive.

- E910.0: Control circuit overvoltage

Cause	Troubleshooting	Solution
Overvoltage occurred on the control circuit of the drive.	Measure whether the input voltage in the control circuit cable is within the following range: 220 V servo drive: Value range: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V) 380 V servo drive: Value range: 380 V to 440 V Allowable deviation: –10% to +10% (342 V to 484 V) Check whether control circuit cables are connected properly and whether the voltage of control circuit cables (L1C, L2C) is within the specified range.	Re-connect or replace the cables.

- E920.0: External braking resistor overload
  Cause:

  The accumulative heat of the braking resistor exceeds the set value.

Cause	Troubleshooting	Solution
1. The external braking resistor is connected improperly or disconnected.	Remove the external braking resistor and measure whether its resistance is "∞" (infinite). Measure whether the resistance between terminals P⊕ and C is "∞" (infinite).	Replace with a new external braking resistor. If the resistance measured is the same as the nominal value, connect the external braking resistor between terminals P ⊕ and C.
		Connect the external braking resistor between terminals P ⊕ and C with a proper cable.
2. The jumper between terminals P ⊕ and D is shorted or disconnected when the built-in braking resistor is used.	Measure whether the resistance between terminals P ⊕ and D is "∞" (infinite).	Ensure terminals P ⊕ and D are jumpered.
3. H02.25 (Braking resistor type) is set improperly when an external braking resistor is used.	• View the setpoint of H02.25. • Check whether the resistance of the external braking resistor connected between P ⊕ and C is too large by comparing it with the value listed in Table	Set H02.25 according to section “Wiring and Setting of Braking Resistor” in SV680-INT Series Servo Drive Hardware Guide. H02.25 = 1 (external, naturally ventilated)

Cause	Troubleshooting	Solution
	"Specifications of the braking resistor".	H02.25 = 2 (external, forced-air cooling)
4. The resistance of the external braking resistor is too large.	• Check whether the value of H02.27 is larger than the resistance of the external braking resistor between terminals P ⊕ and C.	Select a proper braking resistor according to section "Specifications of the Braking Resistor" in SV680-INT Series Servo Drive Hardware Guide.
5. The setpoint of H02.27 (Resistance of external braking resistor) is higher than the resistance of the external braking resistor used.		Set H02.27 according to the resistance of the external braking resistor used.
6. The input voltage of the main circuit is beyond the specified range.	Check whether the input voltage of the main circuit cable on the drive side is within the following range: • 200 V servo drive:Value range: 200 V to 240 VAllowable deviation: –10% to +10% (198 V to 242 V) • 400 V servo drive:Value range: 400 V to 440 VAllowable deviation: –10% to +10% (342 V to 484 V)	Replace or adjust the power supply according to the specified range.
7. The load moment of inertia ratio is too large.	Perform moment of inertia auto-tuning according to section "Inertia auto-tuning" in SV680-INT Series Servo Drive Function Guide. Or calculate the total mechanical inertia based on mechanical parameters. Check whether the actual load inertia ratio exceeds 30.	• Select an external braking resistor with large capacity and set H02.26 (Power of the external braking resistor) to a value consistent with the actual power. • Select a servo drive with large capacity. • Reduce the load if allowed. • Increase the acceleration/deceleration time if allowed. • Increase the motor operation cycle if allowed.
8. The motor speed is excessively high and deceleration is not done within the set time. The motor is in the continuous deceleration status during cyclic operation.	View the motor speed curve in cycle running and check whether the motor is in deceleration status for a long period.	

Cause	Troubleshooting	Solution
9. The capacity of the servo drive or the braking resistor is insufficient.	View the motor's single cycle speed curve and calculate whether maximum braking energy can be absorbed completely.	
10. The servo drive is faulty.	-	Replace the servo drive.

- E921.0: Dynamic brake resistor overload alarm
  Cause:

  The dynamic braking resistor is close to overload.

Cause	Troubleshooting	Solution
The accumulative heat of the dynamic braking resistor is close to the maximum thermal capacity of the resistor.	Check whether the value of H0b.98 exceeds 70%.	Ensure that the motor cannot be driven reversely in the dynamic braking state.

- E922.0: Resistance of the external braking resistor too small
  Cause:

  The value of H02.27 (resistance of external braking resistor) is lower than the value of H02.21 (permissible min. resistance of external braking resistor).

Cause	Troubleshooting	Solution
When an external braking resistor is used (H02.25 = 1 or 2), the resistance of this resistor is lower than the minimum resistance allowed by the servo drive.	Measure whether the resistance of the external braking resistor between terminals P ⊕ and C is lower than the value of H02.21 (Permissible minimum resistance of braking resistor).	• If yes, replace with an external braking resistor that matches the drive, set H02.27 to a value consistent with the resistance of this resistor, and connect this resistor between terminals P ⊕ and C. • If not, set H02.27 to a value consistent with the resistance of the external braking resistor used.

- E924.0: Regenerative transistor overtemperature
  Cause:

  The estimated temperature of the regenerative transistor is higher than H0A.49 (discharge overtemperature threshold).

Cause	Troubleshooting	Solution
1. The junction temperature of the regenerative transistor is too high. 2. The regenerative transistor will be turned off automatically after overload occurs.	The regenerative transistor temperature exceeds the threshold defined by H0A.49.	Control the working conditions and usage of the regenerative transistor.

- E940.0: Change of controlled motor is detected. It is recommended to restore factory settings before use
  Cause:

  Change of controlled motor is detected. It is recommended to restore factory settings before use

Cause	Troubleshooting	Solution
It is detected that the control type of the controlled motor has changed (for example, changing from rotary servo motor control to linear motor control). To ensure the normal functions and thresholds of the drive, it is recommended to restore the factory settings before use. The alarm is raised only once.	Check whether the value of H00.00 is changed.	It is recommended to restore the factory settings before use when any change is made in the controlled motor. If the fault remains, you can maintain the original parameter settings.

- E941.0: Parameter modifications activated at next power-on
  Cause:

  When the parameter effective mode of the drive is set to "Re-power-on", after the parameter value is changed, the servo drive prompts the user to power on again.

Cause	Troubleshooting	Solution
The parameters modified are those whose "Effective time" is "Next power-on".	Check whether parameters you modified are those whose "Effective Time" is "Next power-on".	Power off and on the servo drive again.

- E942.0: Parameter saved frequently
  Cause:

  The number of parameters modified at a time exceeds 700.

Cause	Troubleshooting	Solution
Too many parameters are modified and saved to EEPROM at a brief interval.	Check whether parameters are modified through the host controller at a brief interval.	Check the operation mode. For parameters that need not be saved to EEPROM, set H0E.01 to the correct value before the host controller perform write operation.

- E950.0: Forward overtravel alarm
  Cause:

  The logic of the DI allocated with FunIN.14: P-OT (positive limit switch) is valid.

Cause	Troubleshooting	Solution
1. The logic of the DI assigned with FunIN.14 (P-OT function 14, positive limit switch) is effective.	Check whether a certain DI in group H03 is assigned with FunIN.14. Check whether the logic of DI corresponding to the bit of H0b.03 (Monitored DI status) is effective.	Check the running mode. On the prerequisite of safety, send a reverse command or rotate the motor to deactivate the logic of the DI terminal allocated with DI function 14.
2. The servo position feedback reaches the positive software position limit.	Check whether the position feedback (H0b.17) is close to the value of H0A.41. Check whether the software position limit is set in H0A.40.	Ensure the servo drive references are proper, allowing the load travel range to be within the software position limit.

- E952.0: Reverse overtravel alarm
  Cause:

  The logic of the DI allocated with FunIN.15: N-OT (negative limit switch) is valid.

Cause	Troubleshooting	Solution
1. The logic of the DI assigned with FunIN.15 is effective.	Check whether a certain DI in group H03 is assigned with FunIN.15. Check whether the logic of DI corresponding to the bit of H0b.03 (Monitored DI status) is effective.	Check the operation mode. On the prerequisite of ensuring safety, send a forward run command or rotate the motor to deactivate the logic of DI assigned with FunIN.15.
2. The servo position feedback reaches the negative software position limit.	Check whether the position feedback (H0b.17) is close to the value of H0A.43. Check whether the software position limit is set in H0A.40.	Ensure the servo drive references are proper, allowing the load travel range to be within the software position limit.

- E954.0: Position command overflow
  Cause:

Position reference overflow.

Cause	Troubleshooting	Solution
in PR mode, the position command is beyond the limit.	1. Check the position command. 2. Check the limit value.	Change the value of the position command and the limit.

- E956.0: Forward position reference overtravel in process segment position mode
  Cause:

  Forward position reference overtravel occurs in the process segment position mode.

Cause	Troubleshooting	Solution
Forward position reference overtravel occurs in the process segment position mode.	E956.0 occurs when the position reference exceeds the value of H22.04 when the motor runs forwardly in the process segment position mode.	Reduce the position reference to a value lower than the setpoint of H22.04.

- E958.0: Reverse position reference overtravel in process segment position mode
  Cause:

  Reverse direction position reference overtravel occurs in the process segment position mode.

Cause	Troubleshooting	Solution
Reverse position reference overtravel occurs in the process segment position mode.	E958.0 occurs when the position reference is less than the value of H22.06 when the motor runs reversely in the process segment position mode.	Increase the position reference to a value greater than the setpoint of H22.06.

- E971.0: Undervoltage alarm for voltage drop protection
  Cause:

  The bus voltage is lower than the undervoltage threshold. This alarm can be masked by setting bit1 of H0A.88 to 1.

Cause	Troubleshooting	Solution
The bus voltage is lower than the undervoltage threshold.	Check the bus voltage. This alarm can be masked by setting bit1 of H0A.88 to 1.	Check the power supply.

- E980.0: Frequency division output overflow
  Cause:

  Frequency division output overflow.

Cause	Troubleshooting	Solution
The frequency division output is too large. Calculation overflows.	Check if an E510.0 alarm has occurred and set H05.17 to a proper value so that E510.0 disappears.	Set H05.17 to a proper value or reduce the maximum operating speed.

- EA34.9: Hall is not configured
  Cause:

  Hall is not configured.

Cause	Troubleshooting	Solution
H00.26 is configured when dynamic Hall auto-tuning is enabled.	1. When 1.H0A.13 = 6, check whether bit3 of H00.26 is set to 1. 2. For a non-Hall sensor (bit3 of H00.26 is set to 0), check whether H0A.13 is set to 6 incorrectly.	1. For a Hall-enabled motor, you need to perform Hall auto-tuning (H0A.13=6) and set bit3 of H00.26 to 1. 2. For a non-Hall motor, Hall auto-tuning is unavailable (H0A.13 cannot be set to 6).

- EA41.0: Torque ripple compensation failure
  Cause:

  Torque ripple compensation failure.

Cause	Troubleshooting	Solution
Auto-tuning torque fluctuation compensation failure	1. Check whether homing is not performed during cogging torque ripple auto-tuning of the incremental encoder. 2. Confirm whether emergency stop or external fault interruption occurs during cogging torque ripple auto-tuning. 3. Torque ripple compensation auto-tuning failed. Please try again.	1. Perform homing during cogging torque ripple auto-tuning of the incremental encoder. 2. Avoid emergency stop or external fault interruption during cogging torque ripple auto-tuning. 3. Torque ripple compensation auto-tuning failed. Please try again.

- E08.7: Error frame pre-warning
  Cause:

  Check the increment of the 0x300 register every certain time (determined by H16.44). When the increment reaches the threshold defined by H16.43 (error frame pre-warning switch/threshold), the keypad displays E08.7 and H30.30 (error frame pre-warning count) + 1. If the incremental value is not greater than the set threshold in ten consecutive interval (defined in H16.44). the error frame pre-warning is cleared.

  Related parameters:

1. H16.43 - error frame pre-warning switch/threshold

   0: Disabled; 1, 2, 3...: Enabled. The value is 1, 2, 3 ...; The default value is 4.
2. H16.44: error frame pre-warning sampling interval (in ms, default: 1000)
3. H30.30: error frame pre-warning count (increased by 1 per trigger)

Cause	Troubleshooting	Solution
Interference or poor IN port cable.	Replace the IN port cable of the alarm device and install a magnetic ring. Check whether the alarm persists.	Replace the IN cable of the alarm device and install a magnetic ring.

Note:

1. If you do not want the host controller to know the warning, set bit10 of H0C.72 to 1.
2. If there is interference and the error frame warning threshold is too small, all devices may display an error frame warning.
3. Check the error frame warning mode:

   a. Check H30.30 on the keypad.
   b. View H30-30 through SDO on the PLC software.

28.5 Handling of Faults and Alarms [Functional Safety P]

28.5.1List of Fault and Alarm Codes

The servo drive can output the current highest-level fault/alarm code.

No. 1 non-resettable faults:

Table 28–9 List of No. 1 non-resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
E101	E101.3	CRC error during safety parameter initialization	NO.1	No	0x0101	0x31010101
	E101.4	Error in upper and lower limits verification during safety parameter initialization	NO.1	No	0x0101	0x41010101
	E101.5	Address error in read/write operation after the number of parameters changes	NO.1	No	0x0101	0x51010101
E104	E104.5	The number of interrupts in the safety module FPGA is abnormal	NO.1	No	0x0104	0x51040104

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
	E104.6	Safety module FPGA interrupt timed out	NO.1	No	0x0104	0x61040104
E145	E145.0	Safety module chip diagnosis failure	NO.1	No	0x0145	0x01450145
	E145.1	Safety module program execution exception	NO.1	No	0x0145	0x11450145
E154	E154.0	Speed-related functions enabled for non-safety encoder	NO.1	No	0x0154	0x01540154
	E154.1	Incorrect selection of safety function trigger mode	NO.1	No	0x0154	0x11540154
E740	E740.0	Encoder communication timeout	NO.1	No	0x7305	0x07400740
	E740.2	Encoder communication error	NO.1	No	0x7305	0x27400740
	E740.3	Absolute encoder single-turn calculation error	NO.1	No	0x7305	0x37400740
	E740.6	Encoder write error	NO.1	No	0x7305	0x67400740
	E740.9	Encoder data transmit delay too long	NO.1	No	0x7305	0x97400740
E750	E750.0	Deviation of master QEP and subdivision quadrant too large (over 2 pulses)	NO.1	No	0x0750	0x07500750
	E750.1	Difference between safety encoder master and slave positions too large	NO.1	No	0x0750	0x17500750
	E750.2	QEP difference between encoder master and slave too large	NO.1	No	0x0750	0x27500750
	E750.3	Difference between safety encoder master and slave analog values too large	NO.1	No	0x0750	0x37500750
	E750.4	Encoder chip power supply diagnosis exception	NO.1	No	0x0750	0x47500750
	E750.5	Encoder master and slave SN mismatch	NO.1	No	0x0750	0x57500750
	E750.6	Encoder chip diagnosis exception	NO.1	No	0x0750	0x67500750
	E750.7	Encoder SPI communication error, no response from slave	NO.1	No	0x0750	0x77500750
E751	E751.0	Safety module encoder CRC check error	NO.1	No	0x0751	0x07510751

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
	E751.1	Excessive deviation between speeds calculated by MCU1 and MCU2 of safety module	NO.1	No	0x0751	0x17510751
	E751.2	Safety module position 1 & 2 check error	NO.1	No	0x0751	0x27510751
	E751.3	Safety encoder version number CRC error	NO.1	No	0x0751	0x37510751

No. 1 resettable faults

Table 28–10 List of No. 1 resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
E124	E124.0	Different DIs allocated with the same function	NO.1	Yes	0x0124	0x01240124
	E124.1	DI1 input circuit diagnosis exception	NO.1	Yes	0x0124	0x11240124
	E124.2	DI2 input circuit diagnosis exception	NO.1	Yes	0x0124	0x21240124
	E124.3	DI3 input circuit diagnosis exception	NO.1	Yes	0x0124	0x31240124
	E124.4	DI4 input circuit diagnosis exception	NO.1	Yes	0x0124	0x41240124
	E124.5	DI5 input circuit diagnosis exception	NO.1	Yes	0x0124	0x51240124
E125	E125.0	SSM assigned with non-safety DO serial number	NO.1	Yes	0x0125	0x01250125
	E125.1	DO1 output circuit diagnosis exception	NO.1	Yes	0x0125	0x11250125
	E125.2	DO2 output circuit diagnosis exception	NO.1	Yes	0x0125	0x21250125
	E125.4	DO4 output circuit diagnosis exception	NO.1	Yes	0x0125	0x41250125
	E125.5	DO5 output circuit diagnosis exception	NO.1	Yes	0x0125	0x51250125
E134	E134.1	Discrepancy at two input signals of DI1	NO.1	Yes	0x0134	0x11340134
	E134.2	Discrepancy at two input signals of DI2	NO.1	Yes	0x0134	0x21340134
	E134.3	Discrepancy at two input signals of DI3	NO.1	Yes	0x0134	0x31340134
	E134.4	Discrepancy at two input signals of DI4	NO.1	Yes	0x0134	0x41340134

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
	E134.5	Discrepancy at two input signals of DI5	NO.1	Yes	0x0134	0x51340134
E135	E135.0	Chip 3.3V signal diagnosis exception	NO.1	Yes	0x0135	0x01350135
E150	E150.0	STO safety state applied	NO.1	Yes	0x0150	0x01500150
	E150.1	STO input state abnormal	NO.1	Yes	0x0150	0x11500150
	E150.2	Buffer 5 V supply error	NO.1	Yes	0x0150	0x21500150
	E150.3	STO input circuit hardware diagnosis failure	NO.1	Yes	0x0150	0x31500150
	E150.4	PWM Buffer hardware diagnosis failure	NO.1	Yes	0x0150	0x41500150
	E150.5	STO input signal interference	NO.1	Yes	0x0150	0x51500150
E151	E151.0	SCI communication exception between servo drive and safety module	NO.1	Yes	0x0151	0x01510151
	E151.1	SCI communication exception between two MCUs of the safety module	NO.1	Yes	0x0151	0x11510151
E152	E152.0	Failure of parameter verification between two MCUs of the safety module	NO.1	Yes	0x0152	0x01520152
	E152.1	Timeout for sending CRC between two MCUs of the safety module	NO.1	Yes	0x0152	0x11520152
	E152.2	Timeout for safety module to get initial servo parameters	NO.1	Yes	0x0152	0x21520152
E160	E160.0	SLS1 exceeded	NO.1	Yes	0x0160	0x01600160
	E160.1	SLS2 exceeded	NO.1	Yes	0x0160	0x11600160
	E160.2	SLS3 exceeded	NO.1	Yes	0x0160	0x21600160
	E160.3	SLS4 exceeded	NO.1	Yes	0x0160	0x31600160
E165	E165.0	SDIp exception	NO.1	Yes	0x0165	0x01650165
	E165.1	SDIn exception	NO.1	Yes	0x0165	0x11650165
E170	E170.0	SS1 deceleration ramp exception	NO.1	Yes	0x0170	0x01700170
	E170.1	SS2 deceleration ramp exception	NO.1	Yes	0x0170	0x11700170
	E170.2	SOS speed or position exceeds limit	NO.1	Yes	0x0170	0x21700170
E631	E631.0	SBC brake circuit diagnosis exception	NO.1	Yes	0x0631	0x06310631

No. 3 resettable warnings

Table 28–11 Resettable Alarm List

Warning code	Alarm subcode	Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
E108	E108.5	Safety module EEPROM write timed out	NO.3	Yes	0x0108	0x51080108
	E108.6	Safety module EEPROM read timed out	NO.3	Yes	0x0108	0x61080108
	E108.7	Safety module EEPROM write check error	NO.3	Yes	0x0108	0x71080108
	E108.8	Safety module EEPROM read check error	NO.3	Yes	0x0108	0x81080108
E115	E115.0	SSM parameter setting exception warning	NO. 3	Yes	0x0115	0x011150115
E116	E116.0	SLS overspeed warning	NO. 3	Yes	0x0116	0x011160116
	E116.1	SDI out of tolerance warning	NO. 3	Yes	0x0116	0x111160116

28.5.2Solutions to Faults

- E101.3: CRC error during safety parameter initialization
  Cause:

  The CRC value of the safety parameters is abnormal, which generally occurs after software update.

