INOVANCE

User Guide

SV820N Series Servo Drive

User Guide

A00

Data code 19011165

Preface

Thank you for purchasing SV820N series servo drives developed by Inovance.

The SV820N series servo drive is a high-performance multi-axis AC servo drive covering a power range of 100 W to 750 W. It supports CANopen and EtherCAT communication protocols and carries necessary communication ports to work with the host controller in achieving a networked operation of multiple servo drives.

The SV820N servo drive offers stiffness level setting, inertia auto-tuning and vibration suppression to simplify the operation process. It allows quiet and stable operations through working with a MS1 series high-response servo motor configured with a 20-bit incremental encoder or a 23-bit multi-turn absolute encoder. The SV820N servo drive aims to implement fast and accurate position control, speed control, and torque control in automation equipment such as semiconductor manufacturing equipment, SMT machines, PCB punching machines, transport machineries, food processing machineries, machine tools, and conveying machineries.

This user guide presents information concerning the product safety, mechanical and electrical installations, and basic commissioning and maintenance instructions. First-time users must read through this manual. If you have any question concerning product functions or performance, contact Inovance for technical support.

This user guide is subject to change without notice due to continuous product improvement.

Notes
◆ The drawings in the user 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 described in the user guide.
◆ The drawings in the user guide are shown for descriptions only and may not match the product you purchased.
◆ This user guide is subject to change without notice due to product upgrade, specification modifications as well as efforts to improve the accuracy and convenience of the user guide.
◆ If the user guide is damaged or lost, contact our regional agents or customer service centers to order the user guide.
◆ Contact Inovance customer service center for concerns during use.

Unpacking Inspection

Check the following items upon unpacking.

Items	Description
Check whether the delivered product is consistent with your order.	The box contains the device you ordered. Confirm the device model according to the nameplates of the servo motor and the servo drive.
Check whether the product is damaged.	Check whether the overall appearance of the product is intact. If there is any part missing or damaged, contact Inovance or your supplier immediately.
Check whether the rotating shaft of the servo motor rotates smoothly.	The motor shaft can be rotated manually in normal conditions. Note that the servo motor configured with a brake cannot be rotated manually.

Revision History

Date	Version	Description
January 2020	A00	First edition

Standards Compliance

- The SV820N series servo drive has passed the following functional safety certifications.

Functional Safety	Certification Mark	Standards
STO (Safety Torque Off)	TÜV SÜD	IEC/EN 61508
		SN 29500
		EN ISO 13849-1

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Safety Instructions

Safety Precautions

1) Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations.
2) To ensure the safety of humans and equipment, follow the signs on the equipment and all the safety instructions in this user guide.
3) "CAUTION", "WARNING", and "DANGER" items in the user guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
4) Use this equipment according to the designated environment requirements. Damage caused by improper usage is not covered by warranty.
5) Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Levels and Definitions

DANGER	indicates that failure to comply with the notice will result in severe personal injuries or even death.
WARNING	indicates that failure to comply with the notice may result in severe personal injuries or even death.
CAUTION	indicates that failure to comply with the notice may result in minor personal injuries or damage to the equipment.

Safety Instructions

Unpacking
CAUTION ◆ Check whether the packing is intact and whether there is damage, water seepage, damp, and deformation. ◆ Unpack the package by following the package sequence. Do not hit the package with force. ◆ Check whether there are damage, rust, or injuries on the surface of the equipment or equipment accessories. ◆ Check whether the number of packing materials is consistent with the packing list.

WARNING

- Do not install the equipment if you find damage, rust, or indications of use on the equipment or accessories.
- Do not install the equipment if you find water seepage, component missing or damage upon unpacking.
- Do not install the equipment if you find the packing list does not conform to the equipment you received.

Storage and Transportation

CAUTION

- Store and transport this equipment based on the storage and transportation requirements for humidity and temperature.
- Avoid transporting the equipment in environments such as water splashing, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing this equipment 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 this equipment with other equipment or materials that may harm or have negative impacts on this equipment.

WARNING

- Use professional loading and unloading equipment to carry large-scale or heavy equipment.
- When carrying this equipment with bare hands, hold the equipment casing firmly with care to prevent parts falling. Failure to comply may result in personal injuries.
- Handle the equipment with care during transportation and mind your step to prevent personal injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is lifted by hoisting equipment.

Installation

⚠ WARNING

- Thoroughly read the safety instructions and user guide before installation.
- Do not modify this equipment.
- Do not rotate the equipment components or loosen fixed bolts (especially those marked in red) on equipment components.
- Do not install this equipment in places with strong electric or magnetic fields.
- When this equipment is installed in a cabinet or final 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.

⚠ DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Installation, wiring, maintenance, inspection, or parts replacement must be performed by only experienced personnel who have been trained with necessary electrical information.
- Installation personnel must be familiar with equipment installation requirements and relevant technical materials.
- Before installing equipment with strong electromagnetic interference, such as a transformer, install an electromagnetic shielding device for this equipment to prevent malfunctions.

Wiring

⚠ DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Never perform wiring at power-on. Failure to comply will result in an electric shock.
- Before wiring, cut off all equipment power supplies. Wait at least 15 minutes before further operations because residual voltage exists after power-off.
- Make sure that the equipment is well grounded. Failure to comply will result in an electric shock.
- During wiring, follow the proper electrostatic discharge (ESD) procedures, and wear an antistatic wrist strap. Failure to comply will result in damage to internal equipment circuits.

WARNING

- Never connect the power cable to output terminals of the equipment. Failure to comply may cause equipment damage or even a fire.
- When connecting a drive with the motor, make sure that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Wiring cables must meet diameter and shielding requirements. The shielding layer of the shielded cable must be reliably grounded at one end.
- After wiring, make sure that no screws are fallen and cables are exposed in the equipment.

Power-on

DANGER

- Before power-on, make sure that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Before power-on, make sure that the power supply meets equipment requirements to prevent equipment damage or even a fire.
- At power-on, unexpected operations may be triggered on the equipment. Therefore, stay away from the equipment.
- After power-on, do not open the cabinet door and protective cover of the equipment. Failure to comply will result in an electric shock.
- Do not touch any wiring terminals at power-on. Failure to comply will result in an electric shock.
- Do not remove any part of the equipment at power-on. Failure to comply will result in an electric shock.

Operation

DANGER

- Do not touch any wiring terminals during operation. Failure to comply will result in an electric shock.
- Do not remove any part of the equipment during operation. Failure to comply will result in an electric shock.
- Do not touch the equipment shell, fan, or resistor for temperature detection. Failure to comply will result in heat injuries.
- Signal detection must be performed by only professionals during operation. Failure to comply will result in personal injuries or equipment damage.

WARNING

- Prevent metal or other objects from falling into the device during operation. Failure to comply may result in equipment damage.
- Do not start or stop the equipment using the contactor. Failure to comply may result in equipment damage.

Maintenance

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Do not maintain the equipment at power-on. Failure to comply will result in an electric shock.
- Before maintenance, cut off all equipment power supplies and wait at least 15 minutes.

WARNING

- Perform daily and periodic inspection and maintenance for the equipment according to maintenance requirements and keep a maintenance record.

Repair

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Do not repair the equipment at power-on. Failure to comply will result in an electric shock.
- Before inspection and repair, cut off all equipment power supplies and wait at least 15 minutes.

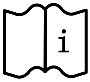
WARNING

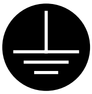
- Require for repair services according to the product warranty agreement.
- When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record.
- Replace quick-wear parts of the equipment according to the replacement guide.
- Do not operate damaged equipment. Failure to comply may result in worse damage.
- After the equipment is replaced, perform wiring inspection and parameter settings again.

Disposal
⚠ WARNING ◆ Dispose of retired equipment by following local regulations or standards. Failure to comply may result in property damage, personal injuries, or even death. ◆ Recycle retired equipment by following industry waste disposal standards to avoid environmental pollution.

Safety Signs

■ Description of safety signs in the user guide


Read the user guide before installation and operation.

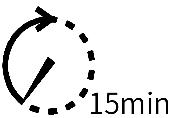

Reliably ground the system and equipment.


Danger!


High temperature!


Prevent personal injuries caused by machines.


High voltage!



Wait 15 minutes before further operations.

■ Description of safety signs on the equipment

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

<table>
<tr><th>Safety Sign</th><th>Description</th></tr>
<tr><td>
</td><td>Never fail to connect the Protective Earth(PE) terminal. Read the user guide and follow the safety instructions before use.

To prevent the risk of electric shock, do not touch terminals within 15 minutes after cutting off the power supply.

To prevent the risk of burning, do not touch the heatsink when the power supply is ON.</td></tr>
</table>

1 Servo System Selection

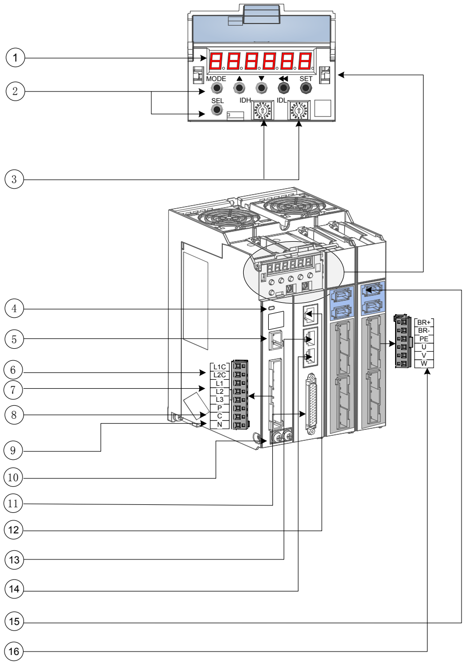
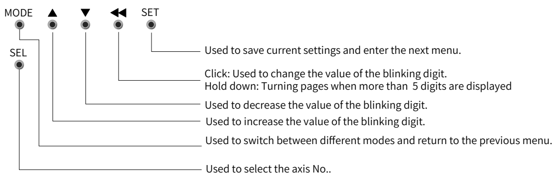


Figure 1-1 Components

No.	Name	Function
1	LED display	Displays the running status and parameter settings of the servo drive
2	Push buttons	
3	IDH, IDL device node address setting	Reserved
4	CHARGE indicator (bus voltage indicator)	When this indicator lights up, electric charge may be still present in the internal capacitor even if the main circuit power supply is switched off. To prevent electric shock, do not touch the power terminals when this indicator lights up.
5	CN7 (24 V brake power input)	24 V brake power input (If you need to use the brake power supply, input the 24 V power through this terminal.)

No.	Name	Function
6	L1C, L2C (control circuit power input terminals)	Control circuit 220 VAC power input
7	L1, L2, L3 (main circuit power input terminals)	Main circuit single-phase/three-phase 220 V power input: L1 and L2 terminals are used in single-phase input L1, L2, and L3 terminals are used in three-phase input
8	P, C (terminals for connecting external regenerative resistor)	The external regenerative resistor is connected between P and C. Note that the external regenerative resistor should be purchased separately.
9	P, N (common DC bus terminals)	Used for common DC bus connection when multiple servo drives are connected in parallel.
10	PE (grounding terminal)	Two PEs are connected respectively to the grounding terminals of the servo drive and servo motor.
11	CN1 (control terminal)	Used for DI/DO signals.
12	CN3 (Ethernet connecting terminal)	Ethernet connector port
13	CN4 (EtherCAT output terminal)	EtherCAT port, CN4 (OUT) connected to the next slave
14	CN5 (EtherCAT input terminal)	EtherCAT port, CN5 (IN) connected to the master or the last slave
15	X1, X2 (terminals for connecting encoder)	Connected to motor encoder terminals.
16	X3, X4 (main circuit signal terminal of the drive unit)	BR+, BR-: Brake coils of the motor with brake U, V, W: Connected to U, V and W phases of the servo motor

NOTE

◆ The motor with brake must be supplied with 24 V power through CN7. The power must be output to the wiring terminal of the brake through BR+ and BR-.

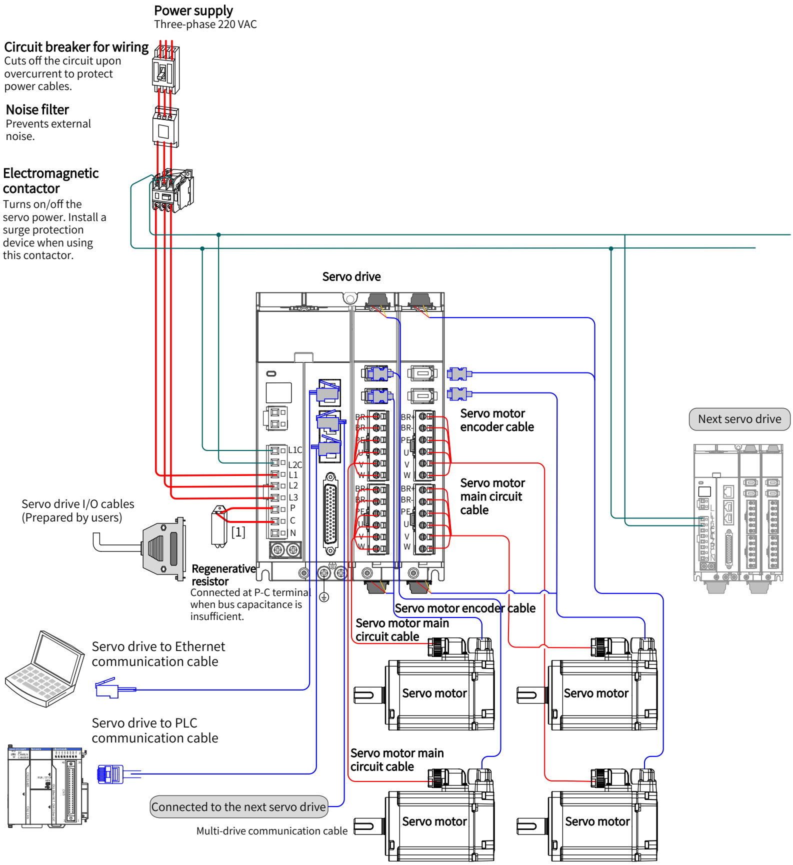


Figure 1-2 Wiring example of the three-phase 220 V system

The servo drive is directly connected to an industrial power supply, with no isolation such as a transformer. To prevent cross electric shock accidents, install a fuse or circuit breaker on the input power supply. The servo drive is not configured with a built-in protective grounding circuit. For the sake of safety, install a residual current device (RCD) to provide protections against overload and short-circuit accidents or install a specialized RCD to protect the grounding cable.

Do not run or stop the motor by using the electromagnetic contactor. As a high-inductance device, the motor may generate high voltage instantaneously, which may damage the contactor.