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The voltage of the control circuit power supply drops instantaneously.	• Check whether the control circuit (L1C, L2C) is in the process of power-off or instantaneous power failure occurs. • Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range:220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V)380 V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	• Restore safety parameters to default settings and write parameters again. • Increase the power supply capacity or replace the power supply with a power supply of higher capacity. Restore the safety parameters to default settings and write the parameters again.

Cause	Troubleshooting	Solution
3. Instantaneous power failure occurs when saving parameters.	Check whether instantaneous power failure occurs when saving parameters.	Power on again, restore the safety parameters to default settings and write parameters again.
4. The number of write operations within a certain period of time exceeds the limit.	Check whether parameters are updated frequently through the host controller.	Change the parameter writing method and write parameters again.
5. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E101.4: Error in upper and lower limits verification during safety parameter initialization
  Cause:

  1. The total number of the safety parameters changes, which generally occurs after software update.

  2. Values of the safety parameters exceed the limit, which generally occurs after software update.

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The voltage of the control circuit power supply drops instantaneously.	• Check whether the control circuit (L1C, L2C) is in the process of power-off or instantaneous power failure occurs. • Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range:220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V)380 V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	• Restore safety parameters to default settings and write parameters again. • Increase the power supply capacity or replace the power supply with a power supply of higher capacity. Restore the safety parameters to default settings and write the parameters again.
3. Instantaneous power failure occurs when saving parameters.	Check whether instantaneous power failure	Power on again, restore the safety parameters to default

Cause	Troubleshooting	Solution
	occurs when saving parameters.	settings and write parameters again.
4. The number of write operations within a certain period of time exceeds the limit.	Check whether parameters are updated frequently through the host controller.	Change the parameter writing method and write parameters again.
5. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E101.5: Address error in read/write operation after the number of parameters changes
  Cause:

  The total number of the safety parameters changes, which generally occurs after software update.

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E104.5: The number of interrupts in the safety module FPGA is abnormal
  Cause:

  The number of interrupts detected in 1 ms is less than four.

Cause	Troubleshooting	Solution
1. The FPGA is abnormal.	Power on and off repeatedly. The probability of failure is high.	Replace the servo drive and safety module.
2. The interrupt pin includes dry joint.		
3. The connection between the servo drive and the safety module is abnormal.		

- E104.6: Safety module FPGA interrupt timed out
  Cause:

  The FPGA interrupt is running longer than the interrupt dispatch time.

Cause	Troubleshooting	Solution
The safety module has failed.	Power on and off repeatedly. The probability of failure is high.	Replace the servo drive and safety module.

- E124.0: Different DIs allocated with the same function
  Cause:

  The function numbers of the safety DI terminals are duplicated.

Cause	Troubleshooting	Solution
One DI function cannot be reused by two or more DI terminals.	Check whether the same number is selected for different DIs.	Ensure that the number is unique.

- E124.1: DI1 input circuit diagnosis exception
  Cause:

  Send a diagnostic signal to DI1 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI1 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI1, and observe whether the input signal of DI1 changes (You can sample and analyze the input signal of DI1 through the background software oscilloscope).	• If the DI1 circuit is abnormal, shield DI1 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.2: DI2 input circuit diagnosis exception
  Cause:

  Send a diagnostic signal to DI2 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI2 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI2, and observe whether the input signal of DI2 changes (You can sample and analyze the input signal of DI2 through the background software oscilloscope).	• If the DI2 circuit is abnormal, shield DI2 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.3: DI3 input circuit diagnosis exception

Cause:

Send a diagnostic signal to DI3 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI3 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI3, and observe whether the input signal of DI3 changes (You can sample and analyze the input signal of DI3 through the background software oscilloscope).	• If the DI3 circuit is abnormal, shield DI3 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.4: DI4 input circuit diagnosis exception
  Cause:

  Send a diagnostic signal to DI4 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI4 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI4, and observe whether the input signal of DI4 changes (You can sample and analyze the input signal of DI4 through the background software oscilloscope).	• If the DI4 circuit is abnormal, shield DI4 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.5: DI5 input circuit diagnosis exception
  Cause:

  Send a diagnostic signal to DI5 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI5 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI5, and observe whether the input signal of DI5 changes (You can sample and analyze the input signal of DI5 through the background software oscilloscope).	• If the DI5 circuit is abnormal, shield DI5 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E125.0: SSM assigned with non-safety DO serial number
  Cause:

  Check whether SSM is assigned to DO3 and DO6.

Cause	Troubleshooting	Solution
The SSM cannot use non-safety DO as signal output.	Check whether the function numbers of DO3 and DO6 are set to 12: SSM-active.	Do not assign the function numbers of DO3 and DO6 as SSM functions.

- E125.1: DO1 output circuit diagnosis exception
  Cause:

  When DO1 is active, the MCU sends a diagnostic pulse to DO5 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO1, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO1 output circuit.	Shield DO1, and the safety module no longer detects whether there is a leakage current risk in DO1.

- E125.2: DO2 output circuit diagnosis exception
  Cause:

  When DO2 is active, the MCU sends a diagnostic pulse to DO5 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO2, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO2 output circuit.	Shield DO2, and the safety module no longer detects whether there is a leakage current risk in DO2.

- E125.4: DO4 output circuit diagnosis exception
  Cause:

  When DO4 is active, the MCU sends a diagnostic pulse to DO5 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO4, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO4 output circuit.	Shield DO4, and the safety module no longer detects whether there is a leakage current risk in DO4.

- E125.5: DO5 output circuit diagnosis exception
  Cause:

  When DO5 is active, the MCU sends a diagnostic pulse to DO5 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO5, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO5 output circuit.	Shield DO5, and the safety module no longer detects whether there is a leakage current risk in DO5.

- E134.1: Discrepancy at two input signals of DI1
  Cause:

  Check whether the DI1 input signal exceeds the value of H20.14.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI1 exceeds the value of H20.14.	Observe whether the difference lasts longer than the setpoint of H20.14.	Ensure the difference does not lasts longer than the value of H20.14.

- E134.2: Discrepancy at two input signals of DI2
  Cause:

  Check whether the DI2 input signal exceeds the value of H20.15.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI2 exceeds the value of H20.15.	Check whether the difference lasts longer than the setpoint of H20.15.	Ensure the difference does not last longer than the setpoint of H20.15.

- E134.3: Discrepancy at two input signals of DI3
  Cause:

  Check whether the DI3 input signal exceeds the value of H20.16.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI3 exceeds the value of H20.16.	Observe whether the difference lasts longer than the setpoint of H20.16.	Ensure the difference does not lasts longer than the value of H20.16.

- E134.4: Discrepancy at two input signals of DI4
  Cause:

Check whether the DI4 input signal exceeds the value of H20.17.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI4 exceeds the value of H20.17.	Check whether the difference lasts longer than the setpoint of H20.17.	Ensure the difference does not lasts longer than the value of H20.17.

- E134.5: Discrepancy at two input signals of DI5
  Cause:

  Check whether the DI5 input signal exceeds the value of H20.18.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI5 exceeds the value of H20.18.	Observe whether the difference lasts longer than the setpoint of H20.18.	Ensure the difference does not lasts longer than the value of H20.18.

- E135.0: Chip 3.3V signal diagnosis error
  Cause:

  The two chips diagnose whether the supply voltage of each other is within the allowed range of 3.0 V to 3.6 V.

Cause	Troubleshooting	Solution
The chip voltage is out of the range of 3.0 V to 3.6 V.	Perform a power cycle to check if the fault is eliminated.	Replace the servo drive.

- E145.0: Safety module chip diagnosis failure
  Cause:

  The chip diagnosis of the safety module failed.

Cause	Troubleshooting	Solution
1. The CPU diagnosis of the chip failed.	Power on and off repeatedly. The probability of failure is high.	Replace the servo drive and safety module.
2. The RAM diagnosis of the chip failed.		
3. The FLASH diagnosis of the chip failed.		
4. The software program has stack overflow problems.		

- E145.1: Safety module program execution exception
  Cause:

The internal program execution of the safety module is abnormal and the 16 kHz interrupt function is not executed.

Cause	Troubleshooting	Solution
The internal program execution of the safety module is abnormal and the 16 kHz interrupt function is not executed.	The fault still exists after power off and restart.	Return to the factory for maintenance.

- E150.0: STO safety state applied
  Cause:

  The STO input protection applies (safety state).

Cause	Troubleshooting	Solution
Two 24 V inputs are disconnected simultaneously, triggering the STO function.	1. Check whether the STO function is activated.	There is no need to take any corrective actions. After the STO terminal is back to normal, clear the fault using the fault reset function.
	2. Check whether the STO power supply is normal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
	3. The fault persists after preceding causes are rectified.	Replace the servo drive.

- E150.1: STO input state abnormal
  Cause:

  The single-channel input of STO is ineffective.

Cause	Troubleshooting	Solution
1. STO input power supply is abnormal.	Check whether the STO power supply is normal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
2.STO input resistor is abnormal.	After STO is triggered, only one STO signal is sent to MCU after the 24 V power supply is cut off due to input resistor drift.	Replace the servo drive.
3. STO is ineffective	The fault persists after preceding causes are rectified.	Replace the servo drive.

- E150.2: Buffer 5 V voltage detection error

Cause:

The MCU monitors the 5 V power supply of the PWM Buffer to detect whether overvoltage or undervoltage occurs. If the voltage is abnormal, E150.2 occurs.

Cause	Troubleshooting	Solution
The 5 V voltage supplied to the STO Buffer is abnormal due to undervoltage or overvoltage.	Check whether the fault can be removed by a restart. If not, the 5V voltage supplied to the Buffer is abnormal.	Replace the servo drive.

- E150.3: STO input circuit hardware diagnosis failure
  Cause:

  The photocoupler of the front hardware circuit for STO input is inspected. If the photocoupler is short-circuited, the servo will display E150.3.

Cause	Troubleshooting	Solution
Short circuit occurs on the upstream optocoupler of STO1 or STO2.	The fault persists and the keypad displays E150.3 after restart.	Replace the servo drive.

- E150.4: PWM buffer hardware detection failure
  Cause:

  An error occurs on the PWM Buffer integrated circuit during initialization detection upon power-on (the PWM signal cannot be blocked).

Cause	Troubleshooting	Solution
STO Buffer power-on test error	The fault persists and the keypad displays E150.4 after restart.	Replace the servo drive.

- E150.5: STO input signal interference
  Cause:

  The STO input signal is interfered with, but the interference does not meet the noise filtering conditions set in H0A.73.

Cause	Troubleshooting	Solution
Poor contact of the STO terminal or unstable external 24V input voltage may lead to STO misoperation or malfunction.	Check whether the 24V input voltage of the STO terminal is unstable and disconnected repeatedly.	Replace the 24V power supply.

- E151.0: SCI communication exception between servo drive and safety module
  Cause:

  The NXP chip diagnoses in real time whether the heartbeat of the InoBus communication with the main MCU is normal.

Cause	Troubleshooting	Solution
The heartbeat detection between the servo drive and the safety module is abnormal.	Check whether the hardware connection between the servo drive and the board is normal.	Ensure that the physical connection between the board and the servo drive is normal.

- E152.0: Failure of parameter verification between two MCUs of the safety module
  Cause:

  The CRC values of the safety parameters read from the EEPROM by the dual MCUs of the safety module are inconsistent.

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The voltage of the control circuit power supply drops instantaneously.	• Check whether the control circuit (L1C, L2C) is in the process of power-off or instantaneous power failure occurs. • Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range:220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V)380 V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	• Restore safety parameters to default settings and write parameters again. • Increase the power supply capacity or replace the power supply with a power supply of higher capacity. Restore the safety parameters to default settings and write the parameters again.
3. Instantaneous power failure occurs when saving parameters.	Check whether instantaneous power failure occurs when saving parameters.	Power on again, restore the safety parameters to default settings and write parameters again.
4. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E152.1: Timeout for sending CRC between two MCUs of the safety module
  Cause:

  When the two MCUs of the safety module are powered on for communication, the sending of the CRC times out.

Cause	Troubleshooting	Solution
1. The communication between MCU1 and MCU2 of the safety module is disturbed.	Check for interference around the safety module.	Reduce interference around the safety module.
2. The safety module has failed.	Check whether replacing the safety module solves the problem.	Replace the safety module.

- E152.2: Timeout for safety module to get initial servo parameters
  Cause:

  When the safety module and the servo drive are powered on for communication, the security module has timed out to obtain the initial parameters of the servo drive.

Cause	Troubleshooting	Solution
1. The communication between the safety module and the servo drive is disturbed.	Check whether the connection between the safety module and the servo drive is normal.	Connect the safety module and servo drive correctly.
2. The safety module has failed.	Check whether replacing the safety module solves the problem.	Replace the safety module.

- E154.0: Speed-related functions enabled for non-safety encoder
  Cause:

  The speed-related safety functions are enabled when a non-safety encoder is used, or when a safety encoder is used but H00.00 is not set to 14102.

Cause	Troubleshooting	Solution
1. A non-safety encoder is used.	Check whether the encoder used is a non-safety encoder.	Use a safety encoder.
2. A safety encoder is used but H00.00 is not set to 14102.	Check whether H00.00 is set to 14102.	Set H00.00 to 14102.
3. When a non-safety encoder is used, the DI is set to speed-related functions.	When a non-safety encoder is used, check whether the DI is set to speed-related functions.	When a non-safety encoder is used, set the DI to speed-irrelated functions.
4. When a non-safety encoder is used, the DI is set to SS1 and the monitoring mode is set to SS1-r.	When a non-safety encoder is used, check whether the DI is set to SS1 and the monitoring mode is set to SS1-r.	When a non-safety encoder is used and the DI is set to SS1, set the monitoring mode to SS1-t.

- E154.1: Incorrect selection of safety function trigger mode
  Cause:

For non-EtherCAT models, the safety function trigger mode is selected as FSoE trigger.

Cause	Troubleshooting	Solution
For non-EtherCAT models, the safety function trigger mode is selected as FSoE trigger	• Check whether the servo drive is a EtherCAT model. • Check whether the safety function trigger mode is selected as FSoE trigger.	For non-EtherCAT models, select the safety function trigger mode as local trigger.

- E160.0: SLS1 exceeded
  Cause:

  The speed feedback real-time value exceeds the limit value of SLS1 after SLS1 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS1 after SLS1 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS1 when the SLS1 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS1 after SLS1 monitoring is active.

- E160.1: SLS2 exceeded
  Cause:

  The speed feedback real-time value exceeds the limit value of SLS2 after SLS2 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS2 after SLS2 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS2 when the SLS3 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS2 after SLS2 monitoring is active.

- E160.2: SLS3 exceeded
  Cause:

  The speed feedback real-time value exceeds the limit value of SLS3 after SLS3 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS3 after SLS3 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS3 when the SLS3 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS3 after SLS3 monitoring is active.

- E160.3: SLS4 exceeded
  Cause:

  The speed feedback real-time value exceeds the limit value of SLS4 after SLS4 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS4 after SLS4 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS4 when the SLS4 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS4 after SLS4 monitoring is active.

- E165.0: SDIp exception
  Cause:

  The motor cannot move in the positive direction or the positive movement exceeds the limit.

Cause	Troubleshooting	Solution
The motor moves in the positive direction when not allowed to do so, or the positive movement exceeds the limit.	When the stop mode upon SDI fault is STO, check the fault record to see if the positive rotation speed at the time of fault exceeds the zero speed window of SDI or if the positive rotation position exceeds the zero position window of SDI.	When positive movement is prohibited, ensure that the motor does not exceed the allowable conditions for positive movement.

- E165.1: SDIn exception
  Cause:

  The motor cannot move in the negative direction or the negative movement exceeds the limit.

Cause	Troubleshooting	Solution
The motor moves in the negative direction when not allowed to do so, or the negative movement exceeds the limit.	When the stop mode upon SDI fault is STO, check the fault record to see if the negative rotation speed at the time of fault exceeds the zero speed window of SDI or if the negative rotation position exceeds the zero position window of SDI.	When negative movement is prohibited, ensure that the motor does not exceed the allowable conditions for negative movement.

- E170.0: SS1 deceleration ramp exception
  Cause:

After SS1 deceleration ramp monitoring is started, the actual deceleration ramp exceeds the preset monitoring threshold.

Cause	Troubleshooting	Solution
The deceleration and monitoring threshold are not properly set, and the actual deceleration ramp exceeds the monitoring threshold.	Check whether the preset deceleration is within the monitoring threshold range.	Reasonably set the SS1 deceleration and ramp monitoring threshold to ensure that the deceleration is within the monitoring threshold range.

- E170.1: SS2 deceleration ramp exception
  Cause:

  After SS2 deceleration ramp monitoring is started, the actual deceleration ramp exceeds the preset monitoring threshold.

Cause	Troubleshooting	Solution
The deceleration and monitoring threshold are not properly set, and the actual deceleration ramp exceeds the monitoring threshold.	Check whether the preset deceleration is within the monitoring threshold range.	Reasonably set the SS2 deceleration and ramp monitoring threshold to ensure that the deceleration is within the monitoring threshold range.

- E170.2: SOS speed or position exceeds limit
  Cause:

  In the SOS state, the actual speed or position change exceeds the preset monitoring threshold.

Cause	Troubleshooting	Solution
1. The delay time from SS2 to SOS is set too short, as a result the position and speed monitoring to start before the motor stops.	Check whether the delay time from SS2 to SOS is set properly.	Reasonably set the delay time from SS2 to SOS.
2. The speed and position monitoring threshold settings of SOS are unreasonable.	Check whether the speed and position monitoring thresholds of the SOS are properly set.	Reasonably set the speed and position monitoring thresholds of SOS.
3. The load is too large, resulting in insufficient motor output to maintain the position.	Check whether the motor model is proper.	Select a proper motor model.

- E631.0: SBC brake circuit diagnosis exception
  Cause:

In the SOS state, the actual speed or position change exceeds the preset monitoring threshold.

Cause	Troubleshooting	Solution
1. The SBC circuit is abnormal when the card is powered on.	Check whether the 24 V voltage of the SBC is normal.	Ensure that the 24 V voltage of the SBC is normal.
2. The brake is abnormal during SBC brake release.	SBC brake circuit is faulty.	In case of the SBC circuit hardware failure, it is recommended to return it to the factory for maintenance.

- E740.0: Encoder communication timeout
  Cause:

  Communication timeout occurs on the absolute encoder.

Cause	Troubleshooting	Solution
The encoder cable is loosened.	1. Check the encoder cable connections. 2. Check whether vibration on site is too strong, which loosens the encoder cable and even damages the encoder. 3. Use a new encoder cable. If the fault disappears, the original encoder cable is damaged.	1. Check whether the encoder version (H00.04) is set properly. 2. Check whether the servo drive software version (H01.00). 3. Check the encoder cable connections. 4. Replace the servo motor.

- E740.2: Encoder communication error
  Cause:

  A communication error occurs on the RX side of the encoder.

Cause	Troubleshooting	Solution
1. The encoder is wired improperly.	Check encoder wiring.	Connect the encoder cables according to the correct wiring diagram.
2. The encoder cable connections become loose.	Check for strong vibration, which loosens the encoder cable and even damages the encoder.	Re-connect encoder cables and ensure encoder terminals are connected securely.
3. The encoder Z signal is interfered with.	• Check the field cable layout:Check whether ambient devices are generating disturbance and whether multiple	• It is recommended to use the cables provided by Inovance. • If a customized cable is used, check whether this

Cause	Troubleshooting	Solution
	disturbance sources such as variable-frequency devices are present inside the cabinet. • Make servo drive stay in "Rdy" status and rotate motor shaft counterclockwise (CCW) manually and observer whether H0b.17 (feedback pulse counter) increases/ decreases smoothly. Turning one circle corresponds to five 0°–360° (for Z series motors). For X series motors, turning one circle corresponds to four 0°–360°. • If H0b.17 changes abnormally during motor rotating, the encoder is faulty. • If no alarm is reported during motor shaft rotating but an alarm is reported during servo drive running, interference may exist.	cable is a shielded twisted pair cable that complies with the specifications. • Route the motor cables and encoder cables through different routes. Ensure the servo motor and servo drive are grounded properly. • Check whether the connectors at both ends of the encoder are in good contact and whether any pin retracts.
4. The encoder is faulty.	• Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. • Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	• Use a new encoder cable. • If the fault persists after the encoder cable is replaced, the encoder may be faulty. In this case, replace the servo motor.
5. The T2 interpolator does not support software reset.	If H00.04 starts with 208, the T2 interpolator is used.	Power up and down again. If the error still exists, continue to troubleshoot according to steps 1 to 4.

- E740.3: Absolute encoder single-turn calculation error
  Cause:

  Internal fault of the encoder.

Cause	Troubleshooting	Solution
The encoder is faulty.	1. Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. 2. Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	1. Check whether the encoder version (H00.04) is proper. 2. Check whether the encoder cable is proper. 3. Replace the motor.

- E740.6: Encoder data write error
  Cause:

  The attempt to write the encoder data fails.

Cause	Troubleshooting	Solution
An error occurs when writing the position offset after angle auto-tuning.	Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	Use a new encoder cable. If the fault persists after the encoder cable is replaced, the encoder may be faulty. In this case, replace the servo motor.

- E740.9: Encoder data transmit delay is too long
  Cause:

  The encoder data transmit delay is set to exceed one current loop period.

Cause	Troubleshooting	Solution
1. The value of H01.59 is set too large.	Check if the fault persists after a power cycle.	Decrease the value of H01.59.
2. Too many encoder data bits.		Use an encoder with fewer data bits.

- E750.0: Deviation of master QEP and subdivision quadrant too large (over 2 pulses)
  Cause:

Deviation of master QEP and subdivision quadrant too large (over 2 pulses).

Cause	Troubleshooting	Solution
The encoder disk is contaminated or other photoelectric devices are disturbed.	Check if the fault persists after a power cycle.	Return to the factory for maintenance.

- E750.1: Difference between safety encoder master and slave positions too large
  Cause:

  Difference between safety encoder master and slave positions too large

Cause	Troubleshooting	Solution
Difference between safety encoder master and slave positions too large	Check if the fault persists after a power cycle.	Return to the factory for maintenance.

- E750.2: QEP difference between encoder master and slave too large
  Cause:

  The difference between QEP counts of the master and slave is greater than 2.

Cause	Troubleshooting	Solution
Board-level signal interference, encoder disk contamination, external chip fault.	Check the encoder surroundings for interference.	Replace the motor or encoder.

- E750.3: Difference between safety encoder master and slave analog values too large
  Cause:

  Difference between safety encoder master and slave sampled analog values too large

Cause	Troubleshooting	Solution
Difference between safety encoder master and slave sampled analog values too large	Check if the fault persists after a power cycle.	Return to the factory for maintenance.

- E750.4: Encoder chip power supply diagnosis exception
  Cause:

  LDO or battery voltage is lower than 3.1 V.

Cause	Troubleshooting	Solution
The external power supply of the encoder is under voltage, the LDO device is damaged, and the battery voltage is low	• Check whether the battery is correctly connected. • Check whether the encoder is powered normally.	Replace the motor or encoder.

- E750.5: Encoder master and slave SN mismatch
  Cause:

  SN counts of the master and slave are not equal.

Cause	Troubleshooting	Solution
The chip runs abnormally, and the master and slave do not exchange data normally.	Check whether the chip is abnormal due to too high ambient temperature.	Replace the motor or encoder.

- E750.6: Encoder chip diagnosis exception
  Cause:

  The flash, RAM, and chip of the master or slave are diagnosed faulty.

Cause	Troubleshooting	Solution
Chip exception	Check whether the chip is abnormal due to too high ambient temperature.	Replace the motor or encoder.

- E750.7: Encoder SPI communication error, no response from slave
  Cause:

  The slave failed to receive the command word from the master, or the master failed to receive the reply frame from the slave.

Cause	Troubleshooting	Solution
Board-level communication interference causes internal CRC failure, peripheral abnormality, etc.	Check whether the chip is abnormal due to too high ambient temperature.	Replace the motor or encoder.

- E751.0: Safety module encoder CRC error
  Cause:

  1. The SN increment received by the safety module is abnormal.

  2. The CRC value calculated by the safety module is inconsistent with the received CRC value.

Cause	Troubleshooting	Solution
1. The encoder cable is abnormal.	Check whether the encoder cables are normal.	Check whether encoder cables are connected properly.
2. The communication with encoder suffers from interference.	Check for interference around the encoder cables.	• Check whether the servo drive and motor are properly grounded, and you can put a magnetic ring on the encoder to reduce the interference. • Replace the motor or encoder.

- E751.1: Excessive deviation between speeds calculated by MCU1 and MCU2 of safety module
  Cause:

  The deviation between the speeds calculated by MCU1 and MCU2 exceeds the threshold.

Cause	Troubleshooting	Solution
1. The communication between MCU1 and MCU2 of the safety module is disturbed.	Check for interference around the safety module.	Reduce interference around the safety module.
2. The safety module has failed.	Check whether replacing the safety module solves the problem.	Replace the safety module.

- E751.2: Safety module position 1 & 2 check error
  Cause:

  The deviation between position 1 and position 2 received by the safety module exceeds the threshold.

Cause	Troubleshooting	Solution
The safety encoder is faulty.	Check whether replacing the safety encoder solves the problem.	Replace the safety encoder.

- E751.3: Safety encoder version number CRC error
  Cause:
  - The software version number of the safety encoder is not 264xx.
  - The CRC value of the safety encoder version number is abnormal.

Cause	Troubleshooting	Solution
Safety encoder version (H00.04) is not 264xx.	Check if the fault persists after a power cycle.	Return the motor to the factory for maintenance.
The CRC value of the safety encoder version number is wrong.	1. Check the wiring. 2. After power on and off for multiple times, if the fault persists, the encoder is faulty. 3. Check for interference around the encoder cable.	• If the cable is connected improperly, replace the cable or re-connect the cable. • After power on and off for multiple times, if the fault persists, replace the encoder.

28.5.3Solutions to Alarms

- E108.5: Safety module EEPROM write timed out
  Cause:

  Parameter write time exceeds the limit.

Cause	Troubleshooting	Solution
EEPROM abnormal	Power off and restart the drive to check if the modifications to safety parameters take effect.	• Power off and restart the drive. • Replace the safety module.

- E108.6: Safety module EEPROM read timed out
  Cause:

  The parameter read time exceeds the limit.

Cause	Troubleshooting	Solution
EEPROM abnormal	Power off and restart the drive to check if safety parameters can be read.	• Power off and restart the drive. • Replace the safety module.

- E108.7: Safety module EEPROM write check error
  Cause:

  When the safety module function is written to EEPROM, it is read again from EEPROM and compared with the value to be written. The comparison does not match.

Cause	Troubleshooting	Solution
EEPROM write error	Reset the fault and write again.	If the fault remains, it is recommended to replace the safety module.

- E108.8: Safety module EEPROM read check error
  Cause:

The check on the data read in EEPROM fails.

Cause	Troubleshooting	Solution
The check on the data read in EEPROM fails.	Modify the safety module parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- E115.0: SSM parameter setting error warning
  Cause:

  1. The lower limit of SSM is equal to or larger than the upper limit.

  2. The SSM hysteresis is equal to or larger than the upper limit minus the lower limit.

Cause	Troubleshooting	Solution
The lower limit of SSM is equal to or larger than the upper limit.	Local mode: • Check whether the value of H20.71 is greater than or equal to the value of H20.70. • Check whether the value of H20.72 is greater than or equal to H20.70 minus H20.71.	• Set SSM parameters properly. • The upper limit of SSM is greater than the lower limit.
2. The SSM hysteresis is equal to or larger than the upper limit minus the lower limit.	FSoE module: • Whether the setpoint of 66E4h is greater than or equal to 66E2. • Whether the setpoint of H20.72 is greater than or equal to 66E2 minus 66E4.	The SSM hysteresis is smaller than the upper limit of SSM minus lower limit.

- E116.0: SLS overspeed warning
  Cause:

  The speed limit is exceeded during SLS speed limit monitoring.

Cause	Troubleshooting	Solution
The speed limit is exceeded during SLS speed limit monitoring.	Check the fault log to see if the corresponding speed exceeds the limit of SLS.	Control the motor speed so that it does not exceed the limit.

- E116.1: SDI out of tolerance warning
  Cause:

  The limit is exceeded during SDI direction monitoring.

Cause	Troubleshooting	Solution
The limit is exceeded during SDI direction monitoring. A warning is issued if either the zero-speed window or zero position window exceeds the limit.	Check the fault log to see if the corresponding speed exceeds the SDI zero-speed window or the motor rotational direction exceeds the zero position window allowed by SDI.	Control the motor speed so that it does not exceed the limit.

28.6 Handling of Faults and Alarms [Functional Safety N]

28.6.1List of Fault and Alarm Codes

The servo drive can output the current highest-level fault/alarm code.

No. 1 non-resettable faults:

Table 28–12 List of No. 1 non-resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
E101	E101.3	CRC error during safety parameter initialization	NO.1	No	0x0101	0x31010101
	E101.4	Error in upper and lower limits verification during safety parameter initialization	NO.1	No	0x0101	0x41010101
	E101.5	Address error in read/write operation after the number of parameters changes	NO.1	No	0x0101	0x51010101
E104	E104.5	The number of interrupts in the safety module FPGA is abnormal	NO.1	No	0x0104	0x51040104
	E104.6	Safety module FPGA interrupt timed out	NO.1	No	0x0104	0x61040104
E145	E145.0	Safety module chip diagnosis failure	NO.1	No	0x0145	0x01450145
	E145.1	Safety module program execution exception	NO.1	No	0x0145	0x11450145
E154	E154.0	Speed-related functions enabled for non-safety encoder	NO.1	No	0x0154	0x01540154
	E154.1	Incorrect selection of safety function trigger mode	NO.1	No	0x0154	0x11540154
E740	E740.0	Encoder communication timeout	NO.1	No	0x7305	0x07400740

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
	E740.2	Encoder communication error	NO.1	No	0x7305	0x27400740
	E740.3	Absolute encoder single-turn calculation error	NO.1	No	0x7305	0x37400740
	E740.6	Encoder write error	NO.1	No	0x7305	0x67400740
	E740.9	Encoder data transmit delay too long	NO.1	No	0x7305	0x97400740
E750	E750.0	Deviation of master QEP and subdivision quadrant too large (over 2 pulses)	NO.1	No	0x0750	0x07500750
	E750.1	Difference between safety encoder master and slave positions too large	NO.1	No	0x0750	0x17500750
	E750.2	QEP difference between encoder master and slave too large	NO.1	No	0x0750	0x27500750
	E750.3	Difference between safety encoder master and slave analog values too large	NO.1	No	0x0750	0x37500750
	E750.4	Encoder chip power supply diagnosis exception	NO.1	No	0x0750	0x47500750
	E750.5	Encoder master and slave SN mismatch	NO.1	No	0x0750	0x57500750
	E750.6	Encoder chip diagnosis exception	NO.1	No	0x0750	0x67500750
	E750.7	Encoder SPI communication error, no response from slave	NO.1	No	0x0750	0x77500750
E751	E751.0	Safety module encoder CRC check error	NO.1	No	0x0751	0x07510751
	E751.1	Excessive deviation between speeds calculated by MCU1 and MCU2 of safety module	NO.1	No	0x0751	0x17510751
	E751.2	Safety module position 1 & 2 check error	NO.1	No	0x0751	0x27510751
	E751.3	Safety encoder version number CRC error	NO.1	No	0x0751	0x37510751

No. 1 resettable faults

Table 28–13 List of No. 1 resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
E124	E124.0	Different DIs allocated with the same function	NO.1	Yes	0x0124	0x01240124

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
	E124.1	DI1 input circuit diagnosis exception	NO.1	Yes	0x0124	0x11240124
	E124.2	DI2 input circuit diagnosis exception	NO.1	Yes	0x0124	0x21240124
	E124.3	DI3 input circuit diagnosis exception	NO.1	Yes	0x0124	0x31240124
	E124.4	DI4 input circuit diagnosis exception	NO.1	Yes	0x0124	0x41240124
	E124.5	DI5 input circuit diagnosis exception	NO.1	Yes	0x0124	0x51240124
E125	E125.0	SSM assigned with non-safety DO serial number	NO.1	Yes	0x0125	0x01250125
	E125.1	DO1 output circuit diagnosis exception	NO.1	Yes	0x0125	0x11250125
	E125.2	DO2 output circuit diagnosis exception	NO.1	Yes	0x0125	0x21250125
	E125.4	DO4 output circuit diagnosis exception	NO.1	Yes	0x0125	0x41250125
	E125.5	DO5 output circuit diagnosis exception	NO.1	Yes	0x0125	0x51250125
E134	E134.1	Discrepancy at two input signals of DI1	NO.1	Yes	0x0134	0x11340134
	E134.2	Discrepancy at two input signals of DI2	NO.1	Yes	0x0134	0x21340134
	E134.3	Discrepancy at two input signals of DI3	NO.1	Yes	0x0134	0x31340134
	E134.4	Discrepancy at two input signals of DI4	NO.1	Yes	0x0134	0x41340134
	E134.5	Discrepancy at two input signals of DI5	NO.1	Yes	0x0134	0x51340134
E135	E135.0	Chip 3.3V signal diagnosis exception	NO.1	Yes	0x0135	0x01350135
E150	E150.0	STO safety state applied	NO.1	Yes	0x0150	0x01500150
	E150.1	STO input state abnormal	NO.1	Yes	0x0150	0x11500150
	E150.2	Buffer 5 V supply error	NO.1	Yes	0x0150	0x21500150
	E150.3	STO input circuit hardware diagnosis failure	NO.1	Yes	0x0150	0x31500150
	E150.4	PWM Buffer hardware diagnosis failure	NO.1	Yes	0x0150	0x41500150
	E150.5	STO input signal interference	NO.1	Yes	0x0150	0x51500150
E151	E151.0	SCI communication exception between servo drive and safety module	NO.1	Yes	0x0151	0x01510151

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
	E151.1	SCI communication exception between two MCUs of the safety module	NO.1	Yes	0x0151	0x11510151
E152	E152.0	Failure of parameter verification between two MCUs of the safety module	NO.1	Yes	0x0152	0x01520152
	E152.1	Timeout for sending CRC between two MCUs of the safety module	NO.1	Yes	0x0152	0x11520152
	E152.2	Timeout for safety module to get initial servo parameters	NO.1	Yes	0x0152	0x21520152
E160	E160.0	SLS1 exceeded	NO.1	Yes	0x0160	0x01600160
	E160.1	SLS2 exceeded	NO.1	Yes	0x0160	0x11600160
	E160.2	SLS3 exceeded	NO.1	Yes	0x0160	0x21600160
	E160.3	SLS4 exceeded	NO.1	Yes	0x0160	0x31600160
E165	E165.0	SDIp exception	NO.1	Yes	0x0165	0x01650165
	E165.1	SDIn exception	NO.1	Yes	0x0165	0x11650165
E170	E170.0	SS1 deceleration ramp exception	NO.1	Yes	0x0170	0x01700170
	E170.1	SS2 deceleration ramp exception	NO.1	Yes	0x0170	0x11700170
	E170.2	SOS speed or position exceeds limit	NO.1	Yes	0x0170	0x21700170
E631	E631.0	SBC brake circuit diagnosis exception	NO.1	Yes	0x0631	0x06310631

No. 2 resettable faults

Table 28–14 List of No. 2 resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
EE17	EE17.0	FSoE unexpected command	NO.2	Yes	0x0E17	0x0E170E17
	EE17.1	FSoE unknown command	NO.2	Yes	0x0E17	0x1E170E17
	EE17.2	FSoE invalid connection ID	NO.2	Yes	0x0E17	0x2E170E17
	EE17.3	FSoE CRC error	NO.2	Yes	0x0E17	0x3E170E17
	EE17.4	FSoE watchdog expired	NO.2	Yes	0x0E17	0x4E170E17
	EE17.5	FSoE invalid slave address	NO.2	Yes	0x0E17	0x5E170E17
	EE17.6	FSoE invalid FSoE safety data	NO.2	Yes	0x0E17	0x6E170E17
	EE17.7	FSoE invalid communication parameter length	NO.2	Yes	0x0E17	0x7E170E17
	EE17.8	FSoE invalid communication parameter data	NO.2	Yes	0x0E17	0x8E170E17

Fault Code	Fault subcode	Fault Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
	EE17.9	FSoE invalid application parameter length	NO.2	Yes	0x0E17	0x9E170E17
	EE17.A	FSoE invalid application parameter Data	NO.2	Yes	0x0E17	0xAE170E17

No. 3 resettable warnings

Table 28–15 Resettable Alarm List

Warning code	Alarm subcode	Name	Fault level	Resettable	Error code (603Fh)	Aux. Code (203Fh)
E108	E108.5	Safety module EEPROM write timed out	NO.3	Yes	0x0108	0x51080108
	E108.6	Safety module EEPROM read timed out	NO.3	Yes	0x0108	0x61080108
	E108.7	Safety module EEPROM write check error	NO.3	Yes	0x0108	0x71080108
	E108.8	Safety module EEPROM read check error	NO.3	Yes	0x0108	0x81080108
E115	E115.0	SSM parameter setting exception warning	NO. 3	Yes	0x0115	0x011150115
E116	E116.0	SLS overspeed warning	NO. 3	Yes	0x0116	0x011160116
	E116.1	SDI out of tolerance warning	NO. 3	Yes	0x0116	0x111160116

28.6.2Solutions to Faults

- E101.3: CRC error during safety parameter initialization
  Cause:

  The CRC value of the safety parameters is abnormal, which generally occurs after software update.

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The voltage of the control circuit power supply drops instantaneously.	• Check whether the control circuit (L1C, L2C) is in the process of power-off or instantaneous power failure occurs. • Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range:220 V servo drive:	• Restore safety parameters to default settings and write parameters again. • Increase the power supply capacity or replace the power supply with a power supply of higher capacity. Restore the safety parameters to default

Cause	Troubleshooting	Solution
	Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V)380 V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	settings and write the parameters again.
3. Instantaneous power failure occurs when saving parameters.	Check whether instantaneous power failure occurs when saving parameters.	Power on again, restore the safety parameters to default settings and write parameters again.
4. The number of write operations within a certain period of time exceeds the limit.	Check whether parameters are updated frequently through the host controller.	Change the parameter writing method and write parameters again.
5. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E101.4: Error in upper and lower limits verification during safety parameter initialization
  Cause:

  1. The total number of the safety parameters changes, which generally occurs after software update.

  2. Values of the safety parameters exceed the limit, which generally occurs after software update.

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The voltage of the control circuit power supply drops instantaneously.	• Check whether the control circuit (L1C, L2C) is in the process of power-off or instantaneous power failure occurs. • Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range:220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V)380	• Restore safety parameters to default settings and write parameters again. • Increase the power supply capacity or replace the power supply with a power supply of higher capacity. Restore the safety parameters to default settings and write the parameters again.

Cause	Troubleshooting	Solution
	V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	
3. Instantaneous power failure occurs when saving parameters.	Check whether instantaneous power failure occurs when saving parameters.	Power on again, restore the safety parameters to default settings and write parameters again.
4. The number of write operations within a certain period of time exceeds the limit.	Check whether parameters are updated frequently through the host controller.	Change the parameter writing method and write parameters again.
5. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E101.5: Address error in read/write operation after the number of parameters changes
  Cause:

  The total number of the safety parameters changes, which generally occurs after software update.

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E104.5: The number of interrupts in the safety module FPGA is abnormal
  Cause:

  The number of interrupts detected in 1 ms is less than four.

Cause	Troubleshooting	Solution
1. The FPGA is abnormal.	Power on and off repeatedly. The probability of failure is high.	Replace the servo drive and safety module.
2. The interrupt pin includes dry joint.		
3. The connection between the servo drive and the safety module is abnormal.		

- E104.6: Safety module FPGA interrupt timed out
  Cause:

  The FPGA interrupt is running longer than the interrupt dispatch time.

Cause	Troubleshooting	Solution
The safety module has failed.	Power on and off repeatedly. The probability of failure is high.	Replace the servo drive and safety module.

- E124.0: Different DIs allocated with the same function
  Cause:

  The function numbers of the safety DI terminals are duplicated.

Cause	Troubleshooting	Solution
One DI function cannot be reused by two or more DI terminals.	Check whether the same number is selected for different DIs.	Ensure that the number is unique.