Pay attention to the power capacity when connecting an external control power supply or a 24 VDC power supply, especially when the power supply is used to power up multiple servo drives or brakes. Insufficient power supply will lead to insufficient supply current, resulting in failure of the servo drive or brake. The brake must be powered up by a 24 VDC power supply that matches the motor model and brake requirements.

Observe the following precautions during wiring:

1) Connect an external regenerative resistor between terminals P and C when the servo system is in regenerative braking status.

2) CN3 is used to connect the Ethernet. CN4 and CN5 are used to connect the EtherCAT. CN4 is used to connect the next slave, and CN5 is used to connect the master or the last slave.

1.1 Nameplate and Model Number

■ Model and nameplate of the servo drive

SV820 N 2S 2C 2C-FH

Code	Series No.
SV820	SV820

Code	Type of Control Card
N	Network type

Code	Power supply unit
1S	1 kW
2S	2 kW

Code	Drive Unit 1
Single-axis drive unit (rated current)	
1C	2.8 A
1D	4.6 A
Dual-axis drive unit (rated current per axis)	
2C	2.8 A
2D	4.6 A

Code	Drive Unit 2

Code	Type of Control Card
None	Standard
FH	High protection
FS	STO functional safety

Note: Motors of 400 W (inclusive) are configured with 2C or 1C drive unit.

Figure 1-3 Description of the servo drive model number

Example:

SV820N2S2C2C: SV820 series multi-axis network-type servo system, with power supply unit being 2 kW, drive unit 1 being 2.8 A x 2, and drive unit 2 being 2.8 A*2

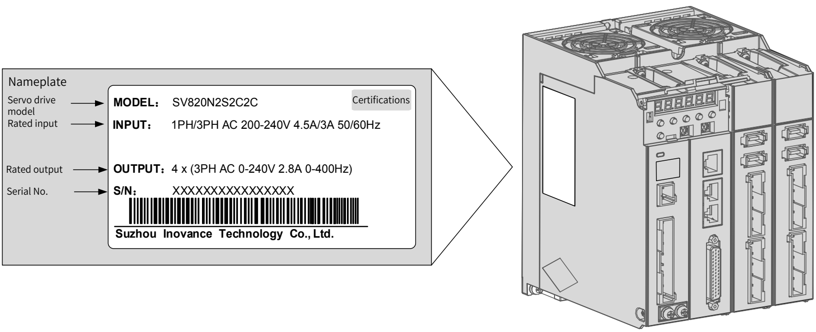


Figure 1-4 Description of the servo drive nameplate

■ Servo Drive Model Selection

Model	Input Power 220 VAC	Rated Output Power of Power Supply Unit	Axis 1 Output Current	Axis 2 Output Current	Axis 3 Output Current	Axis 4 Output Current
SV820N2S2C2C	Single-phase	2 kW	2.8 A	2.8 A	2.8 A	2.8 A
SV820N2S2C2D	Single-phase[1]/ Three-phase	2 kW	2.8 A	2.8 A	4.6 A	4.6 A
SV820N1S2C1C	Single-phase	1 kW	2.8 A	2.8 A	2.8 A	NC
SV820N2S2D1D	Single-phase	2 kW	4.6 A	4.6 A	4.6 A	NC
SV820N2S2C1D	Single-phase	2 kW	2.8 A	2.8 A	4.6 A	NC

[1] For SV820N2S2C2D models, derate to 80% of the load ratio upon single-phase 220 V power input.

1.2 Technical Data

1.2.1 Basic Specifications

Item			Description
Basics	Control mode		220 V single-phase/three-phase full-bridge rectification IGBT PWM control, sine wave current drive mode
	Feedback		Serial incremental type: 23-bit or 20-bit
	Conditions for use	Operation/ Storage temperature	0°C to 45°C (derating required for ambient temperature higher than 45°C)/–40°C to +70°C
		Operation/ Storage humidity	Below 90% RH (without condensation)
		Vibration/Impact resistance level	4.9 m/s^2, 19.6 m/s^2
		IP rating	IP20 (except connecting terminals)
		Pollution degree	PD2
		Altitude	Below 1000 m
Performance	Speed and torque control	Speed control range	1:5500 (The lower limit of the speed control range acts as the condition for non-stop at rated torque load.)
		Speed loop bandwidth	3000 Hz
		Torque control accuracy (repetitiveness)	±2%
		Soft start time	0s to 60s (Acceleration and deceleration can be set separately.)
	Position control	Positioning time	1 ms to 10 ms

Item			Description
Input/Output signal	Digital input (DI) signal	Signal allocation change available	24 DIs (shared by multiple axes, with 16 DIs available for high-speed probe function)
			P-OT (Positive limit switch), N-OT (Negative limit switch), HomeSwitch (Home switch), TouchProbe1 (Touch probe 1) TouchProbe2 (Touch probe 2)
	Digital output (DO) signal	Signal allocation change available	6 DOs (shared by multiple axes) DO load-carrying capacity: 50 mA Voltage range: 5 V to 30 V
			S-RDY (servo ready), TGON (motor rotation output), WARN (warning), ALM (fault)
Built-in functions	Overtravel (OT) prevention		Decelerating to stop when P-OT and N-OT activated
	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
	LED display		Main circuit CHARGE indicator, 6-digit LED display
	Vibration suppression		Four notches per axis, two of which are adaptive notches capable of suppressing mechanical resonance of 50 Hz to 4000 Hz Filters for suppressing low- (machine stand/tip vibration of 1 Hz to 100 Hz), medium-, and high-frequency (mechanical/system vibration of 30 Hz to 1000 Hz) vibration available
	Communication protocol		Ethernet, EtherCAT
	Dynamic brake		Built-in dynamic brake for emergency braking
	Brake power supply		Built-in brake power output The external 24 V power supply must be connected through CN7. The brake coil can be connected directly to terminals BR+ and BR-.
	Others		Gain auto-tuning, fault log, jog

NOTE

Precautions for use of the built-in dynamic brake:

- As the dynamic brake allows emergency stop, do not stop the motor by triggering the S-OFF signal. The dynamic brake circuit may act frequently if the motor is started or stopped through ON/OFF control of the power supply or the servo drive, causing deterioration and failure of internal components of the servo drive. Start or stop the servo motor through speed or position references.
- The dynamic brake can be used for emergency stop only. To stop a motor normally, make the motor coast to stop or stop at zero speed. If the dynamic brake is activated in high-speed rotating status, wait for three minutes before performing the next operation (such as power on or run the motor again).
- The dynamic brake can be used when:

  a) The control power supply is turned off.
  b) The servo drive is turned off.
  c) The protection function is activated.
- The dynamic brake can be activated or deactivated through parameter settings during decelerating or after stop when any one of above conditions occurs. When the control power supply is turned off, the dynamic brake acts.
- See the description of H02-08 for setting of dynamic brake functions.

1.2.2 Technical Data of EtherCAT Communication

Item		Specifications
Basic performance of EtherCAT slave	Communication protocol	EtherCAT protocol
	Available services	CoE (PDO, SDO)
	Synchronization mode	DC - Distributed clock
	Physical layer	100BASE-TX
	Baud rate	100 Mbit/s (100Base-TX)
	Duplex mode	Full duplex
	Topological structure	Ring and linear
	Transmission medium	Shielded Cat 5e or better network cable
	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	A maximum of 1486 bytes per Ethernet frame
	Synchronous jitter of two slaves	Less than 1 μs
	Refresh time	About 30 μs for 1000 DI/DOs About 100 μs for 100 servo axes Different refresh time for different interfaces
	Communication code error rate	10^{-10} Ethernet standard
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 Initialization data written by EtherCAT master

1.3 Specifications of the Servo Motor

1.3.1 Nameplate and Model Number of the Servo Motor

MS1 H1 – 40B 30C B – A3 3 1 Z

Code	Series No.
MS1	MS series servo motor

Code	Type
H	1: Low inertia, small capacity
	2: Low inertia, medium capacity
	3: Medium inertia, medium capacity
	4: Medium inertia, small capacity

Code	Rated Power (W)
Comprised of a digit and a letter	
A	x1
B	x10
C	x100
D	x1000
E	x10000
Example: 40B: 400 W	

Code	Rated Speed (RPM)
Comprised of a digit and a letter	
A	x1
B	x10
C	x100
D	x1000
E	x10000
Example: 30C: 3000 RPM	

Code	Motor Specification
Z	Z series motor
Z-S	Swinging-type motor

Code	Brake, Reducer, Oil Sealing
0	None
1	Oil sealing
2	Brake
4	Oil sealing+Brake

Code	Shaft Connection Mode
1	Plain shaft
2	Solid, with key
3	Solid, with key and threaded hole
5	Solid, with threaded hole

Code	Encoder Type
Comprised of a digit and a letter	
A3	2nd generation of multi-turn absolute encoder
U3	Incremental encoder

Code	Voltage Class
B	220 V
D	380 V

Figure 1-5 Description of the servo motor model number

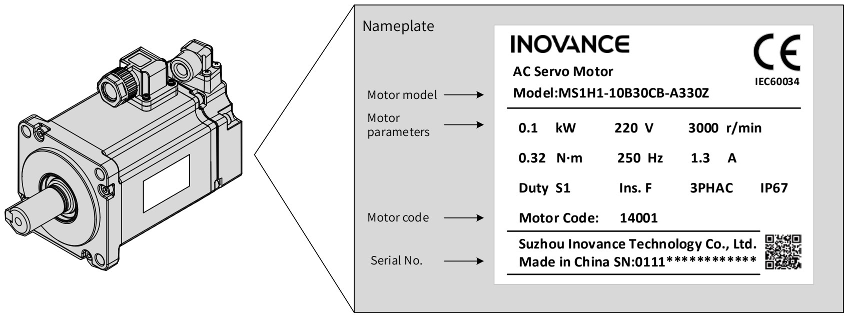


Figure 1-6 Description of the servo motor nameplate

NOTE

- The preceding information only applies to motors in 40, 60, or 80 frame size.

1.3.2 Mechanical Characteristics of the Servo Motor

Item	Description
Rated time	Continuous
Vibration level	V15
Insulation resistance	500 VDC, above 10 MΩ
Ambient temperature	0°C to 40°C
Excitation mode	Permanent magnetic
Installation mode	Flange
Heat resistance level	Level F
Insulation voltage	1500 VAC, 1 minute (200 V) 1800 VAC, 1 minute (400 V)
IP rating of the enclosure	H1: IP67 (except the shaft opening and connectors) H4: IP67 (except the shaft opening and connectors)
Ambient humidity	20% to 80% (without condensation)
Connection mode	Direct connection
Rotation direction	Rotates counterclockwise (CCW) when viewed from the load side at the forward run command.

1.3.3 Motor Ratings

Model	Rated Output (kW)[1]	Rated Torque (N·m)	Max. Torque (N·m)	Rated Current (Arms)	Max. Current (Arms)
MS1H1 (Vn = 3000 RPM, Vmax = 6000 RPM)					
MS1H1-05B30CB-****Z(-S)	0.05	0.16	0.56	1.3	4.6
MS1H1-10B30CB-****Z(-S)	0.1	0.32	1.12	1.3	4.9
MS1H1-20B30CB-****Z(-S)	0.2	0.64	2.2	1.5	5.6
MS1H1-40B30CB-****Z(-S)	0.4	1.27	4.5	2.8	10.8
MS1H1-55B30CB-**** Z(-S)	0.55	1.75	6.13	3.8	15
MS1H1-75B30CB-****Z(-S)	0.75	2.39	8.4	4.8	19
MS1H4 (Vn = 3000 RPM, Vmax = 6000 RPM)					
MS1H4-40B30CB-****Z-S	0.4	1.27	4.5	2.8	10.8
MS1H4-75B30CB-****Z-S	0.75	2.39	8.4	4.8	19

Model	Rated Speed (RPM)	Max. Speed (RPM)	Torque Para. (N·m/Arms)	Rotor Inertia (10^{-4}kg m^2)	Voltage (V)
MS1H1 (Vn = 3000 RPM, Vmax = 6000 RPM)					
MS1H1-05B30CB-****Z-S	3000	6000	0.149	0.026 (0.028)[2]	220
MS1H1-10B30CB-****Z-S			0.26	0.041 (0.043)[2]	
MS1H1-20B30CB-****Z-S			0.46	0.207 (0.220)[2]	
MS1H1-40B30CB-****Z-S			0.51	0.376 (0.390)[2]	
MS1H1-55B30CB-**** Z-S			0.48	1.06	
MS1H1-75B30CB-****Z-S			0.53	1.38 (1.43)[2]	
MS1H4 (Vn = 3000 RPM, Vmax = 6000 RPM)					
MS1H4-40B30CB-****Z-S	3000	6000	0.51	0.657 (0.667)[2]	220
MS1H4-75B30CB-****Z-S			0.53	2 (2.012)[2]	

[1] The motor with oil sealing must be derated by 20% during use.

[2] Values inside the brackets "()" are for the motor with brake.

NOTE

- The items and torque/speed characteristic values listed in the preceding table are obtained in cases where the motor is working with Inovance servo drives and the armature coil temperature is 20° C.
- The characteristic parameter values in preceding table are obtained in cases where the motor is installed with the following heatsink: MS1H1/MS1H4: 250 x 250 x 6 mm (aluminum)

1.3. 4 Motor Overload Characteristics

Load Ratio (%)	Operating Time (s)
120	230
130	80
140	40
150	30
160	20
170	17
180	15
190	12
200	10
210	8.5

Load Ratio (%)	Operating Time (s)
220	7
230	6
240	5.5
250	5
300	3
350	2

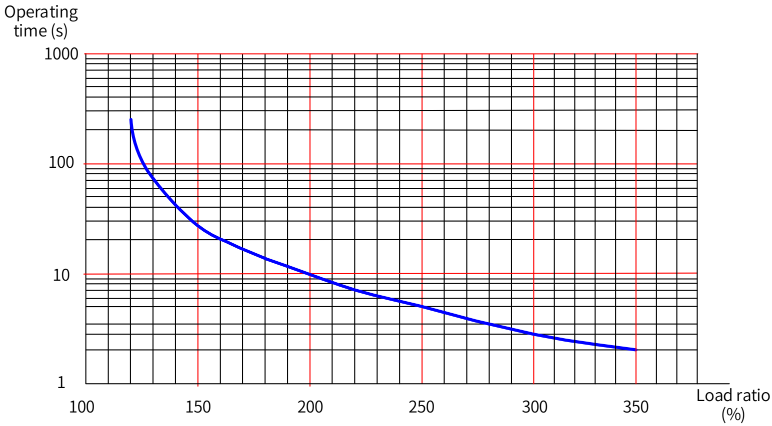


Figure 1-7 Motor overload curve

NOTE

◆ The maximum torque of models H1 and H4 is 3.5 times the rated torque.