- E124.1: DI1 input circuit diagnosis exception
  Cause:

  Send a diagnostic signal to DI1 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI1 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI1, and observe whether the input signal of DI1 changes (You can sample and analyze the input signal of DI1 through the background software oscilloscope).	• If the DI1 circuit is abnormal, shield DI1 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.2: DI2 input circuit diagnosis exception
  Cause:

  Send a diagnostic signal to DI2 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI2 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI2, and observe whether the input signal of DI2 changes (You can sample and analyze the input signal of DI2 through the background software oscilloscope).	• If the DI2 circuit is abnormal, shield DI2 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.3: DI3 input circuit diagnosis exception
  Cause:

  Send a diagnostic signal to DI3 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI3 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI3, and observe whether the input signal of DI3 changes (You can sample and analyze the input signal of DI3 through the background software oscilloscope).	• If the DI3 circuit is abnormal, shield DI3 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.4: DI4 input circuit diagnosis exception
  Cause:

  Send a diagnostic signal to DI4 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI4 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI4, and observe whether the input signal of DI4 changes (You can sample and analyze the input signal of DI4 through the background software oscilloscope).	• If the DI4 circuit is abnormal, shield DI4 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.5: DI5 input circuit diagnosis exception
  Cause:

Send a diagnostic signal to DI5 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI5 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI5, and observe whether the input signal of DI5 changes (You can sample and analyze the input signal of DI5 through the background software oscilloscope).	• If the DI5 circuit is abnormal, shield DI5 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E125.0: SSM assigned with non-safety DO serial number
  Cause:

  Check whether SSM is assigned to DO3 and DO6.

Cause	Troubleshooting	Solution
The SSM cannot use non-safety DO as signal output.	Check whether the function numbers of DO3 and DO6 are set to 12: SSM-active.	Do not assign the function numbers of DO3 and DO6 as SSM functions.

- E125.1: DO1 output circuit diagnosis exception
  Cause:

  When DO1 is active, the MCU sends a diagnostic pulse to DO5 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO1, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO1 output circuit.	Shield DO1, and the safety module no longer detects whether there is a leakage current risk in DO1.

- E125.2: DO2 output circuit diagnosis exception
  Cause:

  When DO2 is active, the MCU sends a diagnostic pulse to DO5 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO2, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO2 output circuit.	Shield DO2, and the safety module no longer detects whether there is a leakage current risk in DO2.

- E125.4: DO4 output circuit diagnosis exception
  Cause:

  When DO4 is active, the MCU sends a diagnostic pulse to DO5 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO4, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO4 output circuit.	Shield DO4, and the safety module no longer detects whether there is a leakage current risk in DO4.

- E125.5: DO5 output circuit diagnosis exception
  Cause:

  When DO5 is active, the MCU sends a diagnostic pulse to DO5 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO5, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO5 output circuit.	Shield DO5, and the safety module no longer detects whether there is a leakage current risk in DO5.

- E134.1: Discrepancy at two input signals of DI1
  Cause:

  Check whether the DI1 input signal exceeds the value of H20.14.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI1 exceeds the value of H20.14.	Observe whether the difference lasts longer than the setpoint of H20.14.	Ensure the difference does not lasts longer than the value of H20.14.

- E134.2: Discrepancy at two input signals of DI2
  Cause:

Check whether the DI2 input signal exceeds the value of H20.15.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI2 exceeds the value of H20.15.	Check whether the difference lasts longer than the setpoint of H20.15.	Ensure the difference does not last longer than the setpoint of H20.15.

- E134.3: Discrepancy at two input signals of DI3
  Cause:

  Check whether the DI3 input signal exceeds the value of H20.16.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI3 exceeds the value of H20.16.	Observe whether the difference lasts longer than the setpoint of H20.16.	Ensure the difference does not lasts longer than the value of H20.16.

- E134.4: Discrepancy at two input signals of DI4
  Cause:

  Check whether the DI4 input signal exceeds the value of H20.17.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI4 exceeds the value of H20.17.	Check whether the difference lasts longer than the setpoint of H20.17.	Ensure the difference does not lasts longer than the value of H20.17.

- E134.5: Discrepancy at two input signals of DI5
  Cause:

  Check whether the DI5 input signal exceeds the value of H20.18.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI5 exceeds the value of H20.18.	Observe whether the difference lasts longer than the setpoint of H20.18.	Ensure the difference does not lasts longer than the value of H20.18.

- E135.0: Chip 3.3V signal diagnosis error
  Cause:

  The two chips diagnose whether the supply voltage of each other is within the allowed range of 3.0 V to 3.6 V.

Cause	Troubleshooting	Solution
The chip voltage is out of the range of 3.0 V to 3.6 V.	Perform a power cycle to check if the fault is eliminated.	Replace the servo drive.

- E145.0: Safety module chip diagnosis failure
  Cause:

  The chip diagnosis of the safety module failed.

Cause	Troubleshooting	Solution
1. The CPU diagnosis of the chip failed.	Power on and off repeatedly. The probability of failure is high.	Replace the servo drive and safety module.
2. The RAM diagnosis of the chip failed.		
3. The FLASH diagnosis of the chip failed.		
4. The software program has stack overflow problems.		

- E145.1: Safety module program execution exception
  Cause:

  The internal program execution of the safety module is abnormal and the 16 kHz interrupt function is not executed.

Cause	Troubleshooting	Solution
The internal program execution of the safety module is abnormal and the 16 kHz interrupt function is not executed.	The fault still exists after power off and restart.	Return to the factory for maintenance.

- E150.0: STO safety state applied
  Cause:

  The STO input protection applies (safety state).

Cause	Troubleshooting	Solution
STO is triggered because either or both of two 24 V inputs are disconnected.	1. Check whether the STO function is activated.	There is no need to take any corrective actions. After the STO terminal is back to normal, clear the fault using the fault reset function.
	2. Check whether the STO power supply is normal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.

Cause	Troubleshooting	Solution
	3. The fault persists after preceding causes are rectified.	Replace the servo drive.

- E150.1: STO input state abnormal
  Cause:

  The single-channel input of STO is ineffective.

Cause	Troubleshooting	Solution
1. STO input power supply is abnormal.	Check whether the STO power supply is normal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
2.STO input resistor is abnormal.	After STO is triggered, only one STO signal is sent to MCU after the 24 V power supply is cut off due to input resistor drift.	Replace the servo drive.
3. STO is ineffective	The fault persists after preceding causes are rectified.	Replace the servo drive.

- E150.2: Buffer 5 V voltage detection error
  Cause:

  The MCU monitors the 5 V power supply of the PWM Buffer to detect whether overvoltage or undervoltage occurs. If the voltage is abnormal, E150.2 occurs.

Cause	Troubleshooting	Solution
The 5 V voltage supplied to the STO Buffer is abnormal due to undervoltage or overvoltage.	Check whether the fault can be removed by a restart. If not, the 5V voltage supplied to the Buffer is abnormal.	Replace the servo drive.

- E150.3: STO input circuit hardware diagnosis failure
  Cause:

  The photocoupler of the front hardware circuit for STO input is inspected. If the photocoupler is short-circuited, the servo will display E150.3.

Cause	Troubleshooting	Solution
Short circuit occurs on the upstream optocoupler of STO1 or STO2.	The fault persists and the keypad displays E150.3 after restart.	Replace the servo drive.

- E150.4: PWM buffer hardware detection failure
  Cause:

An error occurs on the PWM Buffer integrated circuit during initialization detection upon power-on (the PWM signal cannot be blocked).

Cause	Troubleshooting	Solution
STO Buffer power-on test error	The fault persists and the keypad displays E150.4 after restart.	Replace the servo drive.

- E150.5: STO input signal interference
  Cause:

  The STO input signal is interfered with, but the interference does not meet the noise filtering conditions set in H0A.73.

Cause	Troubleshooting	Solution
Poor contact of the STO terminal or unstable external 24V input voltage may lead to STO misoperation or malfunction.	Check whether the 24V input voltage of the STO terminal is unstable and disconnected repeatedly.	Replace the 24V power supply.

- E151.0: SCI communication exception between servo drive and safety module
  Cause:

  The NXP chip diagnoses in real time whether the heartbeat of the InoBus communication with the main MCU is normal.

Cause	Troubleshooting	Solution
The heartbeat detection between the servo drive and the safety module is abnormal.	Check whether the hardware connection between the servo drive and the board is normal.	Ensure that the physical connection between the board and the servo drive is normal.

- E151.1: SCI communication exception between two MCUs of the safety module
  Cause:

  SCI communication exception between two MCUs of the safety module

Cause	Troubleshooting	Solution
RS232 data exchange communication abnormal inside the safety board.	-	• Check whether interference near the servo drive affects RS-232 communication. • If the fault persists after a power cycle, return the drive to the manufacturer for repair.

- E152.0: Failure of parameter verification between two MCUs of the safety module
  Cause:

The CRC values of the safety parameters read from the EEPROM by the dual MCUs of the safety module are inconsistent.

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The voltage of the control circuit power supply drops instantaneously.	• Check whether the control circuit (L1C, L2C) is in the process of power-off or instantaneous power failure occurs. • Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range:220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V)380 V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	• Restore safety parameters to default settings and write parameters again. • Increase the power supply capacity or replace the power supply with a power supply of higher capacity. Restore the safety parameters to default settings and write the parameters again.
3. Instantaneous power failure occurs when saving parameters.	Check whether instantaneous power failure occurs when saving parameters.	Power on again, restore the safety parameters to default settings and write parameters again.
4. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E152.1: Timeout for sending CRC between two MCUs of the safety module
  Cause:

  When the two MCUs of the safety module are powered on for communication, the sending of the CRC times out.

Cause	Troubleshooting	Solution
1. The communication between MCU1 and MCU2 of the safety module is disturbed.	Check for interference around the safety module.	Reduce interference around the safety module.
2. The safety module has failed.	Check whether replacing the safety module solves the problem.	Replace the safety module.

- E152.2: Timeout for safety module to get initial servo parameters

Cause:

When the safety module and the servo drive are powered on for communication, the security module has timed out to obtain the initial parameters of the servo drive.

Cause	Troubleshooting	Solution
1. The communication between the safety module and the servo drive is disturbed.	Check whether the connection between the safety module and the servo drive is normal.	Connect the safety module and servo drive correctly.
2. The safety module has failed.	Check whether replacing the safety module solves the problem.	Replace the safety module.

- E154.0: Speed-related functions enabled for non-safety encoder
  Cause:

  The speed-related safety functions are enabled when a non-safety encoder is used, or when a safety encoder is used but H00.00 is not set to 14102.

Cause	Troubleshooting	Solution
1. A non-safety encoder is used.	Check whether the encoder used is a non-safety encoder.	Use a safety encoder.
2. A safety encoder is used but H00.00 is not set to 14102.	Check whether H00.00 is set to 14102.	Set H00.00 to 14102.
3. When a non-safety encoder is used, the DI is set to speed-related functions.	When a non-safety encoder is used, check whether the DI is set to speed-related functions.	When a non-safety encoder is used, set the DI to speed-irrelated functions.
4. When a non-safety encoder is used, the DI is set to SS1 and the monitoring mode is set to SS1-r.	When a non-safety encoder is used, check whether the DI is set to SS1 and the monitoring mode is set to SS1-r.	When a non-safety encoder is used and the DI is set to SS1, set the monitoring mode to SS1-t.

- E154.1: Incorrect selection of safety function trigger mode
  Cause:

  For non-EtherCAT models, the safety function trigger mode is selected as FSoE trigger.

Cause	Troubleshooting	Solution
For non-EtherCAT models, the safety function trigger mode is selected as FSoE trigger	• Check whether the servo drive is a EtherCAT model. • Check whether the safety function trigger mode is selected as FSoE trigger.	For non-EtherCAT models, select the safety function trigger mode as local trigger.

- E160.0: SLS1 exceeded

Cause:

The speed feedback real-time value exceeds the limit value of SLS1 after SLS1 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS1 after SLS1 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS1 when the SLS1 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS1 after SLS1 monitoring is active.

- E160.1: SLS2 exceeded
  Cause:

  The speed feedback real-time value exceeds the limit value of SLS2 after SLS2 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS2 after SLS2 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS2 when the SLS3 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS2 after SLS2 monitoring is active.

- E160.2: SLS3 exceeded
  Cause:

  The speed feedback real-time value exceeds the limit value of SLS3 after SLS3 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS3 after SLS3 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS3 when the SLS3 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS3 after SLS3 monitoring is active.

- E160.3: SLS4 exceeded
  Cause:

  The speed feedback real-time value exceeds the limit value of SLS4 after SLS4 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS4 after SLS4 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS4 when the SLS4 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS4 after SLS4 monitoring is active.

- E165.0: SDIp exception
  Cause:

  The motor cannot move in the positive direction or the positive movement exceeds the limit.

Cause	Troubleshooting	Solution
The motor moves in the positive direction when not allowed to do so, or the positive movement exceeds the limit.	When the stop mode upon SDI fault is STO, check the fault record to see if the positive rotation speed at the time of fault exceeds the zero speed window of SDI or if the positive rotation position exceeds the zero position window of SDI.	When positive movement is prohibited, ensure that the motor does not exceed the allowable conditions for positive movement.

- E165.1: SDIn exception
  Cause:

  The motor cannot move in the negative direction or the negative movement exceeds the limit.

Cause	Troubleshooting	Solution
The motor moves in the negative direction when not allowed to do so, or the negative movement exceeds the limit.	When the stop mode upon SDI fault is STO, check the fault record to see if the negative rotation speed at the time of fault exceeds the zero speed window of SDI or if the negative rotation position exceeds the zero position window of SDI.	When negative movement is prohibited, ensure that the motor does not exceed the allowable conditions for negative movement.

- E170.0: SS1 deceleration ramp exception
  Cause:

  After SS1 deceleration ramp monitoring is started, the actual deceleration ramp exceeds the preset monitoring threshold.

Cause	Troubleshooting	Solution
The deceleration and monitoring threshold are not properly set, and the actual deceleration ramp exceeds the monitoring threshold.	Check whether the preset deceleration is within the monitoring threshold range.	Reasonably set the SS1 deceleration and ramp monitoring threshold to ensure that the deceleration is within the monitoring threshold range.

- E170.1: SS2 deceleration ramp exception
  Cause:

  After SS2 deceleration ramp monitoring is started, the actual deceleration ramp exceeds the preset monitoring threshold.

Cause	Troubleshooting	Solution
The deceleration and monitoring threshold are not properly set, and the actual deceleration ramp exceeds the monitoring threshold.	Check whether the preset deceleration is within the monitoring threshold range.	Reasonably set the SS2 deceleration and ramp monitoring threshold to ensure that the deceleration is within the monitoring threshold range.

- E170.2: SOS speed or position exceeds limit
  Cause:

  In the SOS state, the actual speed or position change exceeds the preset monitoring threshold.

Cause	Troubleshooting	Solution
1. The delay time from SS2 to SOS is set too short, as a result the position and speed monitoring to start before the motor stops.	Check whether the delay time from SS2 to SOS is set properly.	Reasonably set the delay time from SS2 to SOS.
2. The speed and position monitoring threshold settings of SOS are unreasonable.	Check whether the speed and position monitoring thresholds of the SOS are properly set.	Reasonably set the speed and position monitoring thresholds of SOS.
3. The load is too large, resulting in insufficient motor output to maintain the position.	Check whether the motor model is proper.	Select a proper motor model.

- E631.0: SBC brake circuit diagnosis exception
  Cause:

  In the SOS state, the actual speed or position change exceeds the preset monitoring threshold.

Cause	Troubleshooting	Solution
1. The SBC circuit is abnormal when the card is powered on.	Check whether the 24 V voltage of the SBC is normal.	Ensure that the 24 V voltage of the SBC is normal.
2. The brake is abnormal during SBC brake release.	SBC brake circuit is faulty.	In case of the SBC circuit hardware failure, it is recommended to return it to the factory for maintenance.

- E740.0: Encoder communication timeout
  Cause:

  Communication timeout occurs on the absolute encoder.

Cause	Troubleshooting	Solution
The encoder cable is loosened.	1. Check the encoder cable connections. 2. Check whether vibration on site is too strong, which loosens the encoder cable and even damages the encoder. 3. Use a new encoder cable. If the fault disappears, the original encoder cable is damaged.	1. Check whether the encoder version (H00.04) is set properly. 2. Check whether the servo drive software version (H01.00). 3. Check the encoder cable connections. 4. Replace the servo motor.

- E740.2: Encoder communication error
  Cause:

  A communication error occurs on the RX side of the encoder.

Cause	Troubleshooting	Solution
1. The encoder is wired improperly.	Check encoder wiring.	Connect the encoder cables according to the correct wiring diagram.
2. The encoder cable connections become loose.	Check for strong vibration, which loosens the encoder cable and even damages the encoder.	Re-connect encoder cables and ensure encoder terminals are connected securely.
3. The encoder Z signal is interfered with.	• Check the field cable layout:Check whether ambient devices are generating disturbance and whether multiple disturbance sources such as variable-frequency	• It is recommended to use the cables provided by Inovance. • If a customized cable is used, check whether this cable is a shielded twisted pair cable that complies with the specifications.

Cause	Troubleshooting	Solution
	devices are present inside the cabinet. • Make servo drive stay in "Rdy" status and rotate motor shaft counterclockwise (CCW) manually and observer whether H0b.17 (feedback pulse counter) increases/ decreases smoothly. Turning one circle corresponds to five 0–360° (for Z series motors). For X series motors, turning one circle corresponds to four 0–360°. • If H0b.17 changes abnormally during motor rotating, the encoder is faulty. • If no alarm is reported during motor shaft rotating but an alarm is reported during servo drive running, interference may exist.	• Route the motor cables and encoder cables through different routes. Ensure the servo motor and servo drive are grounded properly. • Check whether the connectors at both ends of the encoder are in good contact and whether any pin retracts.
4. The encoder is faulty.	• Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. • Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	• Use a new encoder cable. • If the fault persists after the encoder cable is replaced, the encoder may be faulty. In this case, replace the servo motor.
5. The T2 interpolator does not support software reset.	If H00.04 starts with 208, the T2 interpolator is used.	Power up and down again. If the error still exists, continue to troubleshoot according to steps 1 to 4.

- E740.3: Absolute encoder single-turn calculation error
  Cause:

  Internal fault of the encoder.

Cause	Troubleshooting	Solution
The encoder is faulty.	1. Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. 2. Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	1. Check whether the encoder version (H00.04) is proper. 2. Check whether the encoder cable is proper. 3. Replace the motor.

- E740.6: Encoder data write error
  Cause:

  The attempt to write the encoder data fails.

Cause	Troubleshooting	Solution
An error occurs when writing the position offset after angle auto-tuning.	Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	Use a new encoder cable. If the fault persists after the encoder cable is replaced, the encoder may be faulty. In this case, replace the servo motor.

- E740.9: Encoder data transmit delay is too long
  Cause:

  The encoder data transmit delay is set to exceed one current loop period.

Cause	Troubleshooting	Solution
1. The value of H01.59 is set too large.	Check if the fault persists after a power cycle.	Decrease the value of H01.59.
2. Too many encoder data bits.		Use an encoder with fewer data bits.

- E750.0: Deviation of master QEP and subdivision quadrant too large (over 2 pulses)
  Cause:

Deviation of master QEP and subdivision quadrant too large (over 2 pulses).

Cause	Troubleshooting	Solution
The encoder disk is contaminated or other photoelectric devices are disturbed.	Check if the fault persists after a power cycle.	Return to the factory for maintenance.

- E750.1: Difference between safety encoder master and slave positions too large
  Cause:

  Difference between safety encoder master and slave positions too large

Cause	Troubleshooting	Solution
Difference between safety encoder master and slave positions too large	Check if the fault persists after a power cycle.	Return to the factory for maintenance.

- E750.2: QEP difference between encoder master and slave too large
  Cause:

  The difference between QEP counts of the master and slave is greater than 2.

Cause	Troubleshooting	Solution
Board-level signal interference, encoder disk contamination, external chip fault.	Check the encoder surroundings for interference.	Replace the motor or encoder.

- E750.3: Difference between safety encoder master and slave analog values too large
  Cause:

  Difference between safety encoder master and slave sampled analog values too large

Cause	Troubleshooting	Solution
Difference between safety encoder master and slave sampled analog values too large	Check if the fault persists after a power cycle.	Return to the factory for maintenance.

- E750.4: Encoder chip power supply diagnosis exception
  Cause:

  LDO or battery voltage is lower than 3.1 V.

Cause	Troubleshooting	Solution
The external power supply of the encoder is under voltage, the LDO device is damaged, and the battery voltage is low	• Check whether the battery is correctly connected. • Check whether the encoder is powered normally.	Replace the motor or encoder.

- E750.5: Encoder master and slave SN mismatch
  Cause:

  SN counts of the master and slave are not equal.

Cause	Troubleshooting	Solution
The chip runs abnormally, and the master and slave do not exchange data normally.	Check whether the chip is abnormal due to too high ambient temperature.	Replace the motor or encoder.

- E750.6: Encoder chip diagnosis exception
  Cause:

  The flash, RAM, and chip of the master or slave are diagnosed faulty.

Cause	Troubleshooting	Solution
Chip exception	Check whether the chip is abnormal due to too high ambient temperature.	Replace the motor or encoder.

- E750.7: Encoder SPI communication error, no response from slave
  Cause:

  The slave failed to receive the command word from the master, or the master failed to receive the reply frame from the slave.

Cause	Troubleshooting	Solution
Board-level communication interference causes internal CRC failure, peripheral abnormality, etc.	Check whether the chip is abnormal due to too high ambient temperature.	Replace the motor or encoder.

- E751.0: Safety module encoder CRC error
  Cause:

  1. The SN increment received by the safety module is abnormal.

  2. The CRC value calculated by the safety module is inconsistent with the received CRC value.

Cause	Troubleshooting	Solution
1. The encoder cable is abnormal.	Check whether the encoder cables are normal.	Check whether encoder cables are connected properly.
2. The communication with encoder suffers from interference.	Check for interference around the encoder cables.	• Check whether the servo drive and motor are properly grounded, and you can put a magnetic ring on the encoder to reduce the interference. • Replace the motor or encoder.

- E751.1: Excessive deviation between speeds calculated by MCU1 and MCU2 of safety module
  Cause:

  The deviation between the speeds calculated by MCU1 and MCU2 exceeds the threshold.

Cause	Troubleshooting	Solution
1. The communication between MCU1 and MCU2 of the safety module is disturbed.	Check for interference around the safety module.	Reduce interference around the safety module.
2. The safety module has failed.	Check whether replacing the safety module solves the problem.	Replace the safety module.

- E751.2: Safety module position 1 & 2 check error
  Cause:

  The deviation between position 1 and position 2 received by the safety module exceeds the threshold.

Cause	Troubleshooting	Solution
The safety encoder is faulty.	Check whether replacing the safety encoder solves the problem.	Replace the safety encoder.

- E751.3: Safety encoder version number CRC error
  Cause:
  - The software version number of the safety encoder is not 264xx.
  - The CRC value of the safety encoder version number is abnormal.

Cause	Troubleshooting	Solution
Safety encoder version (H00.04) is not 264xx.	Check if the fault persists after a power cycle.	Return the motor to the factory for maintenance.
The CRC value of the safety encoder version number is wrong.	1. Check the wiring. 2. After power on and off for multiple times, if the fault persists, the encoder is faulty. 3. Check for interference around the encoder cable.	• If the cable is connected improperly, replace the cable or re-connect the cable. • After power on and off for multiple times, if the fault persists, replace the encoder.

- EE17.0: FSoE unexpected command
  Cause:

  In the current state of FSoE communication, this command should not appear.

Cause	Troubleshooting	Solution
1. In the reset state, the slave has received the Connection, Parameter, ProcessData, FailSafeData commands.	Fault code is displayed on the panel.	• Check whether the command sent by the safety master is wrong. • Check whether the safety PDO data has been modified.
2. In the Session state, the slave has received the Parameter, ProcessData, FailSafeData commands.		
3. In the Connection state, the slave has received ProcessData and FailSafeData commands.		
4. In the Parameter state, the slave has received the Connection command.		
5. In the Data state, the slave has received the Connection and Parameter commands.		
6. In Session, Connection, and Parameter state, the number of security PDUs sent is 0.		

- EE17.1: FSoE unknown command
  Cause:

  Unspecified command word appeared in FSoE communication.

Cause	Troubleshooting	Solution
The slave has received commands other than reset, Session, Connection, Parameter, ProcessData, and FailSafeData.	Fault code is displayed on the panel.	• Check whether the command sent by the safety master is wrong. • Check whether the safety PDO data has been modified.

- EE17.2: FSoE invalid connection ID
  Cause:

  The ID of the connection established by the FSoE does not match the ID received.

Cause	Troubleshooting	Solution
In Connection, Parameter, ProcessData, FailSafeData state, the connection ID is an error.	Fault code is displayed on the panel.	• Check whether the connection ID sent by the safety master is wrong. • Check whether the safety PDO data has been modified.

- EE17.3: FSoE CRC error
  Cause:

  The CRC value of the FSoE data frame does not match the calculated value.

Cause	Troubleshooting	Solution
The CRC value received by the slave is inconsistent with the CRC value calculated by itself.	Fault code is displayed on the panel.	• Check whether the CRC sent by the safety master is wrong. • Check whether the safety PDO data has been modified.

- EE17.4: FSoE watchdog expired
  Cause:

  No data frame was received within the FSoE communication cycle.

Cause	Troubleshooting	Solution
The slave failed to receive a data frame within the specified time.	Fault code is displayed on the panel.	• Check whether the safety master sends any data. • Check whether the watchdog is working properly. • Check whether the connection is disconnected.

- EE17.5: FSoE invalid slave address
  Cause:

  The FSoE communication address does not meet the requirements.

Cause	Troubleshooting	Solution
In the Connection state, the received slave address is inconsistent.	Fault code is displayed on the panel.	• Check whether the slave address sent from the safety master is correct. • Check whether the address of the slave is set correctly.

- EE17.6: FSoE invalid FSoE safety data
  Cause:

  The FSoE communication parameters are incorrect or the connection fails, and the safety data is invalid.

Cause	Troubleshooting	Solution
In the Connection and Parameter state, the safety data received by the slave is invalid.	Fault code is displayed on the panel.	• Check whether the data sent by the safety master is wrong. • Check whether the safety data has been modified.

- EE17.7: FSoE invalid communication parameter length
  Cause:

  The length and value of the FSoE communication parameters are out of the specified range.

Cause	Troubleshooting	Solution
The length of the parameters received by the slave is inconsistent with that set by the slave.	Fault code is displayed on the panel.	• Check whether the length of data sent by the safety master is wrong. • Check whether the data has been modified.

- EE17.8: FSoE invalid communication parameter data
  Cause:

  FSoE communication parameter data is out of range.

Cause	Troubleshooting	Solution
The watchdog time settings received by the slave are unreasonable.	Fault code is displayed on the panel.	• Check whether the data sent by the safety master is wrong. • Check whether the data has been modified.

- EE17.9: FSoE invalid application parameter length
  Cause:

  The length of the FSoE communication application parameters does not match the preset value.

Cause	Troubleshooting	Solution
The length of the application parameters received by the slave is inconsistent with that set by the slave.	Fault code is displayed on the panel.	• Check whether the data sent by the safety master is wrong. • Check whether the data has been modified.

- EE17.A: FSoE invalid application parameter data
  Cause:

  The FSoE communication application program parameter data is out of the range.

Cause	Troubleshooting	Solution
The application parameters received by the slave are incorrect.	Fault code is displayed on the panel.	• Check whether the data sent by the safety master is wrong. • Check whether the data has been modified.

28.6.3Solutions to Alarms

- E108.5: Safety module EEPROM write timed out
  Cause:

  Parameter write time exceeds the limit.

Cause	Troubleshooting	Solution
EEPROM abnormal	Power off and restart the drive to check if the modifications to safety parameters take effect.	• Power off and restart the drive. • Replace the safety module.

- E108.6: Safety module EEPROM read timed out
  Cause:

  The parameter read time exceeds the limit.

Cause	Troubleshooting	Solution
EEPROM abnormal	Power off and restart the drive to check if safety parameters can be read.	• Power off and restart the drive. • Replace the safety module.

- E108.7: Safety module EEPROM write check error
  Cause:

  When the safety module function is written to EEPROM, it is read again from EEPROM and compared with the value to be written. The comparison does not match.

Cause	Troubleshooting	Solution
EEPROM write error	Reset the fault and write again.	If the fault remains, it is recommended to replace the safety module.

- E108.8: Safety module EEPROM read check error
  Cause:

  The check on the data read in EEPROM fails.

Cause	Troubleshooting	Solution
The check on the data read in EEPROM fails.	Modify the safety module parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- E115.0: SSM parameter setting error warning
  Cause:

  1. The lower limit of SSM is equal to or larger than the upper limit.

  2. The SSM hysteresis is equal to or larger than the upper limit minus the lower limit.

Cause	Troubleshooting	Solution
The lower limit of SSM is equal to or larger than the upper limit.	Local mode: • Check whether the value of H20.71 is greater than or equal to the value of H20.70. • Check whether the value of H20.72 is greater than or equal to H20.70 minus H20.71.	• Set SSM parameters properly. • The upper limit of SSM is greater than the lower limit.
2. The SSM hysteresis is equal to or larger than the upper limit minus the lower limit.	FSoE module: • Whether the setpoint of 66E4h is greater than or equal to 66E2. • Whether the setpoint of H20.72 is greater than or equal to 66E2 minus 66E4.	The SSM hysteresis is smaller than the upper limit of SSM minus lower limit.

- E116.0: SLS overspeed warning
  Cause:

  The speed limit is exceeded during SLS speed limit monitoring.

Cause	Troubleshooting	Solution
The speed limit is exceeded during SLS speed limit monitoring.	Check the fault log to see if the corresponding speed exceeds the limit of SLS.	Control the motor speed so that it does not exceed the limit.

- E116.1: SDI out of tolerance warning
  Cause:

  The limit is exceeded during SDI direction monitoring.

Cause	Troubleshooting	Solution
The limit is exceeded during SDI direction monitoring. A warning is issued if either the zero-speed window or zero position window exceeds the limit.	Check the fault log to see if the corresponding speed exceeds the SDI zero-speed window or the motor rotational direction exceeds the zero position window allowed by SDI.	Control the motor speed so that it does not exceed the limit.

29 Maintenance

29.1 Routine Maintenance Items

The required operating conditions are as follows: Average ambient temperature: 30°C Average load rate: Below 80% Daily operating time: Below 20 hours

29.1.1Routine Inspection

Check the following items during routine inspection.

Table 29–1 Routine checklist

No.	Routine Inspection	Yes
1	The ambient temperature and humidity are normal. There is no dust or unwanted objects in the servo drive.	☐
2	There is no abnormal vibration or noise.	☐
3	The voltage of the power supply is normal.	☐
4	There is no strange smell.	☐
5	There are no fibers adhered to the air inlet.	☐
6	There is no intrusion of unwanted object on the load end.	☐

29.1.2Routine Cleaning

Check the following items during routine cleaning.

Table 29–2 Routine cleaning list

No.	Routine Cleaning	Yes
1	Clean the dust on the equipment surface, especially the metallic dust.	☐
2	Keep the front end of the servo drive and the connectors clean.	☐

Note

- Before cleaning, switch off the power supply and clean with an air gun or a piece of dry cloth.
- Do not use gasoline, dilutes, alcohol, or acid or alkaline detergent to prevent enclosure discolor or damage.

29.2 Periodic Inspection Items

29.2.1Periodic Inspection Items

Table 29–3 Periodic checklist

No.	Item	Yes
1	The screws used to fix the couplings between devices are in place.	☐
2	There is no sign of overheating.	☐
3	Terminal blocks are in good condition without any sign of damage.	☐
4	The clamping units of terminal blocks are in place.	☐

29.2.2Periodic Maintenance

The electrical and electronic parts inside the servo drive may be mechanically worn out and degraded. To keep the servo drive in good condition, perform parts replacement based on the replacement cycles listed in the following table. Contact Inovance or your Inovance agent to check whether the parts need to be replaced.

Object	Type	Standard Replacement Interval	Remarks
Drive	Power bus capacitor	About 8 years (ambient temperature: 30°C; load rate: 80%; uptime per day: 20 hours; standard environment[1])	The standard replacement interval is for reference only. If any device/component works improperly before the replacement interval expires, replace it immediately.
	Fan	5 years (ambient temperature: 30°C; load rate: 80%; uptime per day: 20 hours; standard environment[1])	
	Control circuit aluminum electrolytic capacitor	About 10 years (ambient temperature: 30°C; load rate: 80%; uptime per day: 20 hours; standard environment[1])	
	Pre-charge relay	100000 operations (depending on the operating conditions)	
	Pre-charge resistor	20000 operations (depending on the operating conditions)	
	Dynamic brake relay	About 1000 times (rated motor speed; interval: 5 min; inertia: 20 times)	
	Dynamic brake resistor		

Note

[1]: For details on the standard environment, see the related section.

29.3 Replacing the drive



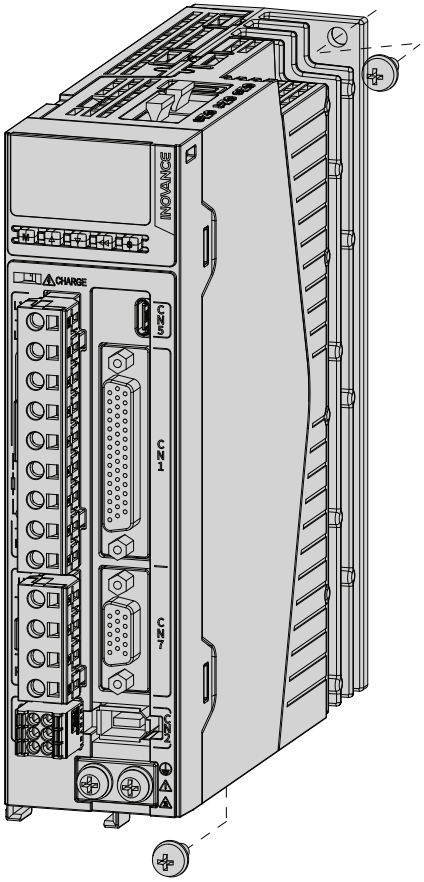
- Note that the drive is energized with high voltage, and all wiring work must be carried out with the drive de-energized.
- Before maintenance, power off the drive, wait for 15 minutes and confirm that the voltage of the drive is lower than 36 VDC. Failure to comply can result in personal injury due to the residual voltage in the capacitor.
- Only trained persons are allowed to repair and maintain the drive. Failure to comply can result in major property loss, severe personal injury or even death.
- Due to the potential external power voltage, exert extreme caution when you are working on the device. Because the power supply and terminals may be live even if the motor does not run.
- Only trained persons are allowed to handle heavy equipment or equipment with high center of gravity. Improper lifting or handling may result in major property loss, serious personal injury or even death.

Steps

1. Turn off the driver power supply.
2. Wait for 15 minutes, and check that the drive voltage is lower than 36 VDC.
3. Remove all cables on the drive.
4. Unscrew the two M4 screws and take off the drive.

   Note:

   - Servo drives in sizes A and C are secured by two screws, with one screw on the top and the other one at the bottom.
   - Servo drives in size D are secured by three screws, with two screws on the top and another one at the bottom.
   - Servo drives in size E are secured by four screws, with two screws on the top and the other two at the bottom.



5. Install the drive. Fix it with 2 M4 screws tightened to a torque of 1.2 N·m. Inspect the installation according to the checklist. For details, see Section "Mechanical Installation" in *SV680N-INT Series Servo Drive Quick Start Guide*.
6. Re-connect the servo drive. After wiring is done, check the drive according to the post-installation checklist. For details, see Section "Electrical Wiring" in *SV680N-INT Series Servo Drive Quick Start Guide*.
7. Turn on the power supply of the drive.
8. Perform a complete commissioning with the commissioning tool. For details, see Sections "Commissioning Tool" and "Commissioning and Operation" in *SV680N-INT Series Servo Drive Quick Start Guide*.

30 Service and Support

Downloads

User guides, brochures, certificates, 2D/3D drawings and other information can be downloaded in the following way:

Go to our official website *https://www.inovance.com*, choose **Service and Support** > **Download**, enter keywords, and download the documentation.

Pre-sales consulting

We are honored to have you as our client. You can submit basic information to us in the following way, so that we can reach you as soon as possible. We are committed to your privacy. We will never share your information with any third party.

Go to our official website (*https://www.inovance.com*), choose **Service and Support** > **Contact Us**, and submit your information.

After-sales service

If you have product quality problems and need after-sales service, or you need to purchase spare parts, you can get the after-sales service person in your region through the following way.

Go to our official website (*https://www.inovance.com*), choose **Service and Support > After-sales Service**, and submit the product category and your region.

Repair

If a product is faulty and needs to be repaired, you can check the maintenance instructions, submit the service request and check the service record in the following way.

Go to our official website (*https://www.inovance.com*), choose **Service and Support** > **Repair**, and submit the repair request.

Authentication

You can authenticate Inovance products in the following way.

Go to our official website (*https://www.inovance.com*), choose **Service and Support** > **Authentication**, and enter the 16-digit serial number.

Feedback

You can submit your feedback in the following way.

Go to our official website *https://www.inovance.com*, choose **Service and Support** > **Feedback**, and submit your feedback.

INOPlanet

InoPlanet provides high-quality courses for beginners and advanced learners. You are free to learn and share there. To get access to the platform:

Go to our official website *https://www.inovance.com* and choose **Service and Support** > **INOPlanet**.

Product Announcement

You can learn about the life cycle of Inovance products in the following way.

Go to our official website (*https://www.inovance.com*) and choose **Service and Support > Product Announcement**.

Authorized Channel

Choose authorized channels and partners when purchasing Inovance products. You can query and verify Inovance authorized channels in the following way.

Go to our official website *https://www.inovance.com* and choose **Service and Support** > **Authorized Channel**.

Video

Find product courses on different scenarios including unpacking, installation, wiring, and software operations. You are free to comment and share there. To get access to the **Video**:

Go to our official website (*https://www.inovance.com*) and choose **Service and Support** > **Video**.

31 Appendix

31.1 Certification and Standard Requirements

CE Certification

reference	Standard	
EMC command 2014/30/EU	Servo Drive	EN 61800-3 EN 61800-6-2 EN 61800-6-4 EN 55011
	Servo Motor	
Low Voltage Directive 2014/35/EU	Servo Drive	EN 61800-5-1
	Servo Motor	EN 60034-1 EN 60034-5
RoHS Directive 2011/65/EU	Servo Drive	-
	Servo Motor	

UL/cUL Certification

Certification	Standard	
UL/cUL Certification	Servo drive	UL61800-5-1 C22.2 No.274
	Servo Motor	UL 1004-1 UL 1004-6 CSA C22.2 No. 100-14

KC Certification

Certification	Standard	
KC Certification	Servo drive	KN 61800-3 (Ver 2014.06) (IEC 61800-3 Ver 2012.03)

Others

The SV680-INT series servo drive meets the requirements of EAC, UKCA and functional safety certification.

Certification	Standard	
EAC Certification	Servo drive	TP TC 004/2011 TP TC 020/2011

31.1.1 CE Certification



Figure 31-1 CE Marking

- The CE mark indicates compliance with the Low Voltage Directive LVD), Electromagnetic Compatibility (EMC), and Restriction of Hazardous Substances (RoHS) directives.
- The CE mark is required for engaging in commercial business (production, importation, and distribution) in Europe.
- The drive complies with LVD, EMC, and RoHS directives and carries the CE mark.
- Machines and devices integrated with this drive must also comply with CE requirements for distribution in Europe.
- The integrator who integrates this drive into other products and attaches CE mark to the final assembly has the responsibility of ensuring compliance with CE certification.

31.1.1.1 Requirements for Compliance with EMC

The drive is applicable to the first environment and second environment and complies with EMC directive 2014/30/EU and standard EN 61800-3.

As required by EMC Directive 2014/30/EU and standard EN IEC 61800-3, install an EMC filter on the input side of the drive and use shielded cables on the output side. Ensure the filter is grounded properly and the shield of the output cable is grounded 360 degrees.



When applied in the first environment, the drive may generate radio interference. In addition to the CE compliance requirements described in this chapter, take additional measures to prevent radio interference if necessary.