1.3.5 Allowable Radial and Axial Loads of the Motor

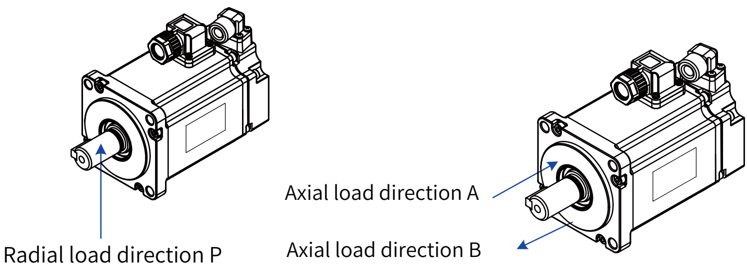


Figure 1-8 Radial and axial loads of the motor

Motor Model	Allowable Radial Load (N)	Allowable Axial Load (N)
MS1H1-05B30CB-****Z-S	78	54
MS1H1-10B30CB-****Z-S	78	54

Motor Model	Allowable Radial Load (N)	Allowable Axial Load (N)
MS1H1-20B30CB-****Z-S	245	74
MS1H1-40B30CB-****Z-S	245	74
MS1H1-55B30CB-****Z-S	392	147
MS1H1-75B30CB-****Z-S	392	147
MS1H4-40B30CB-****Z-S	245	74
MS1H4-75B30CB-****Z-S	392	147

1.3.6 Electrical Specifications of the Motor with Brake

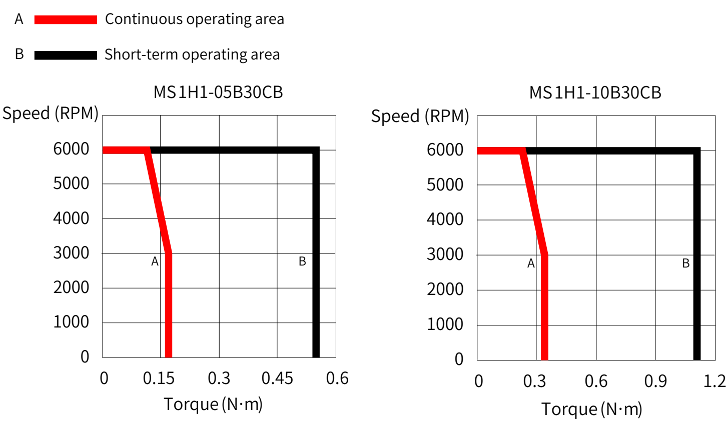
Motor Model	Holding Torque (N·m)	Supplied Voltage (VDC)±10%	Resistance at 20°C (Ω)±10%	Supply Current Range at 20°C (A)±10%	Release Time (ms)	Close Time (ms)
MS1H1-05B/10B	0.3	24	94.4	0.254	≤ 20	≤ 35
MS1H1-20B/40B	1.5	24	75.79	0.3	≤ 20	≤ 35
MS1H1-75B	2.5	24	72	0.333	≤ 20	≤ 60
MS1H4-40B	1.5	24	75.79	0.3	≤ 20	≤ 50
MS1H4-75B	2.5	24	72	0.333	≤ 20	≤ 60

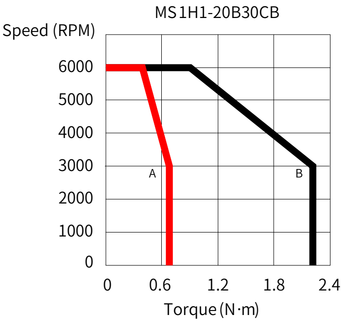
NOTE

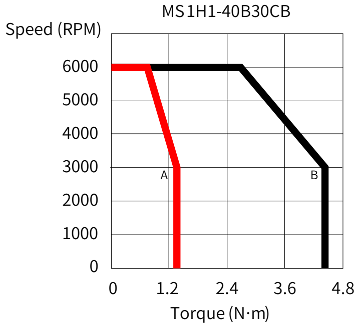
- ◆ The brake cannot share the same power supply with other electrical devices. This is to prevent malfunction of the brake due to voltage or current drop caused by other working devices.
- ◆ It is recommended to use cables of 0.5 mm^2 and above.

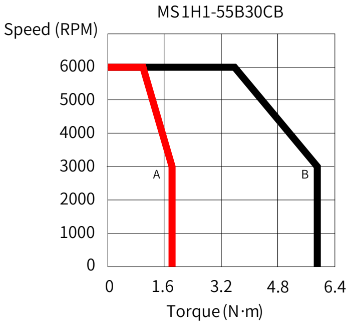
1.3.7 Motor Torque-Speed Characteristics

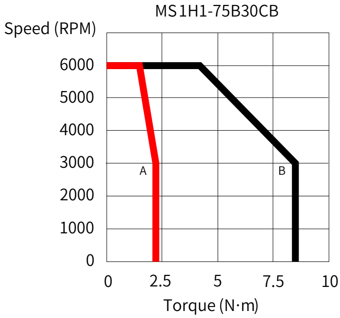
a) MS1H1 (low inertia, small capacity)







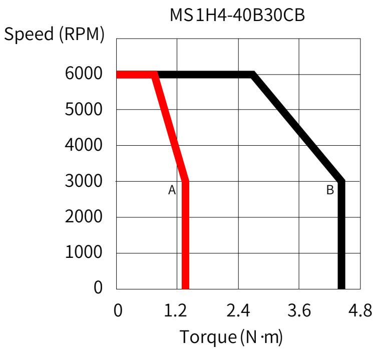


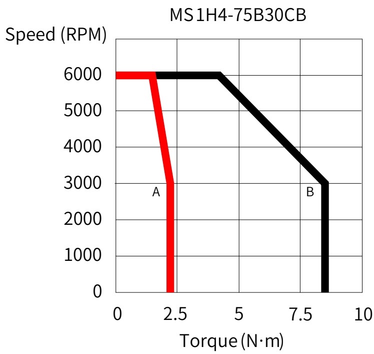


b) MS1H4 (medium inertia, small capacity)

A Continuous operating area

B Short-term operating area





1.4 Servo System Configuration Specifications

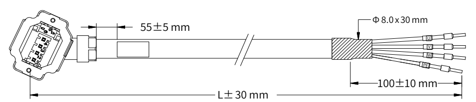
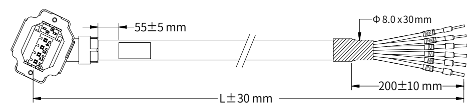
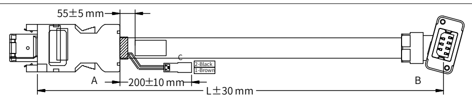
Rated Speed	Max. Speed	Capacity	Servo Motor Model MS1H □ - □□□□□□□ - *****		Motor Frame Size	Drive Unit Model SV820N** □□□□
3000 RPM	6000 RPM	50 W	H1 (low inertia, small capacity)	05B30CB	40	2C, 1C
		100 W		10B30CB	40	2C, 1C
		200 W		20B30CB	60	2C, 1C
		400 W		40B30CB	60	2C, 1C
		550 W		55B30CB	80	2D, 1D
		750 W		75B30CB	80	2D, 1D
		400 W	H4 (medium inertia, small capacity)	40B30CB	60	2C, 1C
		750 W		75B30CB	80	2D, 1D

1.5 Regenerative Resistor Specifications

Servo Drive Model			Min. Allowable Resistance (Ω)	Max. Braking Energy Absorbed by the Capacitor (J)
Single-phase/ Three-phase 220 V	SV820*1S****	Power supply unit of 1 kW	40	31
	SV820*2S****	Power supply unit of 2 kW	40	47

1.6 Cables

Table 1-1 Cables for terminal-type (Z) motors with front cable outlet

Cable Name	Cable Model	Cable Length (m)	Outline Drawing of the Cable
Main circuit cable (without brake)	S6-L-M107-3.0	3.0	
	S6-L-M107-5.0	5.0	
	S6-L-M107-10.0	10.0	
Main circuit cable (with brake)	S6-L-B107-3.0	3.0	
	S6-L-B107-5.0	5.0	
	S6-L-B107-10.0	10.0	
Absolute encoder cable	S6-L-P124-3.0	3.0	
	S6-L-P124-5.0	5.0	
	S6-L-P124-10.0	10.0	

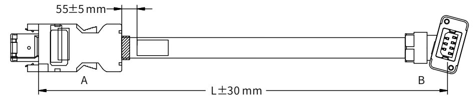
Cable Name	Cable Model	Cable Length (m)	Outline Drawing of the Cable
Incremental encoder cable	S6-L-P114-3.0	3.0	
	S6-L-P114-3.0	5.0	
	S6-L-P114-3.0	10.0	

Table 1-2 Cables for terminal-type (Z) motors with rear cable outlet

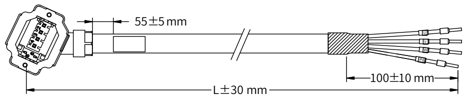
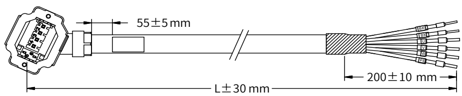
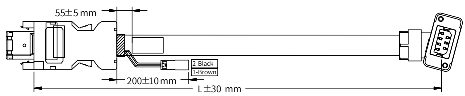
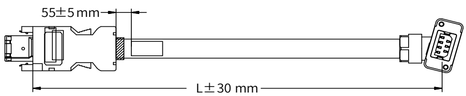
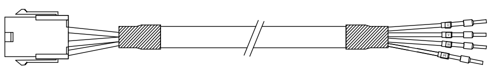
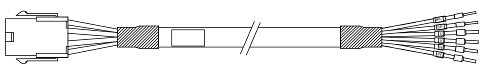
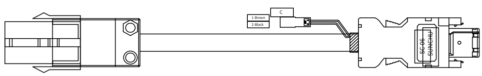
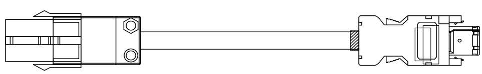
Cable Name	Cable Model	Cable Length (m)	Outline Drawing of the Cable
Main circuit cable (without brake)	S6-L-M108-3.0	3.0	
	S6-L-M108-5.0	5.0	
	S6-L-M108-10.0	10.0	
Main circuit cable (with brake)	S6-L-B108-3.0	3.0	
	S6-L-B108-5.0	5.0	
	S6-L-B108-10.0	10.0	
Absolute encoder cable	S6-L-P125-3.0	3.0	
	S6-L-P125-5.0	5.0	
	S6-L-P125-10.0	10.0	
Incremental encoder cable	S6-L-P115-3.0	3.0	
	S6-L-P115-3.0	5.0	
	S6-L-P115-3.0	10.0	

Table 1-3 Swinging-type motor cable

Cable Name	Cable Model	Cable Length (m)	Outline Drawing of the Cable
Main circuit cable (without brake)	S6-L-M100-3.0	3.0	
	S6-L-M100-5.0	5.0	
	S6-L-M100-10.0	10.0	
Main circuit cable (with brake)	S6-L-B100-3.0	3.0	
	S6-L-B100-5.0	5.0	
	S6-L-B100-10.0	10.0	
Absolute encoder cable	S6-L-P120-3.0	3.0	
	S6-L-P120-5.0	5.0	
	S6-L-P120-10.0	10.0	
Incremental encoder cable	S6-L-P110-3.0	3.0	
	S6-L-P110-5.0	5.0	
	S6-L-P110-10.0	10.0	

1.7 Connector Kit

Item	Connector Kit
I/O connecting port - CN1	S6-C8 (DB44 connector kit for cable sets of the servo drive)
Battery kit for absolute encoder	SV82-C4 (connector kit for battery box of the servo drive)
Swinging-type (Z-S) motor connector	S6-C26 (1394 port connector for encoder, 6-pin connecting terminal for motor power cable/9-pin connecting terminal for encoder cable)
Cable for parallel EtherCAT communication	S6-L-T04-0.3 (length: 0.3 m, 0.5 m, 1 m, 2 m, 3 m, 5 m, and 10 m) Consult with the cable supplier for customized cable length.

1.8 System Configuration

■ Configuration of the servo drive

Rated current

Model	Width	Input Current	Output Power	Number of Axes	Single-axis Output Current	Single-axis Max. Current
SV820N2S2C2C	120 mm	4.6 A	1 kW	4	2.8 A	10.1 A

2 Installation Instructions

2.1 Installation of the Servo Drive

2.1.1 Installation Environment

1 Installation location

- Install the servo drive inside a cabinet free from sunlight and rain.
- Install the servo drive in a place that meets the following requirements:
  a) Free from corrosive or inflammable gases and combustible objects, such as hydrogen sulfide, chlorine, anmonia, sulphur gas, chloridize gas, acid, soda and salt
  b) Free from high temperature, humidity, dusts, and metal powders
  c) Free from vibration
- Pollution degree of the installation location: PD2

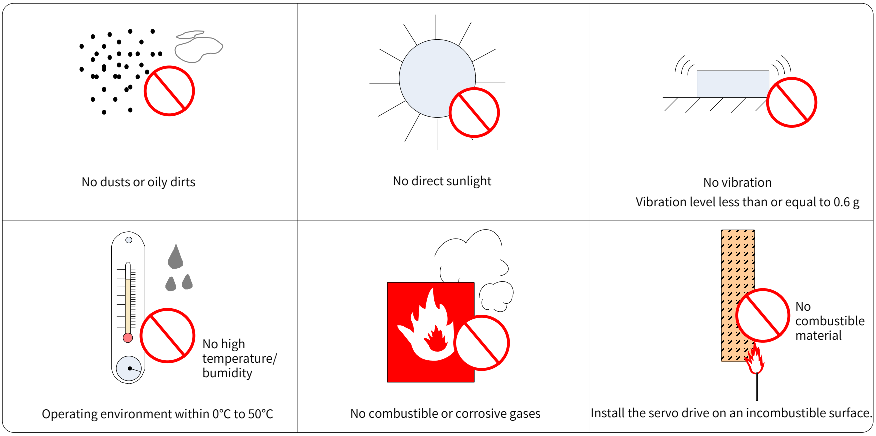


Figure 2-1 Installation Environment

2 Environment conditions

Item	Description
Ambient temperature	0°C to 55°C (average load ratio not exceeding 80% in an ambient temperature of 40°C to 55°C) (non-freezing)
Ambient humidity	Below 90% RH (without condensation)
Storage temperature	–20° C to +85° C (non-freezing)
Storage humidity	Below 90% RH (without condensation)
Vibration	Below 4.9 m/s^2
Shock	Below 19.6 m/s^2
IP rating	IP20 (except the connecting terminals)
Altitude	Below 1000 m

2.1.2 Installation Dimensions and Clearances

1 Dimension drawing (unit: mm)

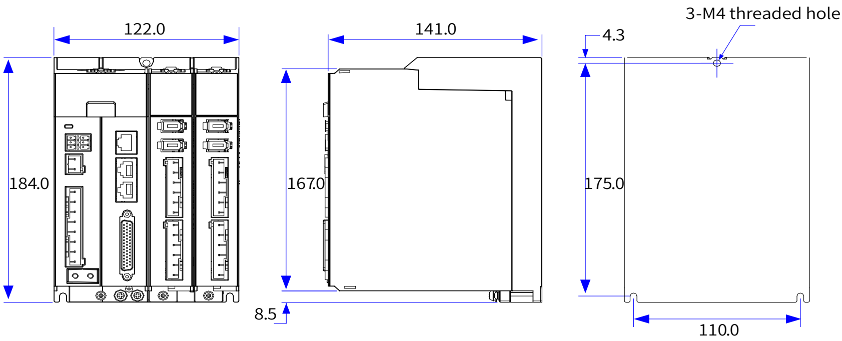


Figure 2-2 Product dimensions

2 Installation clearance (unit: mm)

The servo drive can be installed side by side (with a clearance of at least 2 mm) in one row or two rows, as shown in the following figure. The required minimum clearance between servo drives must be reserved during dual-row installation.