Introduction to EMC standards

Electromagnetic compatibility (EMC) describes the ability of electrical and electronic devices or systems to work properly in the electromagnetic environment without introducing electromagnetic interferences that disturb the operation of other local

devices or systems. In other words, EMC includes two aspects: 1) The electromagnetic interference generated by a device during normal operation cannot exceed a certain limit. 2) The device must have sufficient immunity to the electromagnetic interference in the environment.

EN 61800-3 defines the following two types of environments.

- First environment: Environment that includes domestic premises, and establishments directly connected without intermediate transformers to a low-voltage power supply network which supplies buildings used for domestic purposes
- Second environment: Environment that includes all establishments other than those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes

Devices are divided into the following four categories based on the intended application environment.

- Category C1: a Power drive system (PDS) with the rated voltage less than 1000 V, intended for use in the first environment.
- Category C2 equipment: PDS with rated voltage less than 1000 V, which is neither a plug-in device nor a movable device and, when used in the first environment, is intended to be installed and commissioned only by professionals.
- Category C3 equipment: PDS with rated voltage less than 1000 V, intended for use in the second environment and not intended for use in the first environment.
- Category C4 equipment: PDS with rated voltage equal to or above 1000 V, or rated current equal to or above 400 A, or intended for use in complex systems in the second environment.

31.1.1.2 Requirements for Compliance with LVD

The drive has been tested in accordance with EN61800-5-1 to determine compliance with LVD. Observe the following requirements to enable machines and devices integrated with this drive to comply with LVD.

Installation location

Install the drive in a place with overvoltage category III and pollution degree 1 or 2 as specified by EN61800-5-1.

Installation Environment

For requirements of the installation environment, See the related section.

Protection

The drive must be installed in a fireproof cabinet with doors that provide effective electrical and mechanical protection. The installation must conform to local and regional laws and regulations and relevant IEC standards.

IP20-rated drives intended to be installed inside the cabinet must be installed in a structure that prevents intrusion of unwanted objects from the top and the front.

Main Circuit Cable Requirements

For wiring requirements of main circuit terminals, See the related section.

Requirements of protective devices

To comply with EN 61800-5-1, install a fuse/circuit breaker on the input side of the drive to prevent accidents caused by short circuit in the internal circuit.

See the related section for recommended fuse models and recommended breaker models.

31.1.1.3 Cable Specifications (CE)

Table 31–1 Recommended main circuit cables

Servo Drive Model			L1C, L2C		L1, L2, L3/R, S, T		P ⊕ , D, C, N ⊖ , N2, N1		U, V, W, PE		Grounding terminal	
Size	Model	Rated input current (A)	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG
Single-phase 200 V												
A	S1R6	2.3	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
	S2R8	4	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
C	S5R5	7.9	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18
	S7R6	9.6	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18
D	S012	12.8	2×2.08	14	3×2.08	14	2×2.08	14	4×1.31	16	2.08	14
Three-phase 200 V												
A	S1R6	1.1	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
	S2R8	2.3	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
C	S5R5	4.4	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18
	S7R6	5.1	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18
D	S012	8	2×2.08	14	3×2.08	14	2×2.08	14	4×1.31	16	2.08	14
E	S018	8.7	2×3.33	12	3×3.33	12	2×3.33	12	4×2.08	14	3.33	12
	S022	11	2×3.33	12	3×3.33	12	2×3.33	12	4×2.08	14	3.33	12
	S027	23.8	2×5.26	10	3×5.26	10	2×5.26	10	4×3.33	12	5.26	10
Three-phase 400 V												
C	T3R5	2.4	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
	T5R4	3.6	2×0.52	20	3×0.52	20	2×0.52	20	4×0.52	20	0.52	20
D	T8R4	5.6	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18
	T012	8	2×2.08	14	3×2.08	14	2×2.08	14	4×1.31	16	2.08	14
E	T017	12	2×2.08	14	3×2.08	14	2×2.08	14	4×2.08	14	2.08	14
	T021	16	2×3.33	12	3×3.33	12	2×3.33	12	4×2.08	14	3.33	12
	T026	21	2×5.26	10	3×5.26	10	2×5.26	10	4×3.33	12	5.26	10

Note

Cable selection should be carried out in line with the standard EN60204-1 according to the circuit breaker current.

Table 31–2 Recommended Cable Specifications and Models

Cable Type	Cable Size	OD (mm)
Power cable	4×10AWG	14.1±0.5
	4×12AWG	12.2±0.4
	4×14AWG	10.5±0.3
	4×18AWG	7.8±0.2
	4×20AWG	6.5±0.2
Power cable shield	4×10AWG	14.1±0.5
	4×12AWG	12.9±0.4
	4×14AWG	11.2±0.4
	4×18AWG	7.8±0.2
	4×20AWG	6.5±0.2
Power cable + brake cable	4 × 20AWG + 2 × 24AWG	6.5±0.2
Brake cable	2×18AWG	5.8±0.2
	2×20AWG	5.0±0.2

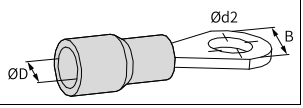
Table 31–3 Main circuit cable lug model and tightening torque

Servo Drive Model			Recommended PVC Cable Model (at 40°C)			
Size	Model	Rated Input Current (A)	U, V, W, PE	Recommended Model of Brake Cable Lug	Recommended Model of Grounding Cable Lug	Tightening Torque (N·m)
Single-phase 200 V						
A	S1R6	2.3	GTVE10008	GTVE05008	TVR2–4	-
	S2R8	4				-
C	S5R5	7.9	GTVE15008	GTVE10008		-
	S7R6	9.6	GTVE20008	GTVE15008		-
D	S012	12.8				-
Three-phase 200 V						
A	S1R6	1.1	GTVE10008	GTVE05008	TVR2–4	-
	S2R8	2.3				-
C	S5R5	4.4	GTVE15008	GTVE10008		-
	S7R6	5.1	GTVE20008	GTVE15008		-
D	S012	8.0				-
E	S018	8.7	GTVE40008	GTVE15008		-
	S022	11.0	GTVE15008	GTVE10008		-

Servo Drive Model			Recommended PVC Cable Model (at 40°C)			
Size	Model	Rated Input Current (A)	U, V, W, PE	Recommended Model of Brake Cable Lug	Recommended Model of Grounding Cable Lug	Tightening Torque (N·m)
	S027	23.8	GTVE25010	GTVE15008		-
Three-phase 400 V						
C	T3R5	2.4	GTVE10008	GTVE05008	TVR2–4	-
	T5R4	3.6				-
D	T8R4	5.6	GTVE20008	GTVE15008		-
	T012	8.0				-
E	T017	12.0	TVR3.5–4	GTVE10008	TVR1.25–4	1.36
	T021	16.0	TVR3.5–4	GTVE10008	TNR2–4	1.36
	T026	21.0	TVR5.5–4	GTVE10008	TNR3.5–4	1.36

The following table lists the data for recommended cable lugs (manufacturer: Suzhou Yuanli Metal Enterprise Co., Ltd) for your reference.

Table 31–4 TVR2-4 cable lug

Lug Model		D (mm)	d2 (mm)	B (mm)	Dimension Drawing
TVR	1.25–4	4.0	4.3	8.0	
	3.5–4	5.8	4.3	9.5	
	5.5–4	6.2	4.3	9.5	

31.1.2 UL&UL Certification

31.1.2.1 UL/cUL Certification



Figure 31-2 UL/cUL marking

The UL/cUL mark commonly applies to products sold in the United States and Canada. Products with UL/cUL mark have been inspected and assessed by the UL organization. To pass UL/cUL certification, main built-in components of electrical products must also be UL certified.

The drive has been tested in accordance with UL 61800–5–1 and CSA C22.2 No. 274-17 to determine compliance with UL/cUL standards. Observe the following requirements

to enable machines and devices integrated with this drive to comply with UL/cUL standards.

Installation location

Install the drive in a place with overvoltage category III and pollution degree 1 or 2 as specified by UL61800–5–1.

Ambient temperature

According to the protection level, the ambient temperature must be maintained within the following range:

Ambient temperature for open-type drives: 0°C to 50°C.

Installation requirements

Installation requirements for open-type drives:

SV680-INT series servo drives are open-type drives that must be installed in a fireproof cabinet with the housing that provides effective electrical and mechanical protection. The installation must conform to local laws and regulations and related NEC requirements.

Main Circuit Cable Requirements



On-site installation of output terminals (such as P ⊕ , C, and N ⊖) is not allowed.

- Terminals P ⊕ , C, and N ⊖ are used to connect optional parts. Do not connect these terminals to an AC power supply.
- To protect the main circuit, separate and cover the surface that may come into contact with the main circuit.
- The control circuit is the internal safety extra-low voltage (SELV) circuit that must be strictly insulated and isolated from other circuits. Make sure that the control circuit is connected to the external SELV circuit.
- Prevent foreign matters from entering the wiring part of the terminal block.
- Do not solder the twisted conductors.
- The tightening torque may vary with terminals. Tighten terminal screws with the specified tightening torque. You can use the torque screwdriver, ratchet, or wrench.
- When using an electric screwdriver to tighten terminal screws, set a low speed to prevent damage to the terminal screws.
- Tighten the terminal screws with an angle not higher than 5°. Failure to comply may damage the terminal screws.

Wiring requirements of the control circuit

Observe the requirements in UL508 during wiring.

Cable requirements

Cable dimensions must be compliant with requirements in NEC (National Electric Code) and CEC (Canadian Electrical Code) Part I and local regulations.

- Use cables with copper conductors.
- The recommended cables for the main circuit are 600 V Class 2 heat-resistant indoor PVC cables that can work under temperature of 75°C continuously. Requirements:
  - Ambient temperature: < 40°C
  - Normal operating ratings

If the recommended cable specifications for peripheral devices or optional parts exceed the applicable cable specification range, contact Inovance.

Cable selection

To comply with UL61800-5-1 and CSA C22.2 No. 274-17, power cables used for the drive must meet the following requirements:

- Compliant with NEC, Table 310-16 of NFPA70.
- Comprised of copper conductors with a rated temperature not lower than 75°C (167°F).
- Cable size must be 14AWG or higher.
- With a rated voltage not lower than the rated voltage of the servo drive.
- It is recommended to use cables compliant with UL758 Style 2517 and Style 2586 as motor main circuit cables.

Requirements of protective devices

To comply with UL61800-5-1, install a fuse/circuit breaker on the input side of the drive to prevent accidents caused by short circuit in the internal circuit.

Install sufficient protective devices against short circuit in branch circuits according to applicable regulations and this guide. The drive is applicable to circuits with a rated breaking capacity lower than 5kA and 65 kA and a maximum voltage of 480 VAC (class 400 V).

Note

All breaker protective devices must be UL-certified.

For the SV680 drive applied in North America, the recommended protective devices are as follows:

Table 31–5 Recommended protective devices

Drive Model		Circuit breaker (A)	Class J fuse (A)	Recommended inverse time lag breaker[1] (A)
Single-phase 200 V				
Size A	S1R6	15	6	40
	S2R8	15	10	40
Size C	S5R5	15	20	40
	S7R6	15	20	100
Size D	S012	20	20	100
Three-phase 200 V				
Size A	S1R6	15	6	40
	S2R8	15	6	40
Size C	S5R5	15	15	40
	S7R6	15	15	100
Size D	S012	20	20	100
Size E	S018	40	20	100
	S022	40	35	100
	S027	40	40	100
Three-phase 400 V				
Size C	3R5	15	6	100
	5R4	15	10	100
Size D	T8R4	20	15	100
	T012	20	20	100
Size E	T017	40	35	100
	T021	40	35	100
	T026	40	40	100

Note

[1]: It is recommended to use an inverse time circuit breaker for a parallel multi-drive system.

31.1.2.2 Cable Specifications (UL)

Table 31–6 Recommended main circuit cables

Servo Drive Model			L1C, L2C		L1, L2, L3/R, S, T		P ⊕ , D, C, N ⊖ , N2, N1		U, V, W, PE		Grounding terminal	
Size	Model	Rated input current (A)	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG
Single-phase 200 V												
A	S1R6	2.3	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
	S2R8	4	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
C	S5R5	7.9	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
	S7R6	9.6	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
D	S012	12.8	2×3.33	12	3×3.33	12	2×3.33	12	4×1.31	16	3.33	12
Three-phase 200 V												
A	S1R6	1.1	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
	S2R8	2.3	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
C	S5R5	4.4	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
	S7R6	5.1	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
D	S012	8	2×2.08	14	3×2.08	14	2×2.08	14	4×1.31	16	2.08	14
E	S018	8.7	2×2.08	14	3×2.08	14	2×2.08	14	4×2.08	14	2.08	14
	S022	11	2×2.08	14	3×2.08	14	2×2.08	14	4×2.08	14	2.08	14
	S027	23.8	2×5.26	10	3×5.26	10	2×5.26	10	4×3.33	12	5.26	10
Three-phase 400 V												
C	T3R5	2.4	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
	T5R4	3.6	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
D	T8R4	5.6	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
	T012	8	2×2.08	14	3×2.08	14	2×2.08	14	4×1.31	16	2.08	14
E	T017	12	2×2.08	14	3×2.08	14	2×2.08	14	4×2.08	14	2.08	14
	T021	16	2×3.33	12	3×3.33	12	2×3.33	12	4×2.08	14	3.33	12
	T026	21	2×5.26	10	3×5.26	10	2×5.26	10	4×3.33	12	5.26	10

Table 31–7 Recommended Cable Specifications and Models

Cable Type	Cable Size	OD (mm)
Power cable	4×10AWG	14.1±0.5
	4×12AWG	12.2±0.4
	4×14AWG	10.5±0.3
Power cable shield	4×10AWG	14.1±0.5
	4×12AWG	12.9±0.4
	4×14AWG	11.2±0.4
Power cable + brake cable	4 × 20AWG + 2 × 24AWG	6.5±0.2
Brake cable	2×18AWG	5.8±0.2

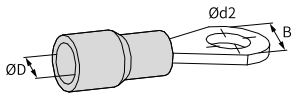
Cable Type	Cable Size	OD (mm)
	2×20AWG	5.0±0.2

Table 31–8 Main circuit cable lug model and tightening torque

Servo Drive Model			Recommended PVC Cable Model (at 40°C)			
Size	Model	Rated Input Current (A)	U, V, W, PE	Recommended Model of Brake Cable Lug	Recommended Model of Grounding Cable Lug	Tightening Torque (N·m)
Single-phase 200 V						
A	S1R6	2.3	GTVE10008	GTVE05008	TVR2–4	-
	S2R8	4				-
C	S5R5	7.9				-
	S7R6	9.6	GTVE15008	GTVE10008		-
D	S012	12.8				-
Three-phase 200 V						
A	S1R6	1.1	GTVE10008	GTVE05008	TVR2–4	-
	S2R8	2.3				-
C	S5R5	4.4				-
	S7R6	5.1				-
D	S012	8.0				-
E	S018	8.7				-
	S022	11.0	GTVE15008	GTVE10008		-
	S027	23.8	GTVE60010	GTVE60010		-
Three-phase 400 V						
C	T3R5	2.4	GTVE10008	GTVE05008	TVR2–4	-
	T5R4	3.6				-
D	T8R4	5.6				-
	T012	8.0				-
E	T017	12.0	TVR1.25–4	GTVE10008	TVR1.25–4	1.36
	T021	16.0	TVR2–4	GTVE10008	TNR2–4	1.36
	T026	21.0	TVR5.5–4	GTVE60010	TNR5.5–4	1.36

The following table lists the data for recommended cable lugs (manufacturer: Suzhou Yuanli Metal Enterprise Co., Ltd) for your reference.

Table 31–9 TVR2-4 cable lug

Lug Model		D (mm)	d2 (mm)	B (mm)	Dimension Drawing
TVR	1.25–4	4.0	4.3	8.0	
	2–4	4.8	4.3	8.5	
	5.5–4	6.8	4.3	9.5	

31.1.3KC Certification



Figure 31-3 KC Certification Mark

The KC mark indicates compliance with ROK standards related to safety (KC) and EMC (KCC).

- The KC mark is required for engaging in commercial business (production, importation, and distribution) in the ROK.
- Machines and devices integrated with this drive must also comply with KC requirements for distribution in the ROK.
- The integrator who integrates this drive into other products and attaches KC mark to the final assembly has the responsibility of ensuring compliance with KC certification.
- Observe the following requirements to enable machines and devices integrated with this drive to comply with KC standards.



Appllicant Suzhou Inovance Technology Co., Ltd.
AC Servo Drive
Model SV680 series
Made In China
Manufacturer
Suzhou Inovance Technology Co.,Ltd.

A급기기 (업무용 방송통신기자재)
이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며,가정외의 지역에서 사용하는 것을 목적으로 합니다.

31.1.4UKCA Certification

Products exported to Great Britain must carry a UKCA mark. However, the products with the CE mark can still be exported to the United Kingdom.

31.1.5Functional Safety Certification

Product Safety
Functional
Safety

www.tuv.com
ID 0600000000

EC directives and standards

EMC Directive 2014/30/EU Standard EN 61800-3: 2018

Machinery Directive 2006/42/EC (Safety Functions) Standard IEC 61800-5-2

31.1.6FSoE Conformance

Safety over EtherCAT®

EtherCAT® and Safety over EtherCAT® are registered trademarks and patented technologies, licensed by Beckhoff Automation GmbH, Germany.

31.2 Solutions to Common EMC Problems

31.2.1Residual Current Device Malfunction

If a residual current device (RCD) is needed, select the RCD according to the following requirements:

- Use a B-type RCD because the drive may generate DC leakage current in the protective conductor.
- For each drive, use an RCD whose tripping current is not lower than 100 mA to prevent RCD malfunction due to high-frequency leakage current generated by the drive.
- When multiple drives are connected in parallel and share one RCD, select an RCD whose tripping current is not lower than 300 mA.
- It is recommended to use Chint or Schneider RCDs.

When malfunction occurs on the RCD, take the following measures.

Table 31–10 Measures against leakage current

Symptom	Possible Cause	Solution
The RCD trips at the moment of power-on.	The anti-interference performance of the RCD is weak.	• It is recommended to use Siemens or Schneider RCDs. • Use a RCD with a higher tripping current. • Move the unbalanced load to the front end of the RCD.
	The tripping current of the RCD is too low.	
	An unbalanced load is connected to the rear end of the RCD.	
	The capacitance of the front end of the servo drive is too high.	
The RCD trips during operation.	The anti-interference performance of the RCD is weak.	• It is recommended to use Siemens or Schneider RCDs. • Use a RCD with a higher tripping current. • Install a simple filter on the input side of the drive and wind the magnetic ring on the LN and RST cables near the RCD, as shown in *"Figure 31–4 Magnetic ring on the input side" on page 2675*. • Reduce the carrier frequency without compromising the performance. • Reduce the length of motor cables.
	The tripping current of the RCD is too low.	
	An unbalanced load is connected to the rear end of the RCD.	
	For motor cables and the motor, the distributed capacitance to ground is too high.	

Figure 31-4 Magnetic ring on the input side

31.2.2Harmonic Suppression

To suppress harmonics and improve the power factor to allow the drive to fulfill the standards, install an AC input reactor on the input side of the drive. For details about

reactor models and the installation method, see the related section.

31.2.3 Control Circuit Interference

31.2.3.1 High-speed Pulse Interference [P]

Take the measures listed in the following table to suppress interference.

No.	Step
1	Used shielded twisted pair cables with both ends of the cable grounded .
2	Connect the motor enclosure to the PE terminal of the drive.
3	Connect the PE terminal of the drive to the PE terminal of the mains power supply.
4	Add an equipotential bonding grounding cable between the host controller and drive .
5	Separate signal cables from power cables with a distance of at least 30 cm.
6	Wind the signal cable onto a ferrite clamp or magnetic ring for one to two turns .
7	At the drive output side, wind the output U/V/W cable onto a magnetic ring for two to four turns.
8	Use shielded power cables and ground the shield properly.

31.2.3.2 Interference with Control Circuit Wiring

For analog/frequency-division input/fully closed-loop wiring, See the related section for details.

31.2.3.3 Common I/O Signal Interference

The drive generates strong interference during operation. Although EMC measures are taken, interference may still exist due to improper wiring or grounding during use. When the drive disturbs or is disturbed by other devices, adopt the following measures.