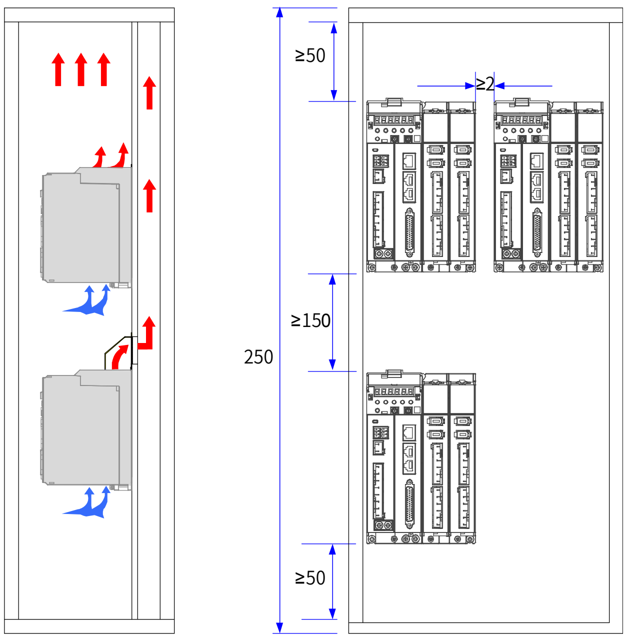


Figure 2-3 Dual-row installation clearance

A multi-axis system requires servo drives to be lined up along the top.

To ensure good heat dissipation and cooling effect, leave enough installation clearance as required by the following figure .

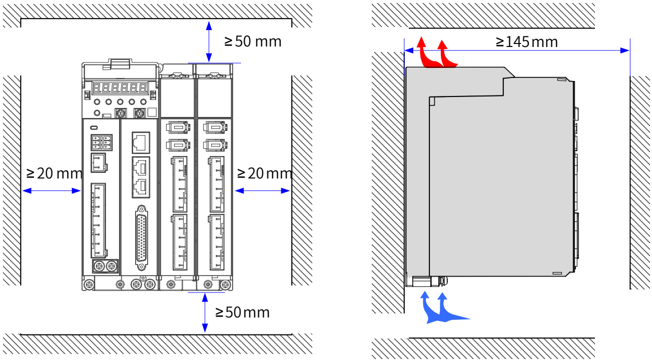


Figure 2-4 Installation clearance

Installation direction: The servo drive must be installed vertically.

2.1.3 Installation Method

The servo drive supports backplate mounting. Use M4 screws to fix the servo drive to the mounting surface through the three mounting holes on the servo drive.

1 Installation method

Mark the position of the threaded holes for installation and drill a screw hole in the base plate for each retaining screw.

The servo drive must be installed on the base plate vertically.

The installation diagram is shown in the following figure.

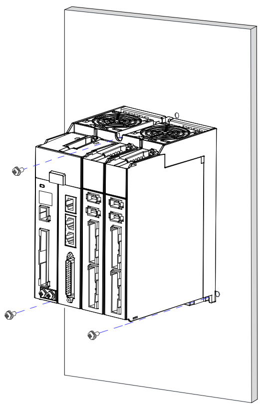


Figure 2-5 Backplate mounting

Recommended installation torque (N·m)

When fixing the servo drive with M4 screws, the recommended torque is 1.2 N·M.

Item	M3	M4	M5	M6	M8	M10	M12
Electrical connection	0.55	1.2	2.8	6	13	25	50

2 Cooling

Ensure the servo drive is installed vertically to the wall. Cool the servo drive down through natural convection or a cooling fan.

As shown in Figure 2-4, leave sufficient space around the servo drive to allow cooling through natural convection or a fan. Install the cooling fan onto the top of the servo drive to avoid excessive temperature rise and maintain an even temperature inside the cabinet.

3 Grounding

The grounding terminal must be grounded properly. Failure to comply may result in electric shock or malfunction due to interference.

4 Routing

Route the cables downwards during wiring (as shown by the following figure). This is to prevent the liquid from flowing into the servo drive along the cable.

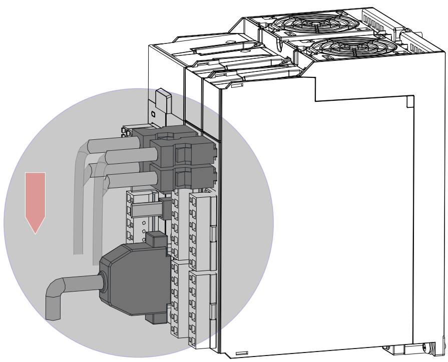


Figure 2-6 Routing direction

2.2 Installation of the Servo Motor

2.2.1 Installation Environment

1 Installation location

- Install the servo motor in a place free from corrosive and inflammable gases and combustible materials, such as the hydrogen sulfide, chlorine, anmonia, sulphur gas, chloridize gas, acid, soda, and salt.
- Use the servo motor with oil sealing when the motor is to be used in a place with grinding fluid, oil mists, iron powders or cuttings.
- Install the servo motor away from heating sources such as a heating stove.
- Do not use the servo motor in an enclosed environment. Working in an enclosed environment will lead to overheat of the servo motor and shorten its service life.
- To ensure proper installation and operation, prevent foreign objects and water from entering the terminals.

2 Environment conditions

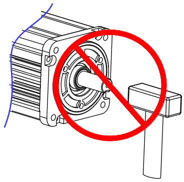
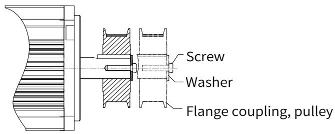
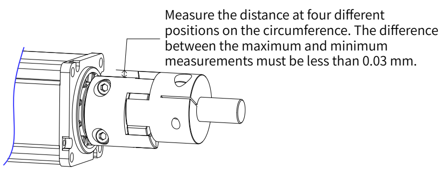
Table 2-1 Installation environment

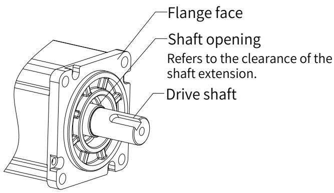
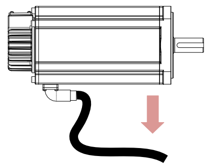
Item	Description
Ambient temperature	0°C to 40°C (non-freezing)
Ambient humidity	20% to 90% RH (without condensation)
Storage temperature	–20°C to +60°C (maximum temperature: 72 hours at 80°C)
Storage humidity	20% to 90% RH (without condensation)
Vibration	Below 49 m/s^2
Shock	Below 490 m/s^2
IP rating	H1 and H4: IP67 (except the shaft opening and connecting terminals of motor connectors)
Altitude	Below 1000 m (derating required for altitude above 1000 m.)

2.2.2 Installation Precautions

Table 2-2 Installation precautions

Item	Description
Rust-proof measures	Wipe up the anti-rust agent applied at the motor shaft extension before installing the servo motor, and then take rust-proof measures.

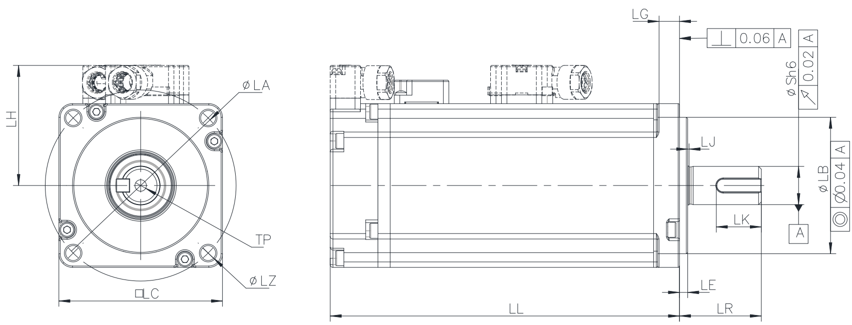
<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td rowspan="2">Encoder</td><td>◆ Do not strike the shaft extension during installation. Failure to comply will damage the encoder.
</td></tr>
<tr><td>◆ Use the screw hole at the shaft end when mounting a pulley to the servo motor shaft with a keyway. To fit the pulley, insert a double-end screw into the screw hole of the shaft, put a washer on the coupling end, and then use a nut to push the pulley in.
◆ For the motor shaft with a keyway, use the screw hole at the shaft end for installation. For the motor shaft without a keyway, use friction coupling or similar methods.
◆ When removing the pulley, use a pulley remover to protect the shaft against the strong shock from the load.
◆ To ensure safety, install a protective cover or similar device on the rotary area such as the pulley mounted on the shaft.

</td></tr>
<tr><td>Alignment</td><td>◆ When connecting the servo motor to a machine, use a coupling and keep the center of the motor shaft and the machine shaft in the same line. When installing the servo motor, make sure the required alignment accuracy shown in the following figure is fulfilled. Failure to comply will result in vibration that may damage the bearing and encoder.

</td></tr>
<tr><td>Installation direction</td><td>◆ The servo motor can be installed horizontally or vertically.</td></tr>
</table>

Item	Description
Measures against oil and liquid	◆ Do not submerge the motor/cable in water or oil. ◆ Check the IP rating of the servo motor in places with water drops (except the shaft opening).  ◆ Install the motor with its connecting terminals facing downwards (as shown in the following figure) when the motor is to be used in a place with liquid. This is to prevent the liquid from flowing into the motor body along the cable.  ◆ In environments where the shaft opening is exposed to oil drops, use a servo motor with oil sealing. ◆ Observe the following requirements when using a servo motor with oil sealing: a) Make sure the oil level is lower than the oil sealing lip during use. b) Prevent oil accumulation on the oil sealing lip when the motor is installed vertically upward.
Stress of cables	◆ Do not bend or apply tension to cables especially the signal cable whose conductor is only 0.2 mm or 0.3 mm in thickness. Do not pull the cables too tight during wiring.

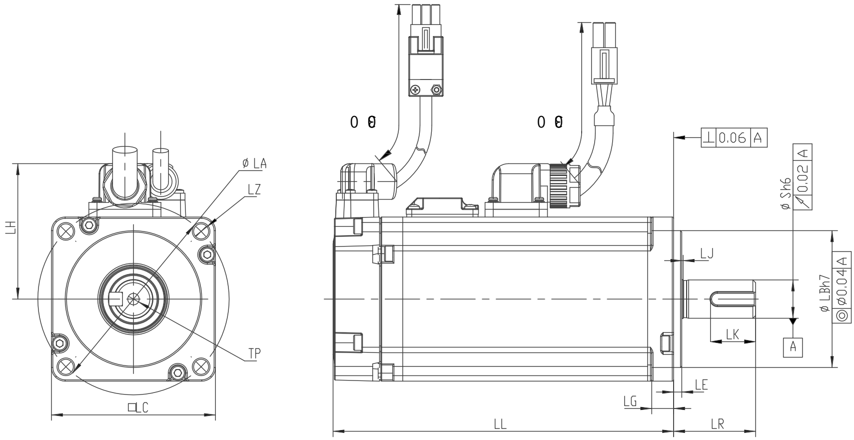
Item	Description
Connectors	Observe the following precautions when connecting the connector: ◆ When connecting the connector, make sure there is no foreign matter such as waste or sheet metal inside the connector. ◆ Connect the connector to the main circuit side of the servo motor first, and ensure the grounding cable of the main circuit is connected properly. If the connector is connected to the encoder cable side first, the encoder may become faulty due to the potential difference between PEs. ◆ Ensure the pins are correctly arranged during wiring. ◆ The connectors are made up of resins. Do not strike the connector to prevent damage to the connector. ◆ When moving the servo motor whose cables are already connected, grasp the servo motor by its body instead of the cables. Failure to comply may damage the connector or break the cables. ◆ If flexible cables are used, do not apply stress on cables during wiring. Failure to comply may damage the connector.