No.	Step
1	Use shielded cables as the I/O signal cables and connect the shield to the PE terminal.
2	Reliably connect the PE terminal of the motor to the PE terminal of the servo drive, and connect the PE terminal of the servo drive to the PE terminal of the grid.

No.	Step
3	Add an equipotential bonding grounding wire between the host controller and the servo drive.
4	At the drive output side, wind the output U/V/W cable onto a magnetic ring for two to four turns
5	Increase the filter capacitance for low-speed DIs. A capacitance up to 0.1 μF is recommended, as shown in *"Figure 31–5 I/O signal cables with capacitance increased" on page 2677*.
6	Increase the filter capacitance between AI and GND. A capacitance up to 0.22 μF is recommended.
7	Wind the signal cable onto a ferrite clamp or magnetic ring for one to two turns .
8	Use shielded power cables and ground the shield properly.

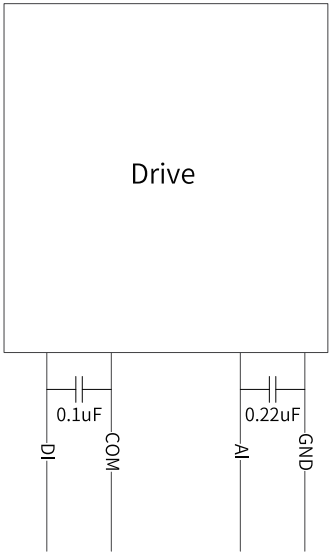


Figure 31-5 I/O signal cables with capacitance increased

31.2.4 Communication Interference

31.2.4.1 RS485&CAN Communication Interference [P]

Take the measures listed in the following table to suppress interference.

Step	Solution
1	Install a 120 Ω termination resistor on each end of the bus.
2	Replace with multi-conductor shielded twisted pair cables and ground both ends of the shield.

Step	Solution
3	Separate communication cables from power cables with a distance of at least 30 cm.
4	Adopt daisy chain mode for multi-node communication layout.
5	Add an equipotential bonding grounding cable between nodes during multi-node communication .
6	Install ferrite clamps on both sides of the communication cable or wind the magnetic ring by one or two turns .
7	At the drive output side, wind the output U/V/W cable onto a magnetic ring for two to four turns.
8	Use shielded power cables and ground the shield properly.

31.2.4.2 EtherCAT Communication Interference [N]

Take the measures listed in the following table to suppress interference.

No.	Step
1	The communication cable complies with the specifications of Cat 5e cables
2	The communication port is tight and secure without the risk of poor contact.
3	Separate communication cables from power cables with a distance of at least 30 cm.
4	Add an equipotential bonding grounding cable between nodes during multi-node communication .
5	Ensure the length of the cable between two nodes does not exceed 100 m.
6	Install ferrite clamps on both sides of the communication cable and wind the cable for one or two turns .
7	At the drive output side, wind the output U/V/W cable onto a magnetic ring for two to four turns.
8	Use shielded power cables and ground the shield properly.

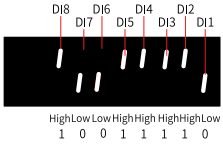
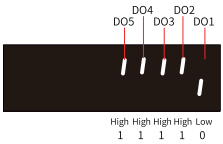
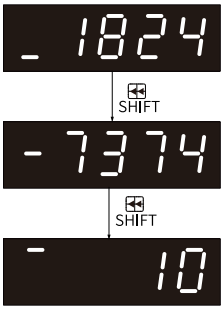
31.3 Display of Monitoring Parameters

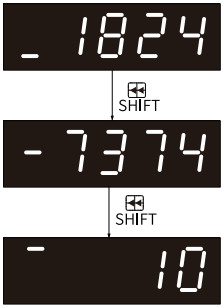
- H0b parameters monitor the operating state of the servo drive. You can enable keypad monitoring display by H02.32. The parameter group number displayed is H0b and the group offset is the setpoint of H02.32.
- When the valid offset is set in H02.32, the keypad enters the "state display" mode if the motor was in the static state, or the "parameter display" mode if the motor was in the rotating state. Mode switchover is not related to whether the servo drive is enabled.

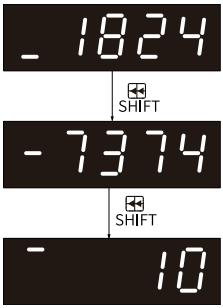
- For example, if you set H02.32 to 00 and the motor changes from the static state to the rotating state, the keypad switches from the "state display" mode to "parameter display" mode and displays the value of H0b.00.

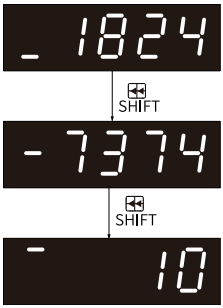
The following table describes the monitoring parameters in group H0b.

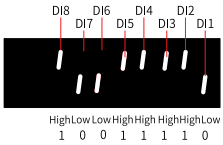
Parameter	Name	Accuracy	Unit	Meaning	Example
H0b.00	Motor speed actual value	1	[mm/s]/[rpm]	Display the motor speed actual value.	3000 [mm/s]/[rpm] is displayed as:  -3000 [mm/s]/[rpm] is displayed as: 
H0b.01	Speed reference	1	[mm/s]/[rpm]	Indicates the present speed reference of the drive in the position and speed control modes.	3000 [mm/s]/[rpm] is displayed as:  -3000 [mm/s]/[rpm] is displayed as: 
H0b.02	Internal torque reference	0.1	%	Display the present torque reference. The setpoint 100.0% corresponds to the rated torque of the motor.	Display of 100.0%:  Display of -100.0%: 
H0b.03	Input (DI) signal monitoring	1	-	Displays the optocoupler status of DI terminals: When the upper LED turns on, the optocoupler is disabled (indicated by "1"). Lower LED segments turned on: The optocoupler is switched on (indicated by "0"). The value of H0b.03 read in the software tool is a decimal.	For example, if DI1 is low level and DI2 to DI8 are high level, the corresponding binary value is "10011110", and the value of H0b.03 read in the software tool is 158. Display on the operating panel:

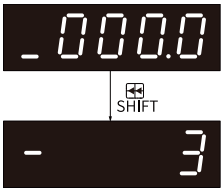
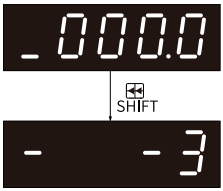
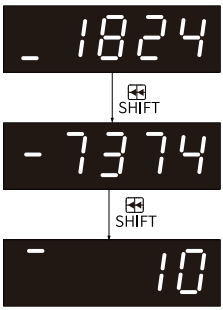
Parameter	Name	Accuracy	Unit	Meaning	Example
					
H0b.05	Output (DO) signal monitoring	1	-	Displays the optocoupler status of DO1 to DO5: When the upper LED turns on, the optocoupler is disabled (indicated by "1"). Lower LED segments turned on: The optocoupler is switched on (indicated by "0"). The value of H0b.05 read in the software tool is a decimal.	For example, if DO1 is low level and DO2 to DO5 are high level, then, the binary value is "11110". The value of H0b.05 read in the software tool is 30. Display on the operating panel: 
H0b.07	Absolute position counter	1	reference unit	It indicates the present absolute position of the motor (in reference unit).	Display of 1073741824 in reference unit: 
H0b.09	Mechanical angle	0.1	°	Indicates the current mechanical angle (p) of the motor. The value 0 indicates that the mechanical angle is 0°. Maximum value of H0b.09 for an incremental encoder: Number of encoder pulses per revolution x 4 - 1. For example, the maximum value of H0b.09 for a 2500-PPR incremental encoder is 9999.	Display of 10000p: 

Parameter	Name	Accuracy	Unit	Meaning	Example
				Maximum value of H0b.09 for an absolute encoder is 65535. The actual mechanical angle is calculated using the following formula: $\text{Actual mechanical angle} = \frac{\text{H0b.09}}{\text{Max. value of H0b.09} + 1} \times 360.0°$	
H0b.10	Electrical angle	0.1	°	Display the electrical angle of the motor.	Display of 360.0°: 
H0b.12	Average load ratio	0.1	%	Displays the ratio of the average load torque to the rated torque of the motor.	Display of 100.0%: 
H0b.13	Input position reference counter (32-bit decimal)	1	reference unit	Counts and displays the number of input position references.	Display of 1073741824 in reference unit: 
H0b.15	Encoder position deviation counter (32-bit decimal)	1	encoder unit	Encoder position deviation = Sum of input position references (encoder unit) – Sum of pulses fed back by the encoder (encoder unit)	Display of 10000 in encoder unit: 
H0b.17	Feedback pulse counter (32-bit decimal)	1	encoder unit	Counts and displays the number of pulses fed back by the motor encoder (encoder unit).	Display of 1073741824 in encoder unit:

Parameter	Name	Accuracy	Unit	Meaning	Example
					
H0b.19	Total power-on time (32-bit decimal)	0.1	s	Counts and displays the total power-on time of the servo drive.	Display of 429496729.5s: 
H0b.24	Phase current RMS value	0.1	A	Displays the RMS value of the phase current of the motor.	Display of 4.60 A: 
H0b.26	Bus voltage	0.1	V	Displays the DC bus voltage of the main circuit input voltage after rectification.	Display of 311.0 V rectified from 220 VAC:  Display of 537.0 V rectified from 380 VAC: 
H0b.27	Module temperature	1	°C	Displays the temperature of the power module inside the servo drive.	Display of 27°C: 
H0b.33	Fault log	1	-	Used to select the previous fault to be viewed. 0: Present fault 1: 2nd last fault 2: 3rd last fault ...	0: Display of present fault: 

Parameter	Name	Accuracy	Unit	Meaning	Example
				19: 20th last fault	
H0b.34	Fault code of the selected fault	1	-	H0b.34 display the fault you selected with H0b.33. When no fault occurs, the displayed value of H0b.34 is E000.0.	If H0b.33 is 0, and H0b.34 is E941.0, the current fault code is 941.0. Corresponding display: 
H0b.35	Timestamp of the selected fault	0.1	s	Displays the total operating time of the servo drive when the selected fault occurred. When no fault occurs, the value of H0b.35 is 0.0.	If H0b.34 is E941.0 and H0b.35 is 1073741824, the current fault code is 941 and the total operating time of the servo drive is 1073741824s when the fault occurs. 
H0b.37	Motor speed upon occurrence of the selected fault	1	[mm/s]/[rpm]	Motor speed upon occurrence of the selected fault. When no fault occurs, the value of H0b.37 is 0.	3000 [mm/s]/[rpm] is displayed as:  -3000 [mm/s]/[rpm] is displayed as: 
H0b.38	Motor phase U current upon occurrence of the selected fault	0.1	A	Displays the RMS value of motor phase U winding current when the selected fault occurred. When no fault occurs, the value of H0b.38 is 0.0.	Display of 4.60 A: 
H0b.39	Motor phase V current upon occurrence of	0.1	A	Display the RMS value of motor phase V winding current when the selected fault occurred.	Display of 4.60 A: 

Parameter	Name	Accuracy	Unit	Meaning	Example
	the selected fault			When no fault occurs, the value of H0b.39 is 0.0.	
H0b.40	Bus voltage upon occurrence of the selected fault	0.1	V	Display the DC bus voltage of the main circuit when the selected fault occurred. When no fault occurs, the value of H0b.40 is 0.0.	Display of 311.0 V rectified from 220 VAC:  Display of 537.0 V rectified from 380 VAC: 
H0b.41	Input terminal state on selected fault	1	-	Display the high/low level status of DI1 to DI8 when the selected fault occurred. The method for determining the DI level status is the same as that of H0b.03. When no fault occurs, all DIs are displayed as low level in H0b.41 (indicated by the decimal value 0).	Display of H0b.41 = 158: 
H0b.53	Position deviation counter (32-bit decimal)	1	reference unit	Position deviation = Sum of input position references (reference unit) - Sum of pulses fed back by the encoder (reference unit)	Display of 10000 in reference unit: 

Parameter	Name	Accuracy	Unit	Meaning	Example
H0b.55	Motor speed actual value	0.1	[mm/s]/[rpm]	Display the motor speed actual value.	3000.0 [mm/s]/[rpm] is displayed as:  -3000.0 [mm/s]/[rpm] is displayed as: 
H0b.64	Real-time input position reference counter	1	reference unit	Displays the value of the position reference counter before being divided or multiplied by the electronic gear ratio. This value is independent of the servo drive status and the control mode.	Display of 1073741824 in reference unit: 

31.4 DIDO Function Assignment [Standard P]

Code	Name	Function Name	Description	Remarks
Description of DI Signals				
FunIN.1	S-ON	Servo ON	Disabled: Servo motor disabled Enabled: Servo motor enabled	The corresponding terminal logic must be level-triggered. The change of the corresponding DI/VDI or terminal logic is activated at next power-on.
FunIN.2	ALM-RST	Alarm reset signal	Inactive: Disabled Active: Enabled	Edge-triggered will be applied even if level-triggered is selected.

Code	Name	Function Name	Description	Remarks
				To reset No. 1 and NO.2 resettable faults, switch off the S-ON signal first. The servo drive may, depending on the alarm type, continue running after reset.
FunIN.3	GAIN-SEL	Gain switchover switch	• H08.08 = 0: • Inactive: Speed control loop being PI control • Active: Speed control loop being P control • When H08.08 = 1, and H08.09 = 1: • Inactive: Fixed to the 1st group of gains • Active: Fixed to the 2nd group of gains	The corresponding terminal logic is recommended to be level-triggered.
FunIN.4	CMD-SEL	Main/Auxiliary reference switchover	Inactive: Current reference being A Active: Current reference being B	The corresponding terminal logic is recommended to be level-triggered.
FunIN.5	DIR-SEL	Multi-reference direction	Inactive: Reference direction by default Active: Reverse to reference direction.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.6	CMD1	Multi-reference switchover CMD1	Used to select a reference from 16 references.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.7	CMD2	Multi-reference switchover CMD2	Used to select a reference from 16 references.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.8	CMD3	Multi-reference switchover CMD3	Used to select a reference from 16 references.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.9	CMD4	Multi-reference switchover CMD4	Used to select a reference from 16 references.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.10	M1-SEL	Mode switchover M1-SEL	Used to perform switchover between speed control, position control, and torque control based on the selected control mode (values 3, 4, 5 of H02-00).	The corresponding terminal logic is recommended to be level-triggered.
FunIN.11	M2-SEL	Mode switchover M2-SEL	Used to perform switchover between speed control, position control, and torque control based on the selected control mode (value 6 of H02-00).	The corresponding terminal logic is recommended to be level-triggered.
FunIN.12	ZCLAMP	Zero clamp enable	Active: Zero clamp enabled Inactive: Zero clamp disabled	The corresponding terminal logic is recommended to be level-triggered.

Code	Name	Function Name	Description	Remarks
				• When H06.15 is set to 100 or above, zero clamp is performed when the speed is lower than H06.15. The movement is triggered again only when the speed command is greater than (H06.15) + 20 RPM. • When H06.15 is set to below 100, zero clamp is performed when the speed is lower than H06.15. The movement is triggered again only when the speed command is greater than (H06.15) + 10 RPM.
FunIN.13	INHIBIT	Position reference inhibited	Active: Pulse reference input inhibited Inactive: Pulse reference input allowed	It is originally pulse inhibit. The position references include internal and external position references. The corresponding terminal logic must be level-triggered.
FunIN.14	P-OT	Positive limit switch	Active: Forward drive inhibited Inactive: Forward drive permitted	Overtravel prevention applies when the machine moves beyond the limit. It is recommended that the corresponding terminal logic is level-triggered.
FunIN.15	N-OT	Negative limit switch	Overtravel prevention applies when the load moves beyond the limit. Active: Reverse drive inhibited Inactive: Reverse drive allowed	The corresponding terminal logic is recommended to be level-triggered.
FunIN.16	P-CL	Positive external torque limit	The torque limit source is switched based on H07.07 (Torque limit source). H07.07 = 1: Active: Positive external torque limit activated Inactive: Positive internal torque limit activated	The corresponding terminal logic is recommended to be level-triggered.
FunIN.17	N-CL	Negative external torque limit	The torque limit source is switched based on H07.07 (Torque limit source). H07.07 = 1: Active: Negative external torque limit activated Inactive: Negative internal torque limit activated	The corresponding terminal logic is recommended to be level-triggered.
FunIN.18	JOGCMD+	Forward jog	Active: Input based on command Inactive: Command input stopped	The corresponding terminal logic is recommended to be level-triggered.

Code	Name	Function Name	Description	Remarks
FunIN.19	JOGCMD–	Jog in the reverse direction	Active: Input in reverse to the command Inactive: Command input stopped	The corresponding terminal logic is recommended to be level-triggered.
FunIN.20	POSSTEP	Step reference	Active: Execute step reference set in H05-05, servo motor running Inactive: Servo motor in locked state	The corresponding terminal logic is recommended to be level-triggered.
FunIN.21	HX1	Hand wheel override signal 1	HX1 active, HX2 inactive: X10. HX1 inactive, HX2 active: X100. Other: X1.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.22	HX2	Hand wheel override signal 2		
FunIN.23	HX_EN	Handwheel enable signal	Inactive: Execute position control as defined by H05-00. Active: Execute position control based on handwheel signal in position mode	The corresponding terminal logic is recommended to be level-triggered.
FunIN.24	GEAR_SEL	Electronic gear ratio switchover	Inactive: Electronic gear ratio 1 Active: Electronic gear ratio 2	The corresponding terminal logic is recommended to be level-triggered.
FunIN.25	TOQDirSel	Torque reference direction	Inactive: Forward. Active: Reverse	The corresponding terminal logic is recommended to be level-triggered.
FunIN.26	SPDDirSel	Speed reference direction	Inactive: Forward. Active: Reverse	The corresponding terminal logic is recommended to be level-triggered.
FunIN.27	POSDirSel	Position reference direction	Inactive: Actual position reference direction same as the set direction Active: Actual position reference direction opposite to the set direction	The corresponding terminal logic is recommended to be level-triggered.
FunIN.28	PosInSen	Multi-position reference enable	Inactive: The reference is ineffective. Active: The reference is enabled.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.29	XintFree	Interruption fixed length cleared	Inactive: Disabled Active: Enabled	-
FunIN.31	HomeSwitch	Home switch	Inactive: The switch is not triggered Active: The switch is triggered.	The corresponding terminal logic must be level-triggered. It is recommended to assign this function to a high-speed DI terminal. If the logic is set to 2 (rising edge active), the servo drive forcibly changes it to 1 (active high). If the logic is set to 3 (falling edge active), the servo drive forcibly changes it to 0 (active low). If the logic is set to 4 (both rising edge and falling edge

Code	Name	Function Name	Description	Remarks
				active), the servo drive forcibly changes it to 0 (low level active).
FunIN.32	HomingStart	Homing enable	Inactive: Disabled Active: Enabled	-
FunIN.33	XintInhibit	Interrupt positioning inhibited	Active: Interrupt positioning inhibited. Inactive: Interrupt positioning allowed.	The corresponding terminal logic must be level-triggered. • If the logic is set to 2 (rising edge active), the servo drive forcibly changes it to 1 (active high). • If the logic is set to 3 (falling edge active), the servo drive forcibly changes it to 0 (active low). • If the logic is set to 4 (both rising edge and falling edge active), the servo drive forcibly changes it to 0 (low level active).
FunIN.34	Emergence Stop	Emergency stop	Active: Position lock is applied after stop at zero speed. Inactive: Current operating state is unaffected.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.35	ClrPosErr	Position deviation cleared	Active: Clear the position deviation Inactive: Do not clear the position deviation	It is recommended to assign this function to DI8 or DI9.
FunIN.36	V_LmtSel	Internal speed limit source	Inactive: H07.19 used as positive/negative internal speed limit Active: H07.20 used as positive/ negative internal speed limit	The corresponding terminal logic is recommended to be level-triggered.
FunIN.37	PulseInhibit	Pulse reference inhibited	When the position reference source is pulse reference (H05.00 = 0) in the position control mode: Inactive: Respond to pulse references Active: Not respond to pulse references	The corresponding terminal logic is recommended to be level-triggered.
FunIN.38	TouchProbe1	Touch probe 1	Inactive: Touch probe is not triggered. Active: Touch probe is triggerable.	The touch probe logic is only related to the touch probe function (60B8h).
FunIN.39	TouchProbe2	Touch probe 2	Inactive: Touch probe is not triggered. Active: Touch probe is triggerable.	The touch probe logic is only related to the touch probe function (60B8h).
FunIN.40	Multi-speed	Multi-speed enable	Disabled: The internal multi-speed reference is ineffective.	The corresponding terminal logic is recommended to be level-triggered.

Code	Name	Function Name	Description	Remarks
			Active: The internal multi-speed reference is enabled.	
FunIN.41	HomeRecord	Homing on current position	Inactive: The switch is not triggered Active: Triggered	The corresponding terminal logic is recommended to be level-triggered.
FunIN.42	MultiBlockTrig	Axis control command executed immediately	Inactive: Do not execute Active: Execute immediately	-
FunIN.43	MultiBlockWr	Axis control command not executed immediately	Inactive: Do not execute Active: Execute (not immediately)	-
FunIN.44	ClrCmdOkAndArrOk	Positioning and reference completed signal cleared	Inactive: No operation Active: Clear	-
FunIN.45	XintEn	Interrupt positioning selection	Inactive: Disabled Active: Enabled	-
FunIN.46	PrEnable	Technology segment enable	Inactive: Stop technology segment Active: Start technology segment	The corresponding terminal logic is recommended to be level-triggered.
FunIN.47	PrCMD1	Technology segment command switchover 1	Switchover among 16 technology segments	The corresponding terminal logic is recommended to be level-triggered.
FunIN.48	PrCMD2	Technology segment command switchover 2	Switchover among 16 technology segments	The corresponding terminal logic is recommended to be level-triggered.
FunIN.49	PrCMD3	Technology segment command switchover 3	Switchover among 16 technology segments	The corresponding terminal logic is recommended to be level-triggered.
FunIN.50	PrCMD4	Technology segment command switchover 4	Switchover among 16 technology segments	The corresponding terminal logic is recommended to be level-triggered.
FunIN.51	PrEvent1	Event trigger technology segment 1	Process segment A triggered by rising edge. Process segment B triggered by falling edge.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.52	PrEvent2	Event trigger technology segment 2	Process segment A triggered by rising edge. Process segment B triggered by falling edge.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.53	PrEvent3	Event trigger technology segment 3	Process segment A triggered by rising edge. Process segment B triggered by falling edge.	The corresponding terminal logic is recommended to be level-triggered.

Code	Name	Function Name	Description	Remarks
FunIN.54	PrEvent4	Event trigger technology segment 4	Process segment A triggered by rising edge. Process segment B triggered by falling edge.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.55	PrSuspend	Process segment suspend	Inactive: Continue the already enabled technology segment. Active: Suspend the technology segment	The corresponding terminal logic is recommended to be level-triggered.
FunIN.56	GantryTrqAlignEnable	Gantry torque alignment	Inactive: Disabled Active: Enabled	-
FunIN.57	Gantry-DI-AlignClear	Gantry DI alignment	Inactive: Disabled Active: Enabled	-
FunIN.58	Gantry-DI-AlignEnable	Gantry DI alignment clear	Inactive: Disabled Active: Enabled	-
FunIN.59	GantrySyncEnable	Gantry sync enable	Inactive: Disabled Active: Enabled	-
Description of DO signals				
FunOUT.1	S-RDY	Ready to switch on	The servo drive is ready to receive the S-ON signal. Inactive: The servo drive not ready. Active: The servo drive is ready.	-
FunOUT.2	TGON	Motor rotation signal	Inactive: Absolute value of filtered motor speed is lower than the setpoint of H06.16. Active: Absolute value of filtered motor speed reaches the setpoint of H06.16.	-
FunOUT.3	ZERO	Zero speed signal	Inactive: Difference between motor speed feedback and reference value larger than H06.19 (Threshold of zero speed output signal) Active: The difference between the motor speed feedback and the reference value is within the threshold defined by H06.19.	-
FunOUT.4	V-CMP	Speed matching signal	Active when the absolute value of the difference between the motor speed and the speed reference lower than H06.17 (Threshold of V-Cmp signal) in the speed control mode	-
FunOUT.5	COIN	Positioning completed	Inactive: Positioning not completed Active: Positioning completed	-

Code	Name	Function Name	Description	Remarks
FunOUT.6	NEAR	Proximity	Inactive: large positioning deviation Active: position deviation near	-
FunOUT.7	C-LT	Torque limited signal	Confirming torque limit: Active: Servo drive torque reference reaching the torque limit value and restricted to this value Inactive: Servo drive torque reference not reaching the torque limit value	-
FunOUT.8	V-LT	Velocity limited signal	Confirming speed limit in torque control: Active: Motor speed limited Inactive: Motor speed unlimited	-
FunOUT.9	BK	Brake output signal	Active - Brake signal is output. Disabled - Brake signal not output.	-
FunOUT.10	WARN	Alarm	Inactive: The servo drive issued no alarm or the alarm has been reset. Active - The servo drive issued an alarm.	-
FunOUT.11	ALM	Fault	The servo drive is faulty. Inactive: No fault occurred on the servo drive or the fault has been reset.	-
FunOUT.15	Xintcoin	Interrupt positioning completed	Active: Interrupt positioning completed Invalid: Interruption fixed length not completed	-
FunOUT.16	HomeAttain	Home find	Homing state: Active: Homing completed in the position control mode Inactive: Homing not completed	-
FunOUT.17	ElecHome Attain	Electrical homing completed	Electrical homing state: Active: Electrical homing completed Inactive: Electrical homing not completed	-
FunOUT.18	ToqReach	Torque reached signal	Active: Absolute value of torque reference reached setpoint Inactive: Absolute value of torque reference smaller than setpoint	-
FunOUT.19	V-Arr	Speed reached signal	Active: Speed feedback reaches setpoint	-

Code	Name	Function Name	Description	Remarks
			Inactive: Speed feedback smaller than setpoint	
FunOUT.21	SrvOn	Enable completed	Active: Enable completed. Inactive: Enable not completed.	-
FunOUT.22	CmdOk	Internal command completed	Inactive: Internal command transmit not completed. Active: Internal command transmit completed.	-
FunOUT.23	WrNextBlockEn	Command input	Active: Writing the next segment allowed. Inactive: Writing the next segment inhibited.	-
FunOUT.24	MC_OK	Internal motion completed	Inactive: Internal command transmit or positioning not completed. Active: Internal command transmit and positioning completed.	-
FunOUT.25	CMP	Comparison DO	Inactive: The servo drive did not pass the target position comparison point. Active: The servo drive passed the target position comparison point.	-
FunOUT.26	LoopState	Closed loop state	0: Semi-closed-loop Position feedback signals come from the built-in encoder of the servo motor. 1: Full closed-loop Position feedback signals come from the full closed-loop external encoder.	-
FunOUT.27	LEFTLIMIT	Left limit	Inactive: The drive is not at the left limit. Active: The drive is at the left limit.	Only Inovance DDL communication reading head supports this feature.
FunOUT.28	RIGHTLIMIT	Right limit	Inactive: The drive is not at the right limit. Active: The drive is at the right limit.	Only Inovance DDL communication reading head supports this feature.
FunOUT.30	WARN OR ALM	Warning or fault output	Active: An alarm or fault is present. Inactive: No warning or fault.	-
FunOUT.31	Communication-forced DO		See *"Table 31–11 Communication forced DO wire breakage output" on page 2694*.	-

Code	Name	Function Name	Description	Remarks
FunOUT.32	EDM	EDM output	Active: STO is triggered Inactive: STO is not triggered	The EDM outputs active signals only when both the 24 V input voltages for STO1 and STO2 are disconnected.
FunOUT.33	GantryAlignStatus	Gantry alignment	Inactive: Not aligned Active: Aligned	-

Table 31–11 Communication forced DO wire breakage output

Type	Data	Description
bit0	0	Maintain DO1 output
	1	DO1 output prohibited
bit1	0	Maintain DO2 output
	1	DO2 output prohibited
bit2	0	Maintain DO3 output
	1	DO3 output prohibited
bit3	0	Maintain DO4 output
	1	DO4 output prohibited
bit4	0	Maintain DO5 output
	1	DO5 output prohibited

31.5 DIDO Function Assignment [Standard N]

Code	Name	Function Name	Description	Remarks
Description of DI Signals				
FunIN.1	S-ON	Servo ON	Disabled: Servo motor disabled Enabled: Servo motor enabled	The corresponding terminal logic must be level-triggered. The change of the corresponding DI/VDI or terminal logic is activated at next power-on.
FunIN.2	ALM-RST	Alarm reset signal	Inactive: Disabled Active: Enabled	Edge-triggered will be applied even if level-triggered is selected. To reset No. 1 and NO.2 resettable faults, switch off the S-ON signal first. The servo drive may, depending on the alarm type, continue running after reset.
FunIN.5	DIR-SEL	Multi-reference direction	Inactive: Reference direction by default Active: Reverse to reference direction.	The corresponding terminal logic is recommended to be level-triggered.

Code	Name	Function Name	Description	Remarks
FunIN.6	CMD1	Multi-reference switchover CMD1	Used to select a reference from 16 references.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.7	CMD2	Multi-reference switchover CMD2	Used to select a reference from 16 references.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.8	CMD3	Multi-reference switchover CMD3	Used to select a reference from 16 references.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.9	CMD4	Multi-reference switchover CMD4	Used to select a reference from 16 references.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.14	P-OT	Positive limit switch	Active: Forward drive inhibited Inactive: Forward drive permitted	Overtravel prevention applies when the machine moves beyond the limit. It is recommended that the corresponding terminal logic is level-triggered.
FunIN.15	N-OT	Negative limit switch	Overtravel prevention applies when the load moves beyond the limit. Active: Reverse drive inhibited Inactive: Reverse drive allowed	The corresponding terminal logic is recommended to be level-triggered.
FunIN.16	P-CL	Positive external torque limit	The torque limit source is switched based on H07.07 (Torque limit source). H07.07 = 1: Active: Positive external torque limit activated Inactive: Positive internal torque limit activated	The corresponding terminal logic is recommended to be level-triggered.
FunIN.17	N-CL	Negative external torque limit	The torque limit source is switched based on H07.07 (Torque limit source). H07.07 = 1: Active: Negative external torque limit activated Inactive: Negative internal torque limit activated	The corresponding terminal logic is recommended to be level-triggered.
FunIN.18	JOGCMD+	Forward jog	Active: Input based on command Inactive: Command input stopped	The corresponding terminal logic is recommended to be level-triggered.
FunIN.19	JOGCMD–	Jog in the reverse direction	Active: Input in reverse to the command Inactive: Command input stopped	The corresponding terminal logic is recommended to be level-triggered.
FunIN.24	GEAR_SEL	Electronic gear ratio switchover	Inactive: Electronic gear ratio 1 Active: Electronic gear ratio 2	The corresponding terminal logic is recommended to be level-triggered.
FunIN.28	PosInSen	Multi-position reference enable	Inactive: The reference is ineffective.	The corresponding terminal logic is recommended to be level-triggered.

Code	Name	Function Name	Description	Remarks
			Active: The reference is enabled.	
FunIN.31	HomeSwitch	Home switch	Inactive: The switch is not triggered Active: The switch is triggered.	The corresponding terminal logic must be level-triggered. It is recommended to assign this function to a high-speed DI terminal. If the logic is set to 2 (rising edge active), the servo drive forcibly changes it to 1 (active high). If the logic is set to 3 (falling edge active), the servo drive forcibly changes it to 0 (active low). If the logic is set to 4 (both rising edge and falling edge active), the servo drive forcibly changes it to 0 (low level active).
FunIN.34	Emergence Stop	Emergency stop	Active: Position lock is applied after stop at zero speed. Inactive: Current operating state is unaffected.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.36	V_LmtSel	Internal speed limit source	Inactive: H07.19 used as positive/negative internal speed limit Active: H07.20 used as positive/negative internal speed limit	The corresponding terminal logic is recommended to be level-triggered.
FunIN.38	TouchProbe1	Touch probe 1	Inactive: Touch probe is not triggered. Active: Touch probe is triggerable.	The touch probe logic is only related to the touch probe function (60B8h).
FunIN.39	TouchProbe2	Touch probe 2	Inactive: Touch probe is not triggered. Active: Touch probe is triggerable.	The touch probe logic is only related to the touch probe function (60B8h).
FunIN.40	Multi-speed	Multi-speed enable	Inactive: The internal multi-speed reference is ineffective. Active: The internal multi-speed reference is enabled.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.46	PrEnable	Technology segment enable	Inactive: Stop technology segment Active: Start technology segment	The corresponding terminal logic is recommended to be level-triggered.
FunIN.47	PrCMD1	Technology segment command switchover 1	Switchover among 16 technology segments	The corresponding terminal logic is recommended to be level-triggered.
FunIN.48	PrCMD2	Technology segment command switchover 2	Switchover among 16 technology segments	The corresponding terminal logic is recommended to be level-triggered.

Code	Name	Function Name	Description	Remarks
FunIN.49	PrCMD3	Technology segment command switchover 3	Switchover among 16 technology segments	The corresponding terminal logic is recommended to be level-triggered.
FunIN.50	PrCMD4	Technology segment command switchover 4	Switchover among 16 technology segments	The corresponding terminal logic is recommended to be level-triggered.
FunIN.51	PrEvent1	Event trigger technology segment 1	Process segment A triggered by rising edge. Process segment B triggered by falling edge.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.52	PrEvent2	Event trigger technology segment 2	Process segment A triggered by rising edge. Process segment B triggered by falling edge.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.53	PrEvent3	Event trigger technology segment 3	Process segment A triggered by rising edge. Process segment B triggered by falling edge.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.54	PrEvent4	Event trigger technology segment 4	Process segment A triggered by rising edge. Process segment B triggered by falling edge.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.55	PrSuspend	Process segment suspend	Inactive: Continue the already enabled technology segment. Active: Suspend the technology segment	The corresponding terminal logic is recommended to be level-triggered.
FunIN.56	GantryTrqAlignEnable	Gantry torque alignment	Inactive: Disabled Active: Enabled	-
FunIN.57	Gantry-DI-AlignClear	Gantry DI alignment	Inactive: Disabled Active: Enabled	-
FunIN.58	Gantry-DI-AlignEnable	Gantry DI alignment clear	Inactive: Disabled Active: Enabled	-
FunIN.59	GantrySyncEnable	Gantry sync enable	Inactive: Disabled Active: Enabled	-
Description of DO signals				
FunOUT.1	S-RDY	Ready to switch on	The servo drive is ready to receive the S-ON signal. Inactive: The servo drive not ready. Active: The servo drive is ready.	-
FunOUT.2	TGON	Motor rotation signal	Inactive: Absolute value of filtered motor speed is lower than the setpoint of H06.16. Active: Absolute value of filtered motor speed reaches the setpoint of H06.16.	-

Code	Name	Function Name	Description	Remarks
FunOUT.5	COIN	Positioning completed	Inactive: Positioning not completed Active: Positioning completed	-
FunOUT.6	NEAR	Proximity	Inactive: large positioning deviation Active: position deviation near	-
FunOUT.9	BK	Brake output signal	Active - Brake signal is output. Disabled - Brake signal not output.	-
FunOUT.10	WARN	Alarm	Inactive: The servo drive issued no alarm or the alarm has been reset. Active - The servo drive issued an alarm.	-
FunOUT.11	ALM	Fault	The servo drive is faulty. Inactive: No fault occurred on the servo drive or the fault has been reset.	-
FunOUT.22	CmdOk	Internal command completed	Inactive: Internal command transmit not completed. Active: Internal command transmit completed.	-
FunOUT.24	MC_OK	Internal motion completed	Inactive: Internal command transmit or positioning not completed. Active: Internal command transmit and positioning completed.	-
FunOUT.25	CMP	Comparison DO	Inactive: The servo drive did not pass the target position comparison point. Active: The servo drive passed the target position comparison point.	-
FunOUT.26	LoopState	Closed loop state	0: Semi-closed-loop Position feedback signals come from the built-in encoder of the servo motor. 1: Full closed-loop Position feedback signals come from the full closed-loop external encoder.	-
FunOUT.27	LEFTLIMIT	Left limit	Inactive: The drive is not at the left limit. Active: The drive is at the left limit.	Only Inovance DDL communication reading head supports this feature.
FunOUT.28	RIGHTLIMIT	Right limit	Inactive: The drive is not at the right limit.	Only Inovance DDL communication reading head supports this feature.

Code	Name	Function Name	Description	Remarks
			Active: The drive is at the right limit.	
FunOUT.31	Communication-forced DO		See *"Table 31–12 Communication forced DO wire breakage output" on page 2699*. .	-
FunOUT.32	EDM	EDM output	Active: STO is triggered Inactive: STO is not triggered	The EDM outputs active signals only when both the 24 V input voltages for STO1 and STO2 are disconnected.
FunOUT.33	GantryAlignStatus	Gantry alignment	Inactive: Not aligned Active: Aligned	-

Table 31–12 Communication forced DO wire breakage output

Type	Data	Description
bit0	0	Maintain DO1 output
	1	DO1 output prohibited
bit1	0	Maintain DO2 output
	1	DO2 output prohibited

31.6 DIDO Function Assignment [Functional Safety N]

Table 31–13 DI Function Assignment

Value	Name	Function Name	Description
01	STO command	STO trigger command	0: STO active 1: STO deselected
02	SBC command	SBC trigger command	0: SBC active 1: SBC deselected
03	SS1 command	SS1 trigger command	0: SS1 active 1: SS1 deselected
04	SS2 command	SS2 trigger command	0: SS2 active 1: SS2 deselected
05	SLS1 command	SLS1 trigger command	0: SLS1 active 1: SLS1 deselected
06	SLS2 command	SLS2 trigger command	0: SLS2 active 1: SLS2 deselected
07	SLS3 command	SLS3 trigger command	0: SLS3 active 1: SLS3 deselected
08	SLS4 command	SLS4 trigger command	0: SLS4 active 1: SLS4 deselected
09	SDIp command	SDIp trigger command	0: Active, forward rotation prohibited

Value	Name	Function Name	Description
			1: Canceled, forward rotation allowed
10	SDIn command	SDIn trigger command	0: Active, reverse rotation prohibited 1: Canceled, reverse rotation allowed
11	ACK command	ACK trigger command	0: ACK deselected 1: ACK active

Table 31–14 DO Function Assignment

Value	Name	Function Name	Description
01	STO Active	STO active	0: Normal state 1: STO state
02	SBC Active	SBC active	0: Normal state 1: SBC state
03	SS1 Active	SS1 active	0: SS1 inactive 1: SS1 stop state
04	SS2 Active	SS2 active	0: SS2 inactive 1: SS2 stop state
05	SLS1 Active	SLS1 active	0: Normal state 1: SLS1 monitoring state
06	SLS2 Active	SLS2 active	0: Normal state 1: SLS2 monitoring state
07	SLS3 Active	SLS3 active	0: Normal state 1: SLS3 monitoring state
08	SLS4 Active	SLS4 active	0: Normal state 1: SLS4 monitoring state
09	SDIp Status	SDIp state	0: Inactive, motor is not rotating forward 1: Active, motor is rotating forward
10	SDIn Status	SDIn state	0: Inactive, motor is not rotating reversely 1: Active, motor is rotating reversely
11	SOS Active	SOS active	0: SOS inactive 1: SOS active
12	SSM Active	SSM active	0: Out of SSM limit 1: Within SSM limit
13	SS1-r Active	SS1-r active	0: SS1-r inactive 1: SS1-r active state
14	SS2-r Active	SS2-r active	0: SS2-r inactive 1: SS2-r active

Note

The DIDO function can only be used in the local mode. The bus mode automatically shields the DIDO function, and will not diagnose whether the DIDO hardware circuit fails.

PS00018929A01

Copyright © Shenzhen Inovance Technology Co., Ltd.

Shenzhen Inovance Technology Co., Ltd.

www.inovance.com

Add.: Inovance Headquarters Tower, High-tech Industrial Park,
Guanlan Street, Longhua New District,
Shenzhen 518000, P.R. China
Tel: (0755) 2979 9595 Fax: (0755) 2961 9897

Suzhou Inovance Technology Co., Ltd.

www.inovance.com

Add.: No.52, Tian'e Dang Road, Wuzhong District,
Suzhou 215104, P.R. China
Tel: (0512) 6637 6666 Fax: (0512) 6285 6720