2.3 Dimension Drawing of MS1H1 Series Servo Motors

■ Terminal-type servo motor



■ Swinging-type servo motor



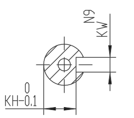


Diagram of shaft end

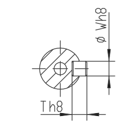


Diagram of shaft end with key

Motor Type	LL	LC	LR	LA	LZ	LH	LG	LE	LJ
MS1H1-05B30CB-A330Z(-S)	65	40	25±0.5	46	2-ф4.5	34	5	2.5±0.5	0.5±0.35
MS1H1-05B30CB-A332Z(-S)	96	40	25±0.5	46	2-ф4.5	34	5	2.5±0.5	0.5±0.35
MS1H1-10B30CB-A330Z(-S)	77.5	40	25±0.5	46	2-ф4.5	34	5	2.5±0.5	0.5±0.35
MS1H1-10B30CB-A332Z(-S)	109	40	25±0.5	46	2-ф4.5	34	5	2.5±0.5	0.5±0.35
MS1H1-20B30CB-A331Z(-S)	72.5	60	30±0.5	70	4-ф5.5	44	7.5	3±0.5	0.5±0.35
MS1H1-20B30CB-A334Z(-S)	100	60	30±0.5	70	4-ф5.5	44	7.5	3±0.5	0.5±0.35
MS1H1-40B30CB-A331Z(-S)	91	60	30±0.5	70	4-ф5.5	44	7.5	3±0.5	0.5±0.35
MS1H1-40B30CB-A334Z(-S)	119	60	30±0.5	70	4-ф5.5	44	7.5	3±0.5	0.5±0.35
MS1H4-40B30CB-A331Z(-S)	105	60	30±0.5	70	4-ф5.5	44	7.5	3±0.5	0.5±0.35
MS1H4-40B30CB-A334Z(-S)	128	60	30±0.5	70	4-ф5.5	44	7.5	3±0.5	0.5±0.35
MS1H1-55B30CB-A331Z(-S)	96.2	80	35±0.5	90	4-ф7	54	7.7	3±0.5	0.5±0.35
MS1H1-75B30CB-A331Z(-S)	107	80	35±0.5	90	4-ф7	54	7.7	3±0.5	0.5±0.35

Motor Type	LL	LC	LR	LA	LZ	LH	LG	LE	LJ
MS1H1-75B30CB-A334Z(-S)	140	80	35±0.5	90	4-ϕ7	54	7.7	3±0.5	0.5±0.35
MS1H1-10C30CB-A331Z(-S)	118.2	80	35±0.5	90	4-ϕ7	54	7.7	3±0.5	0.5±0.35
MS1H4-75B30CB-A331Z(-S)	118.5	80	35±0.5	90	4-ϕ7	54	7.7	3±0.5	0.5±0.35
MS1H4-75B30CB-A334Z(-S)	148	80	35±0.5	90	4-ϕ7	54	7.7	3±0.5	0.5±0.35
Motor Type	S	LB	TP	LK	KH	KW	W	T	Weight (kg)
MS1H1-05B30CB-A330Z(-S)	8	30	M3 x 6	15.5	$6.2^{0}_{-0.1}$	3	3	3	/
MS1H1-05B30CB-A332Z(-S)	8	30	M3 x 6	15.5	$6.2^{0}_{-0.1}$	3	3	3	/
MS1H1-10B30CB-A330Z(-S)	8	30	M3 x 6	15.5	$6.2^{0}_{-0.1}$	3	3	3	/
MS1H1-10B30CB-A332Z(-S)	8	30	M3 x 6	15.5	$6.2^{0}_{-0.1}$	3	3	3	/
MS1H1-20B30CB-A331Z(-S)	14	50	M5 x 8	16.5	$11^{0}_{-0.1}$	5	5	5	/
MS1H1-20B30CB-A334Z(-S)	14	50	M5 x 8	16.5	$11^{0}_{-0.1}$	5	5	5	/
MS1H1-40B30CB-A331Z(-S)	14	50	M5 x 8	16.5	$11^{0}_{-0.1}$	5	5	5	/
MS1H1-40B30CB-A334Z(-S)	14	50	M5 x 8	16.5	$11^{0}_{-0.1}$	5	5	5	/
MS1H4-40B30CB-A331Z(-S)	14	50	M5 x 8	16.5	$11^{0}_{-0.1}$	5	5	5	/
MS1H4-40B30CB-A334Z(-S)	14	50	M5 x 8	16.5	$11^{0}_{-0.1}$	5	5	5	/
MS1H1-55B30CB-A331Z(-S)	19	70	M6 x 20	25	$15.5^{0}_{-0.1}$	6	6	6	/
MS1H1-75B30CB-A331Z(-S)	19	70	M6 x 20	25	$15.5^{0}_{-0.1}$	6	6	6	/
MS1H1-75B30CB-A334Z(-S)	19	70	M6 x 20	25	$15.5^{0}_{-0.1}$	6	6	6	/
MS1H1-10C30CB-A331Z(-S)	19	70	M6 x 20	25	$15.5^{0}_{-0.1}$	6	6	6	/
MS1H4-75B30CB-A331Z(-S)	19	70	M6 x 20	25	$15.5^{0}_{-0.1}$	6	6	6	/
MS1H4-75B30CB-A334Z(-S)	19	70	M6 x 20	25	$15.5^{0}_{-0.1}$	6	6	6	/

3 Wiring

CAUTION

- Use the power from the grounded (TN/TT) grid for the servo drive. Failure to comply may result in electric shock.
- Connect a electromagnetic contactor between the input power supply and the main circuit power supply of the servo drive (L1 and L2 for single-phase; L1, L2, and L3 for three-phase) to form a structure which allows independent power cutoff on the servo drive power side. This is to prevent fire accidents caused by continuous large current upon fault.
- Ensure the input power supply of the servo drive is within the specified voltage ripple range. Otherwise, the servo drive may become faulty.
- Do not connect the output terminals U, V, and W of the servo drive to a three-phase power supply. Failure to comply may cause physical injuries or fire accidents.
- Do not connect the motor connecting terminals U, V, and W to a mains frequency power supply. Failure to comply may cause physical injuries or fire accidents.
- Use the ALM (fault) signal to cut off the main circuit power supply. A faulty braking transistor may cause overheat of the regenerative resistor and lead to a fire accident.

CAUTION

- Connect the PE terminal of the servo drive to the PE terminal of the control cabinet. Failure to comply may cause electric shock.
- Ensure the entire system is grounded. Otherwise, malfunction may occur to the servo drive.

CAUTION

- Residual voltage is still present in the internal capacitor after power off, allow for an interval of 15 min before any further operation.

CAUTION

- The specifications and installation method of external cables must comply with applicable local regulations.
- Observe the following requirements when applying the servo drive on a vertical axis.
  a) Set the safety device properly to prevent the workpiece from falling in such status as warning and overtravel.
  b) Ensure the positive/negative polarity of the 24 V power supply is correct. Otherwise, the axis may fall down and cause physical injuries or damage the servo drive.
- Observe the following requirements when wiring the power supply and the main circuit:
  a) When the main circuit terminal is a connector, remove the connector from the servo drive before wiring.
  b) Insert one cable into one cable terminal of the connector. Do not insert multiple cables to one cable terminal.
  c) When inserting the cables, take enough care to prevent the cable conductor burrs from being short circuited to the neighboring cable.
  d) Insulate the connecting part of the power terminals to prevent electric shock.
  e) Do not connect a 220 V servo drive to a 380 V power supply directly.
  f) Install safety devices such as a circuit breaker to prevent short-circuit in external circuits. Failure to comply may result in a fire.
  h) Cut off the main circuit power supply and switch off the S-ON signal after a warning signal is detected.
- Connect the servo drive to the motor directly. Do not use an electromagnetic contactor during wiring. Failure to comply may result in faults.
- Do not put heavy objects onto the cables or pull the cable with large force. Otherwise electric shock may occur due to cable damage.
- When connecting DO terminals to relays, ensure the polarity of the flywheel diode is correct. Wrong polarity will damage the servo drive or disable signal output.
- Keep a distance of at least 30 cm between main circuit cables and I/O signals or encoder cables. Failure to comply may cause malfunction of the servo drive.
- Use twisted pair cables or multi-core shielded twisted pair cables as the I/O signal cables or encoder cables. Failure to comply may cause malfunction of the servo drive.
- The maximum wiring lengths of the I/O signal cable and the encoder cable are 3 m and 20 m respectively.
- Use a noise filter to reduce the electromagnetic interference on electronic devices surrounding the servo drive.
- Take proper shielding measures in the following application locations to prevent damage to the servo drive:
  a) Locations suffering from interference caused by static electricity
  b) Locations with strong electric field or magnetic field
  c) Locations with radioactive rays

■ Terminal pin layout of the servo drive

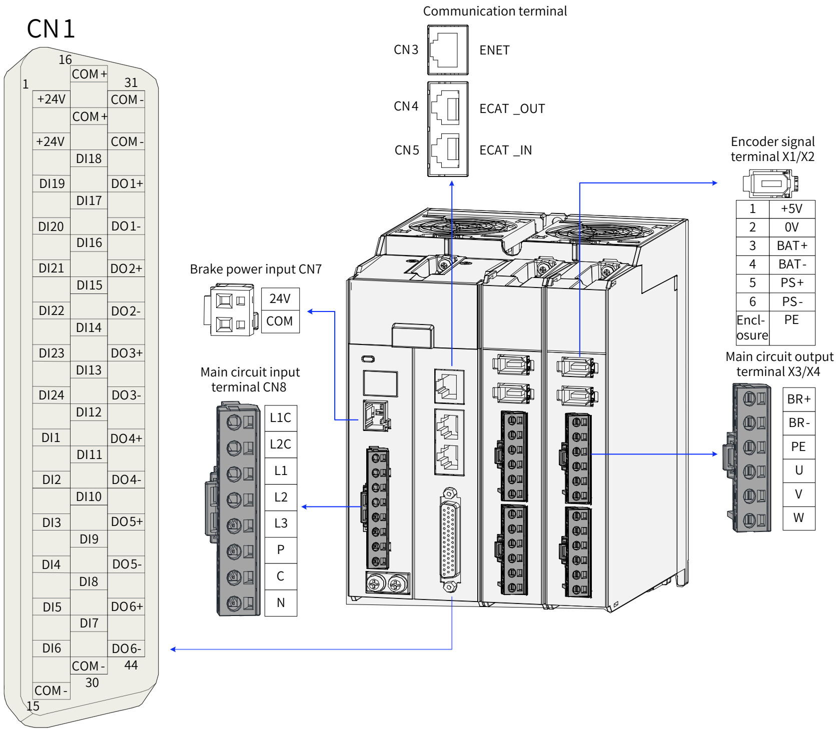


Figure 3-1 Terminal pin layout

The preceding figure shows the terminal pin layout of the servo drive.

3.1 Wiring of the Servo Drive Main Circuit

3.1.1 Introduction to Main Circuit Terminals

■ Main circuit input terminals of the servo drive

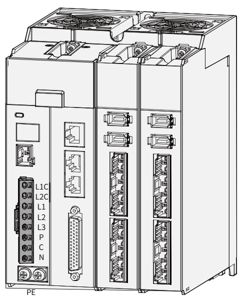


Figure 3-2 Position and layout of main circuit terminals

Table 3-1 Names and functions of main circuit terminals

Terminal Symbol	Terminal Name	Function
L1, L2, L3	Main circuit power input terminals	Single-phase/Three-phase 220 V power input of the main circuit (L1 and L2 used for single-phase input; L1, L2, and L3 used for three-phase input)
L1C, L2C	Control power input terminals	220 VAC power input of the control circuit
P, C	Terminals for connecting external regenerative resistor	When the large-inertia load needs braking for emergency stop, connect an external regenerative resistor between P and C. The external regenerative resistor needs to be purchased separately.
P, N	Common DC bus terminals	Used for common DC bus connection when multiple servo drives are connected in parallel.
PE	Grounding terminal	Two PEs connected respectively to the grounding terminals of the power supply and the servo motor

3.1.2 Wiring Example of the Regenerative Resistor

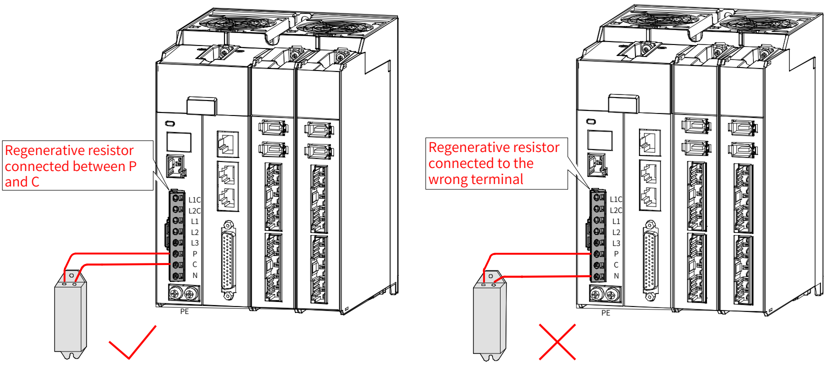


Figure 3-3 Connection of the external regenerative resistor

Observe the following precautions when connecting the external regenerative resistor:

1) Do not connect the external regenerative resistor to the positive pole (P) and negative pole (N) of the bus. Failure to comply will damage the servo drive or cause a fire.

2) Do not select any resistor lower than the minimum allowed resistance. Failure to comply will result in Er.201 (Hardware overcurrent) or damage the servo drive.

3) Before using the servo drive, ensure parameters related to the regenerative resistor (2002-1Ah, 2002-1Bh and 2002-1Ch) are set properly.

4) Install the regenerative resistor on an incombustible object such as metal.

3.1.3 Recommended Models and Specifications of Main Circuit Cables

The following figure shows the connectors of main circuit cables. These connectors will be delivered along with servo drive.

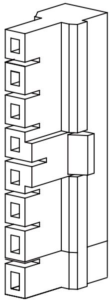


Figure 3-4 Outline drawing of the connector

Table 3-2 Recommended cables and models for the main circuit

Servo Drive Model Single-phase 220 V	Rated Input Current (A)	Recommended Input Power Cable		Rated Output Current (A)	Recommended Output Power Cable		Recommended Grounding Cable	
		mm^2	AWG		mm^2	AWG	mm^2	AWG
SV820N2S2C2C	4.6	2x0.5	20	2.80	2x0.5	20	0.50	20

For requirements on other main circuit cables, see "3.1.5 Precautions for Main Circuit Wiring".

Use the cables listed in the following table for the main circuit.

Table 3-3 Recommended main circuit cables

Cable Type		Allowable Temperature (°C)
Model	Name	
PVC	General PVC cable	-
IV	PVC cable with rated voltage of 600 V	60
HIV	PVC cable with special heat-resistance capacity	75

For three-cable applications, the relation between the AWG specification and the allowable current is shown in the following table. Note that the values listed in the table cannot be exceeded during use.

Table 3-4 Specifications of three-cable applications

AWG Specification	Nominal Cross Sectional Area (mm^2)	Allowable Current at Different Ambient Temperatures (A)		
		30°C	40°C	50°C
20	0.519	8	7	6

AWG Specification	Nominal Cross Sectional Area (mm^2)	Allowable Current at Different Ambient Temperatures (A)		
		30°C	40°C	50°C
19	0.653	9	8	7
18	0.823	13	11	9

3.1.4 Wiring Example of the Power Supply

■ Single-phase 220 V model: SV820N2S2C2C

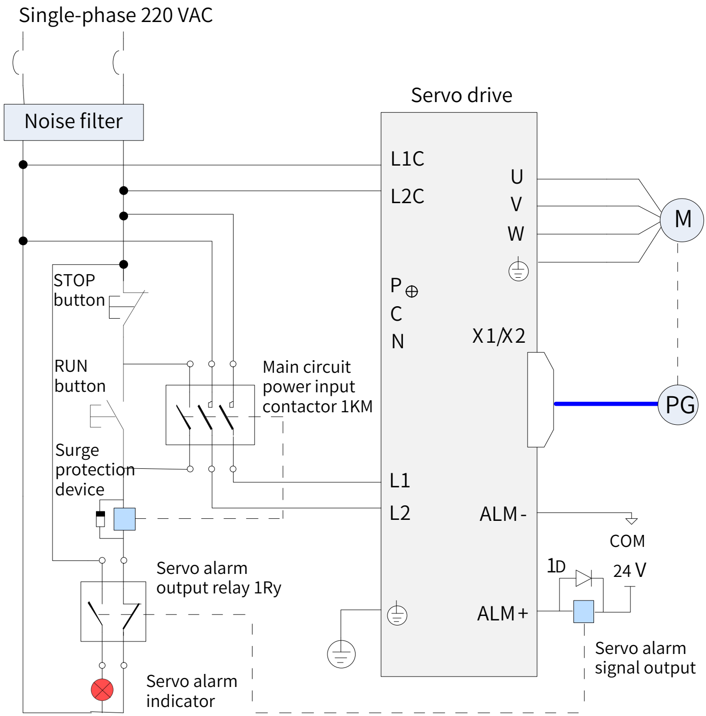


Figure 3-5 Wiring of the main circuit of single-phase 220 V models

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. SV820N series servo drives are not configured with built-in regenerative resistors, connect an external regenerative resistor between P and C as needed.

■ Three-phase 220 V model: SV820N2S2C2C

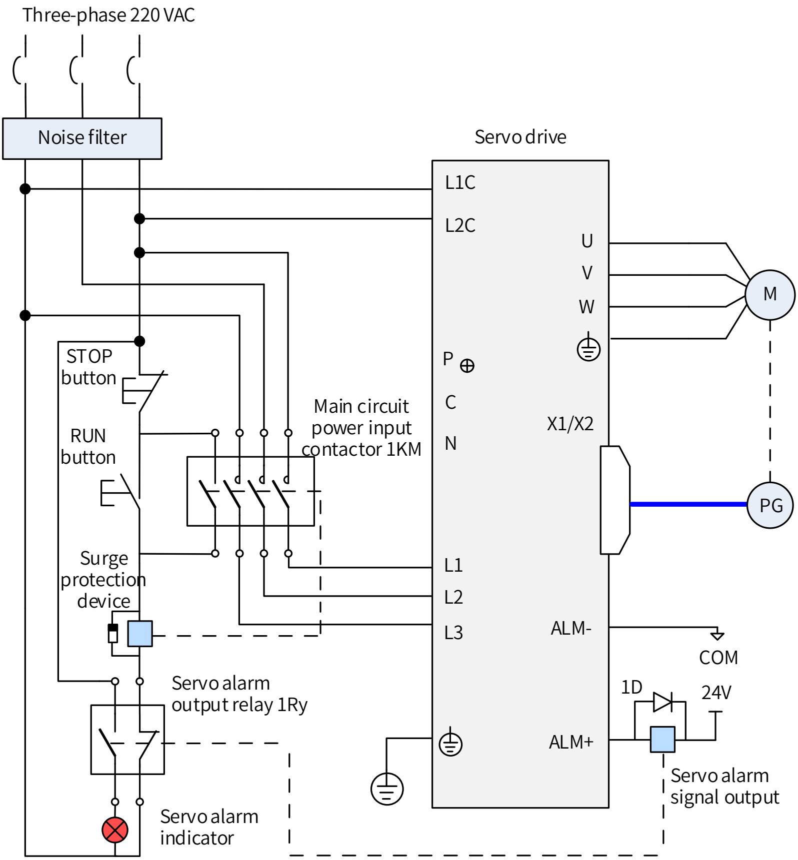


Figure 3-6 Main circuit wiring of three-phase 220 V models

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 will be cut off automatically and the alarm indicator lights up.

3.1.5 Precautions for Main Circuit Wiring

1) Do not connect the input power cables to the output terminals U, V and W. Failure to comply will damage the servo drive.

2) When cables are bundled in a duct, take current reduction ratio into consideration because of the poor cooling condition.

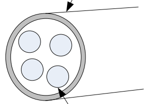
3) When the temperature inside the cabinet is higher than the temperature limit of the

cable, it is recommended to use a Teflon cable with a larger temperature limit. As the surface of regular cables may be easily hardened and cracked under a low temperature, take thermal insulation measures for cables laid in a low-temperature environment.

4) The bending radius of a cable must be 10 times longer than its outer diameter to prevent the internal conductor from breaking due to long-time bending.

5) Select and use cables with a rated voltage above 600 VAC and rated temperature above 75° C. Under 30° C ambient temperature and normal cooling conditions, the allowable current density of the cable cannot exceed 8 A/mm^2 when the total current is below 50 A, or 5 A/mm^2 when the total current is above 50 A. The allowable current value can be adjusted in the case of high ambient temperature or bundled cables. You can calculate the allowable current density (A/mm^2) by using the following formula:

Allowable current density = 8 x Reduction coefficient of the current-carrying density of the conductor x Current correction coefficient



Number of Cables in the Duct	Current Reduction Coefficient
Less than 3	0.7
4	0.63
5–6	0.56
7–15	0.49

6) Do not connect the regenerative resistor between DC bus terminals P and N. Failure to comply may cause a fire.

7) Route the power cables and signal cables through different routes at an interval of at least 30 cm to prevent interference.

8) High voltage may be still present in the servo drive even if the power supply is cut off. Do not touch the power terminals within 5 minutes after power-off.

9) Do not turn on/off the power supply frequently. If frequent ON/OFF is needed, make sure the time interval is at least one minute. The capacitor in the main circuit of the servo drive will be charged with a large current for 0.2s upon power on. Turning on/off the power supply frequently will deteriorate the performance of the main circuit components inside the servo drive.

10) Use a grounding cable with the same cross sectional area as the main circuit cable in general cases, but if the cross sectional area of the main circuit cable is less than 1.6 mm^2, use a grounding cable with a cross sectional area of 2.0 mm^2.

11) Ground the servo drive properly.

12) Do not power on the servo drive if any cable becomes loose. Otherwise, a fire accident may occur.

3.1.6 Specifications of Peripheral Parts of the Main Circuit

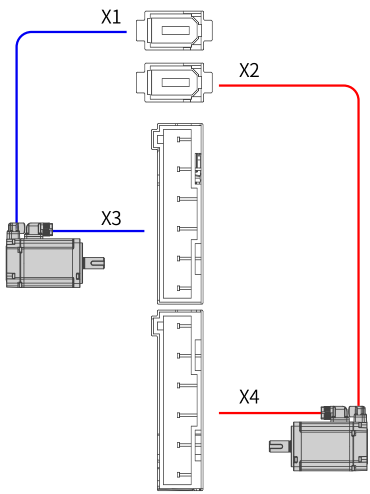
Recommended circuit breaker and electromagnetic contactor

Table 3-5 Recommended models of the circuit breaker and electromagnetic contactor

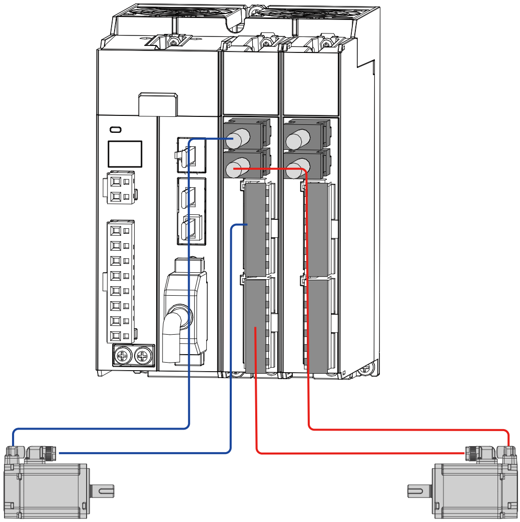
Main Circuit Power Supply	Servo Drive Model	Recommended Circuit Breaker		Recommended Contactor	
		Current (A)	Schneider Model	Current (A)	Schneider Model
Single-phase/ Three-phase 220 V	SV820N1S**** SV820N2S****	6	OSMC32N3C6	9	LC1 D09

3.2 Connection Between the Servo Drive and Servo Motor

A complete servo drive consists of two drive units with each drive unit supporting two motors. When connecting motors to the drive unit, pay attention to the terminal silkscreen on the drive unit and use correct terminals for wiring (X1 matches X3, and X2 matches X4).



Actual connection diagram



3.3 Power Cable Connections Between Servo Drive and Motor

3.3.1 Power Cable Connections for the Motor with Brake

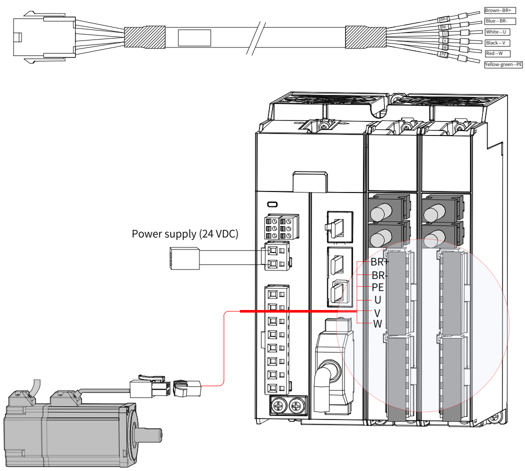
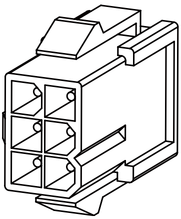
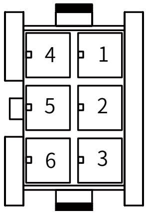


Figure 3-7 Example of the wiring between the servo drive and the motor with brake

Table 3-6 Connectors of power cables on the servo motor side

Outline Drawing of the Connector	Terminal Pin Layout	Applicable Motor Frame[1]
	Black 6-pin connector  Recommendation: Plastic housing: MOLEX-50361736 Terminal: MOLEX-39000061	40 (Z series) 60 (Z series) 80 (Z series)

[1] Motor frame refers to the width of the mounting flange.

Power cable colors are subject to the actual product. The cable colors mentioned in this user guide refer to Inovance cables.

3.3.2 Power Cable Connections for the Motor Without Brake

When the motor without brake is connected to the servo drive, the two brake signal terminals (BR+ and BR-) can be left unconnected, as shown in the following figure.

Other connections are the same as the connection of the motor with brake. See "3.3.1 Power Cable Connections for the Motor with Brake" for details.

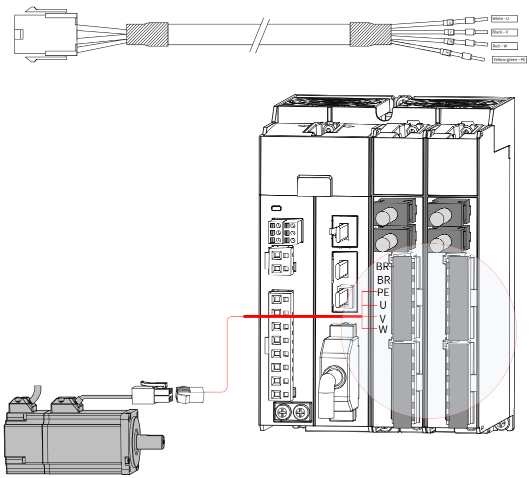


Figure 3-8 Example of the wiring between the servo drive and the motor without brake

3.4 Encoder Cable Connection

3.4.1 Connection of Serial Incremental Encoder

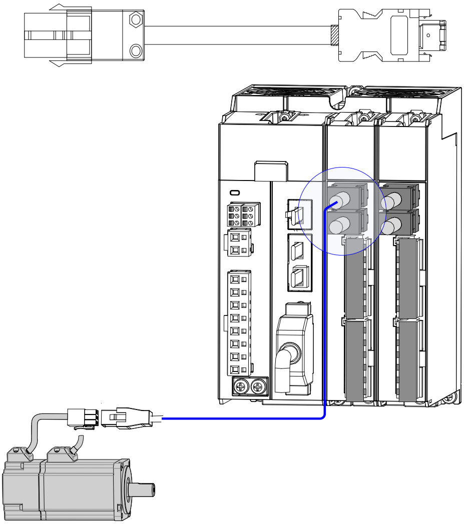
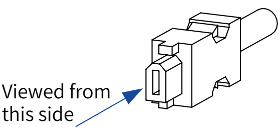
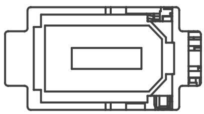


Figure 3-9 Wiring example of encoder signals

The encoder cable colors are subject to the actual product. The cable colors mentioned in this user guide refer to Inovance cables.

Table 3-7 Connector of 20-bit encoder cables on the servo drive side

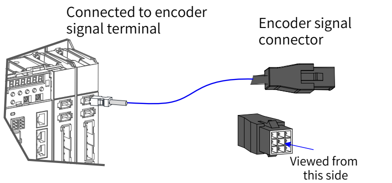
<table>
<tr><th>Outline Drawing of the Connector</th><th>Terminal Pin Layout</th></tr>
<tr><td>
</td><td>

Pin No.	Signal Name
1	+5V
2	0V
3	Reserved
4	Reserved
5	PS+
6	PS-
Enclosure	PE

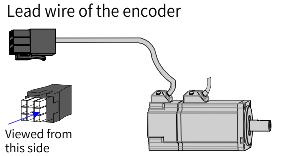
Recommendation:
Connector at cable side: Sunchu, IEEE 1394 (6-pin, solder type, provided with an enclosure)</td></tr>
</table>

Table 3-8 Connector of 20-bit encoder cables (9-pin connector)

<table>
<tr><th colspan="2">Outline Drawing and Terminal Pin Layout of the Connector</th><th>Applicable Motor Frame [1]</th></tr>
<tr><td>

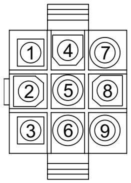


</td><td>



</td><td rowspan="2">40
60
80</td></tr>
<tr><td>

9-pin connector

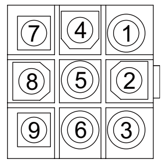


<table>
<tr><th>Pin No.</th><th>Signal Name</th><th>Remark</th></tr>
<tr><td>3</td><td>PS+</td><td rowspan="2">Twisted pair</td></tr>
<tr><td>6</td><td>PS-</td></tr>
<tr><td>9</td><td>+5V</td><td rowspan="3">-</td></tr>
<tr><td>8</td><td>GND</td></tr>
<tr><td>7</td><td>Shield</td></tr>
</table>

Recommendation:
Plastic housing: AMP 172161-1
Terminal: AMP 770835-1

</td><td>

9-pin connector



<table>
<tr><th>Pin No.</th><th>Signal Name</th><th>Color</th><th>Remark</th></tr>
<tr><td>3</td><td>PS+</td><td>Yellow</td><td rowspan="2">Twisted pair</td></tr>
<tr><td>6</td><td>PS-</td><td>Blue</td></tr>
<tr><td>9</td><td>+5V</td><td>Red</td><td rowspan="3">-</td></tr>
<tr><td>8</td><td>GND</td><td>White</td></tr>
<tr><td>7</td><td>Shield</td><td>-</td></tr>
</table>

</td></tr>
</table>

[1] Motor frame refers to the width of the mounting flange.

Table 3-9 Pin connection relation of 20-bit encoder cables

DB9 on the Servo Drive Side		Description	Motor Side	
			9-pin	20-29 Aviation Plug
Signal Name	Pin No.		Pin No.	Pin No.
PS+	5	Serial communication signal (+)	3	A
PS-	6	Serial communication signal (-)	6	B
+5V	1	Encoder +5 V power supply	9	G
GND	2	Encoder +5 V power ground	8	H
PE	Enclosure	Shield	7	J

Observe the following precautions when wiring the encoder signals:

1) Ground the shield of the servo drive and servo motor properly. Failure to comply will result in a false warning.
2) Do not connect cables to the "reserved" terminals.
3) When determining the length of the encoder cable, take the voltage drop caused by cable resistance and the signal attenuation caused by distributed capacitance into consideration. It is recommended to use shielded twisted pair cables within 10 m. Such cables must be 26AWG or above and comply with UL2464 standard.
4) 22AWG to 26AWG cables are recommended for 10B, 20B, 40B, and 75B series motors, and the matching terminal is AMP170359-1. The following table lists diameters for cables of or above 10 m.

Figure 3-10 Recommended cables

Cable Diameter	Ω/km	Allowable Cable Length (m)
26AWG (0.13 mm^2)	143	10.0
25AWG (0.15 mm^2)	89.4	16.0
24AWG (0.21 mm^2)	79.6	18.0
23AWG (0.26 mm^2)	68.5	20.9
22AWG (0.32 mm^2)	54.3	26.4

If the cables above 22AWG are required, contact the sales personnel of Inovance.

3.4.2 Connection of Absolute Encoder Cables

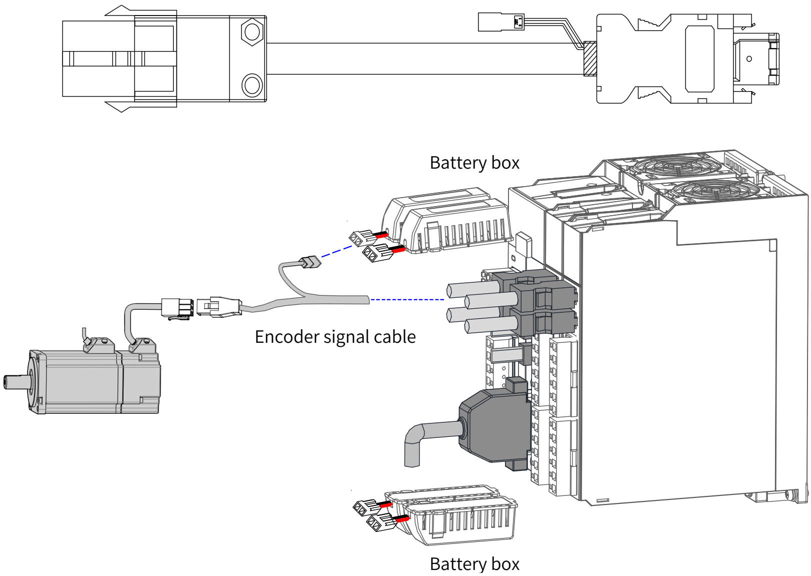


Figure 3-11 Wiring example of absolute encoder signals and the battery box

1 Description of the lead wire color of the battery box

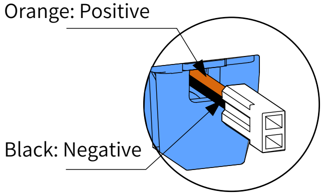
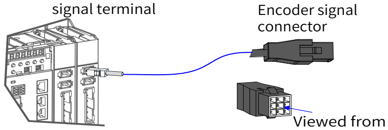
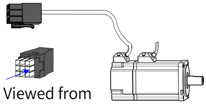
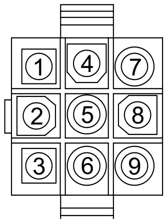
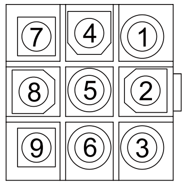


Figure 3-12 Description of the lead wire color of the battery box

NOTE	Store the battery under required ambient temperature and ensure reliable contact and sufficient electricity. Failure to comply may cause encoder information loss.

2 Specification of absolute encoder cables

Table 3-10 Connector of 20-bit encoder cables (9-pin connector)

<table>
<tr><th colspan="2">Outline Drawing and Terminal Pin Layout of the Connector</th><th>Applicable Motor Frame [1]</th></tr>
<tr>
<td>
</td>
<td>
</td>
<td rowspan="2">40
60
80</td>
</tr>
<tr>
<td>9-pin connector

<table>
<tr><th>Pin No.</th><th>Signal Name</th><th>Remark</th></tr>
<tr><td>1</td><td>Battery (+)</td><td rowspan="2">-</td></tr>
<tr><td>4</td><td>Battery (-)</td></tr>
<tr><td>3</td><td>PS+</td><td rowspan="2">Twisted pair</td></tr>
<tr><td>6</td><td>PS-</td></tr>
<tr><td>9</td><td>+5V</td><td rowspan="3">-</td></tr>
<tr><td>8</td><td>GND</td></tr>
<tr><td>7</td><td>Shield</td></tr>
</table>
Recommendation:
Plastic housing: AMP 172161-1
Terminal: AMP 170359</td>
<td>9-pin connector

<table>
<tr><th>Pin No.</th><th>Signal Name</th><th>Color</th><th>Remark</th></tr>
<tr><td>1</td><td>Battery (+)</td><td>Blue</td><td rowspan="2">-</td></tr>
<tr><td>4</td><td>Battery (-)</td><td>Blue and black</td></tr>
<tr><td>3</td><td>PS+</td><td>Yellow</td><td rowspan="2">Twisted pair</td></tr>
<tr><td>6</td><td>PS-</td><td>Yellow and black</td></tr>
<tr><td>9</td><td>+5V</td><td>Red</td><td rowspan="3">-</td></tr>
<tr><td>8</td><td>GND</td><td>Black</td></tr>
<tr><td>7</td><td>Shield</td><td></td></tr>
</table></td>
</tr>
</table>

[1] Motor frame refers to the width of the mounting flange.

3 Installation of the absolute encoder battery box

■ The SV82-C4 battery box (optional) contains the following items:

One plastic box

One battery (3.6 V, 2,600 mAh)

Terminal block and crimping terminal

■ Installing the battery box

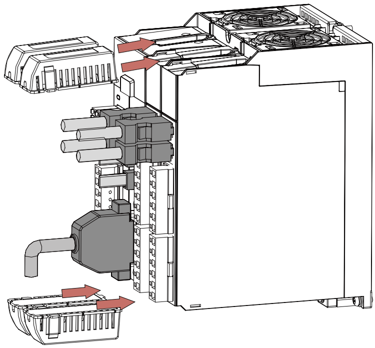


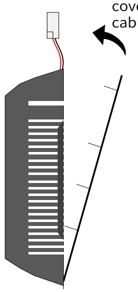
Figure 3-13 Installation of the absolute encoder battery box

Insert the battery box into the corresponding slot in the servo drive. Ensure the battery is inserted securely, without the risk of falling.

■ Removing the battery box

The battery is exposed to the risk of liquid leakage after a long-time operation. It is recommended to replace the battery every two years. Remove the battery box in steps in reverse to those in the preceding figure.

When closing the battery box cover, prevent the connector cables from being pinched.



Note: Improper use of the battery may result in liquid leakage which corrodes the components or causes battery explosion. Observe the following precautions during use:

a) Place the battery in the correct +/– polarity.

b) Leaving a battery that has been used for a long time or is no longer useful inside the device can cause liquid leakage. The electrolyte inside the battery is corrosive and conductive, not only corroding surrounding components but also incurring the danger of short circuit. It is recommended to replace the battery every 2 years.

c) Do not disassemble the battery because the internal electrolyte may spread out and cause physical injuries.

d) Do not throw a battery into fire or heat up the battery. Failure to comply may result in an explosion.

e) Do not short circuit the battery or strip off the battery tube. Prevent terminals (+) and (-) of the battery from coming into contact with the metal. Contact with the metal will incur a large current, not only weakening the battery power, but also giving rise to the danger of explosion due to overheating.

f) This battery is not chargeable.

g) Dispose of the battery according to local regulations.

4 Selection of the encoder battery

Select an appropriate battery according to the following table.

Table 3-11 Description of absolute encoder battery

Battery Specification	Item and Unit	Ratings			Condition
		Minimum Value	Typical Value	Maximum Value	
Output: 3.6 V, 2500 mAh Recommended manufacturer and model: Shenzhen Jieshun, LS14500	External battery voltage (V)	3.2	3.6	5	In standby mode[2]
	Circuit fault voltage (V)	-	2.6	-	In standby mode
	Battery warning voltage (V)	2.85	3	3.15	
	Current consumed by the circuit (μA)	-	2	-	During normal operation[1]
		-	10	-	In standby mode, axis at standstill
		-	80	-	In standby mode, axis rotating
	Operation temperature (°C)	0	-	40	Same as that required by the motor
	Storage temperature (°C)	–20	to	+60	

The preceding data is measured under an ambient temperature of 20°C .

[1] During normal operation, the absolute encoder supports single-turn or multi-turn data counting and data transmitting/receiving. A well-connected encoder will, upon switch-on of the servo drive power supply, enter normal operation status and transmit/receive data after a delay of 5s. Switching from standby mode to normal operation mode upon power-on requires the motor to rotate at a speed less than 10 RPM. Otherwise, the servo drive may report E3.740 (Encoder interference). In this case, you need to power on the servo drive again.

[2] Standby mode means the servo drive is not powered on and the absolute encoder can perform multi-turn counting by utilizing external battery power. In this case, the data transmitting/receiving stops.

5 Design life of the battery

The following calculation only covers the current consumed by the encoder.

Suppose that the servo drive works normally for T1 in a day, the motor rotates for T2 after the servo drive is powered off, and the motor stops rotating for T3 after power off [unit: hour (h)]

Example:

Table 3-12 Design life of an absolute encoder battery

Item	Working Time 1	Working Time 2
Days of working in different operation conditions in 1 year (day)	313	52
T1 (h)	8	0
T2 (h)	0.1	0
T3 (h)	15.9	24

- Capacity consumed in 1 year = (8 h x 2 μA + 0.1 h x 80 μA + 15.9 h x 10 μA) x 313 + (0 h x 2 μA + 0 h x 80 μA +24 h x 10 μA) x 52 ≈ 70 mAH
- Design life of the battery = Battery capacity/Capacity consumed in 1 year = 2600 mAH/70 mAH = 37.1 years

3.5 Wiring of Control Signal Terminal CN1 (DI/DO)

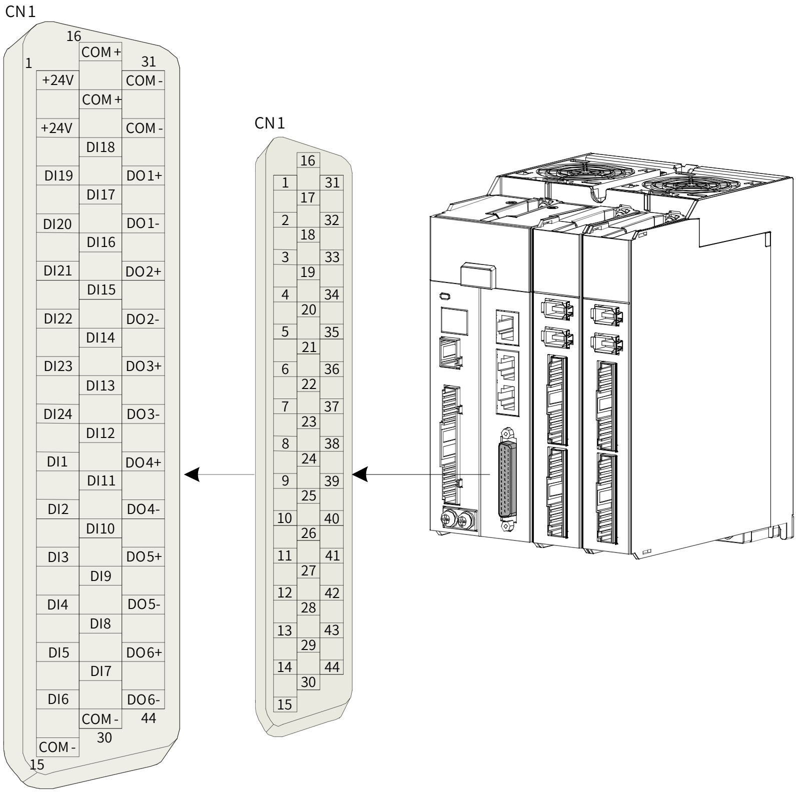


Figure 3-14 Pin layout of control circuit terminal connector

Plastic housing of the plug on cable side: DB25P (SZTDK), black
Core: HDB44P male (SZTDK)

It is recommended to use cables of 24AWG to 26AWG.

Table 3-13 Description of DI/DO signals

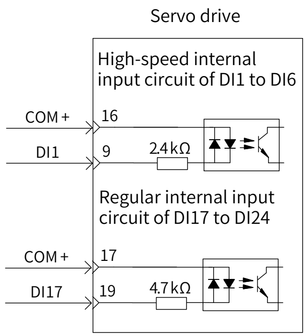
Signal Name	Pin No.	Description	Signal Name	Pin No.	Description
DI1	9	High-speed DI signal 1	DO1+	33	DO signal 1 (positive)
DI2	10	High-speed DI signal 2	DO1-	34	DO signal 1 (negative)
DI3	11	High-speed DI signal 3	DO2+	35	DO signal 2 (positive)
DI4	12	High-speed DI signal 4	DO2-	36	DO signal 2 (negative)
DI5	13	High-speed DI signal 5	DO3+	37	DO signal 3 (positive)
DI6	14	High-speed DI signal 6	DO3-	38	DO signal 3 (negative)

Signal Name	Pin No.	Description	Signal Name	Pin No.	Description
DI7	29	High-speed DI signal 7	DO4+	39	DO signal 4 (positive)
DI8	28	High-speed DI signal 8	DO4-	40	DO signal 4 (negative)
DI9	27	High-speed DI signal 9	DO5+	41	DO signal 5 (positive)
DI10	26	High-speed DI signal 10	DO5-	42	DO signal 5 (negative)
DI11	25	High-speed DI signal 11	DO6+	43	DO signal 6 (positive)
DI12	24	High-speed DI signal 12	DO6-	44	DO signal 6 (negative)
DI13	23	High-speed DI signal 13			
DI14	22	High-speed DI signal 14			
DI15	21	High-speed DI signal 15			
DI16	20	High-speed DI signal 16			
DI17	19	Regular DI signal 17			
DI18	18	Regular DI signal 18			
DI19	3	Regular DI signal 19			
DI20	4	Regular DI signal 20			
DI21	5	Regular DI signal 21			
DI22	6	Regular DI signal 22			
DI23	7	Regular DI signal 23			
DI24	8	Regular DI signal 24			

- DI1 to DI16 are high-speed DIs.
- DI17 to DI24 are regular DIs.

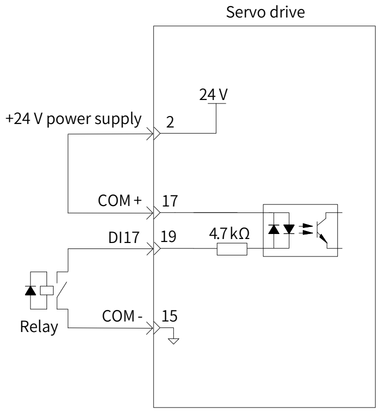
3.5.1 DI Circuits (DI17 as an example)

Circuits of DI1 to DI24 are the same. Resistance of the current-limiting resistor of DI1 to DI6 is 2.4 kΩ.

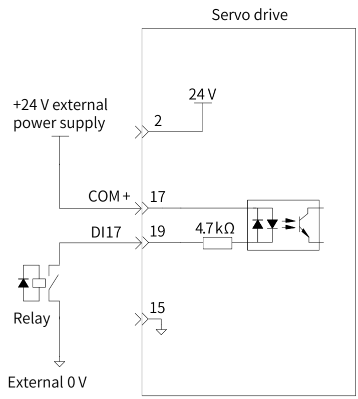


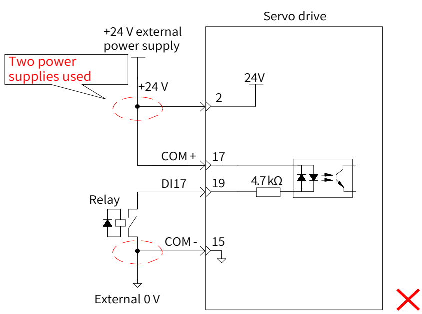
1 **Case 1: The host controller provides relay output.**

a) For use of an internal 24 V power supply of the servo drive



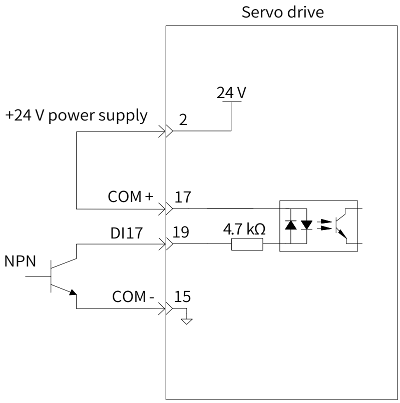
b) For use of an external power supply

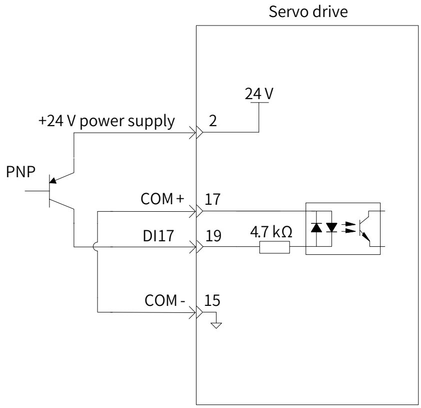




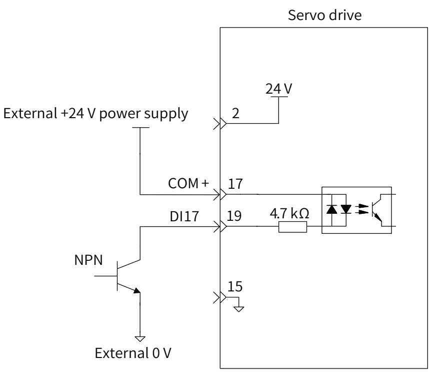
2 Case 2: The host controller provides open-collector output.

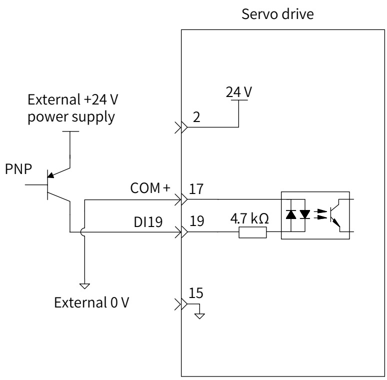
a) For use of an internal 24 V power supply of the servo drive





b) For use of an external power supply





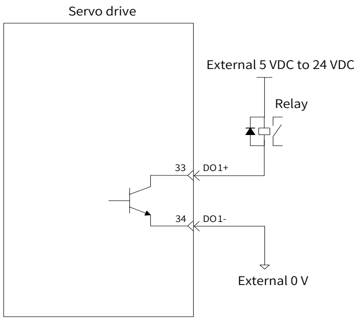
NOTE

PNP and NPN input cannot be applied in the same circuit.

3.5.2 DO Circuit (DO1 as an example)

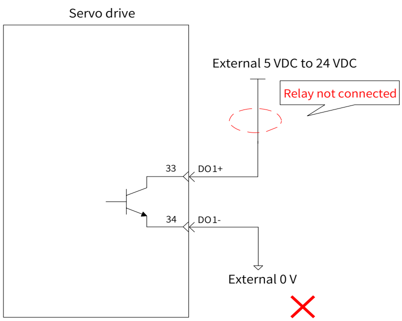
DO1 to DO6 circuits are the same.

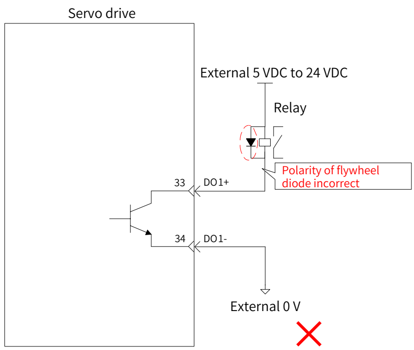
1 Case 1: The host controller provides relay input.



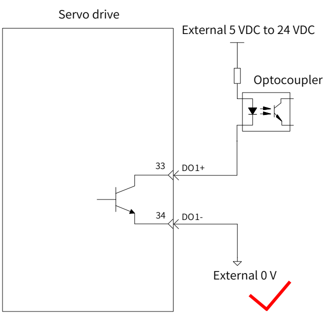
NOTE

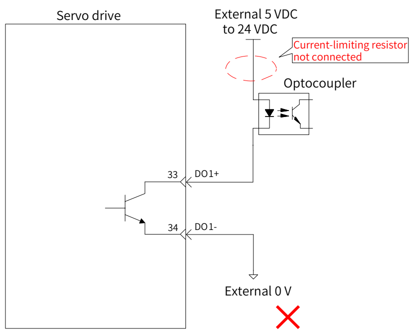
When the host controller provides relay input, a flywheel diode must be installed. Otherwise, the DO terminal may be damaged.





2 Case 2: The host controller provides optocoupler input.





NOTE

The maximum allowable voltage and current of the optocoupler output circuit inside the servo drive are as follows:
Maximum voltage: 30 VDC
Maximum current: DC 50 mA

3.6 Wiring of Communication Signals (CN4/CN5)

3.6.1 Wiring Diagram

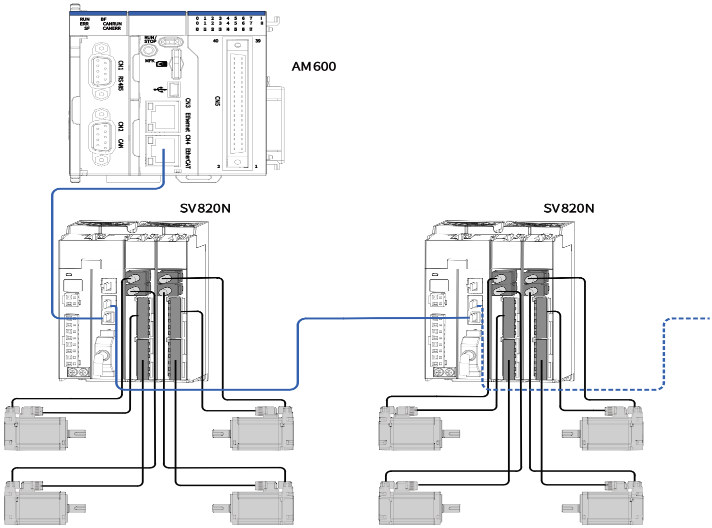


Figure 3-15 Networking topology

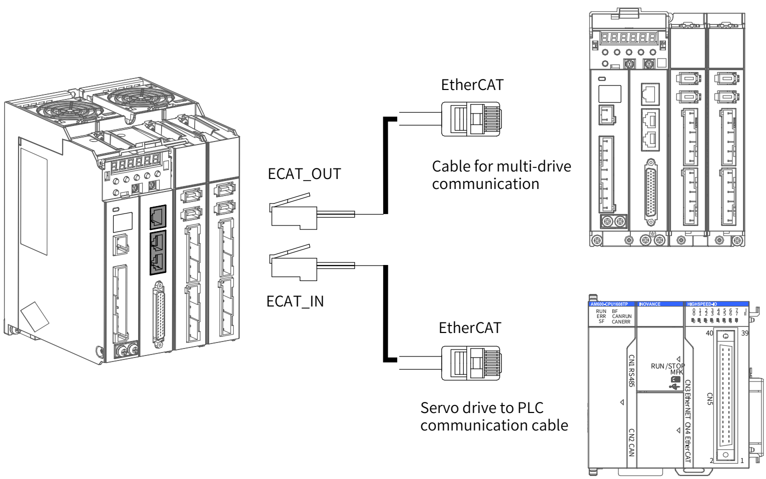
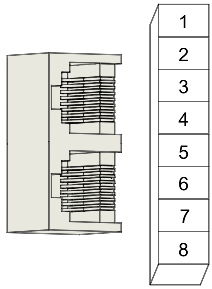


Figure 3-16 Wiring of communication signals

The communication signal connector (CN4 and CN5) is the EtherCAT port connector. CN5 (IN) is connected to the interface line of the master, and CN4 (OUT) is connected to the next slave device.

Table 3-14 Pin definition of communication signal connector

Pin No.	Signal Name	Description	Terminal Pin Layout
1	TX+	Data transmitting (+)	
2	TX-	Data transmitting (-)	
3	RX+	Data receiving (+)	
4	-	-	
5	-	-	
6	RX-	Data receiving (-)	
7	-	-	
8	-	-	
Enclosure	PE	Shield	

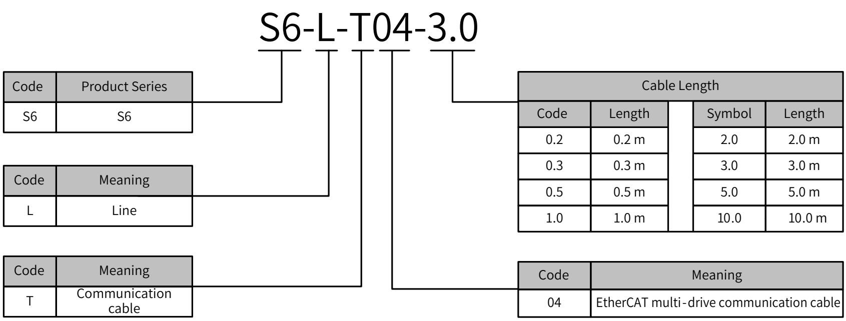
3.6.2 Selection of Communication Cables

- Selection Principle

Cable Specification	Supplier
0.2 m to 10 m	Inovance
Above 10 m	Haituo (preferred)

- Basic information of Inovance EtherCAT communication cables

Cable models are shown in the following figure.



The cable ordering information is shown in the following table.

Article Code	Cable Model	Length (m)
15040261	S6-L-T04-0.3	0.3
15040262	S6-L-T04-3.0	3.0
15041960	S6-L-T04-0.2	0.2

Article Code	Cable Model	Length (m)
15041961	S6-L-T04-0.5	0.5
15041962	S6-L-T04-1.0	1.0
15041963	S6-L-T04-2.0	2.0
15041964	S6-L-T04-5.0	5.0
15041965	S6-L-T04-10.0	10.0

Cables shorter than or equal to 10 m must be purchased from Inovance.

Cables longer than 10 m are preferred to be purchased from Haituo.

Specifications:

Item	Description
UL certification	UL-compliant
Cat 5e cable	Cat 5e cable
Double shielded	Braided shield (coverage: 85%), aluminum foil shield (coverage: 100%)
Environment adaptability	Ambient temperature: –30°C to +60°C , resistant to industrial oil, corrosive acid and alkali
EMC test standard	GB/T 24808-2009

3.7 Wiring of Software Tool Communication and Online Upgrade Signals (CN3)

Terminal layout of Ethernet (CN3)

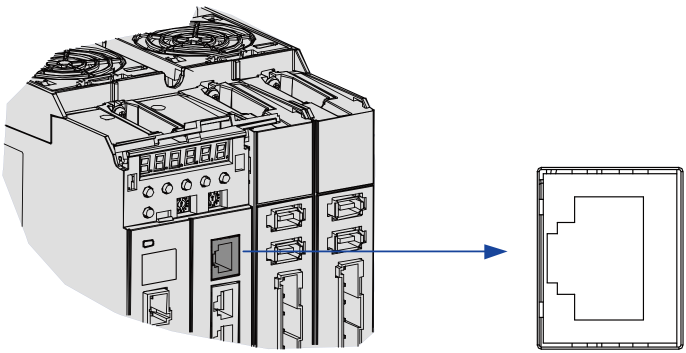
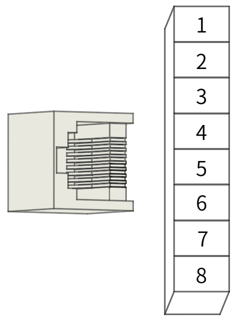


Figure 3-17 Ethernet connector terminal

The pin definition of CN3 (Ethernet connector terminal) is the same as that of CN4/CN5.

Table 3-15 Pin definition of communication signal connector

Pin No.	Signal Name	Description	Terminal Pin Layout
1	TX+	Data transmitting (+)	
2	TX-	Data transmitting (-)	
3	RX+	Data receiving (+)	
4	-	-	
5	-	-	
6	RX-	Data receiving (-)	
7	-	-	
8	-	-	
Enclosure	PE	Shield	

NOTE

Communication cables are the same as the cables for multi-drive communication (S6-L-T04).

3.8 Anti-interference Measures for Electrical Wiring

Take the following measures to suppress interference:

1) Use shielded twisted pair cables less than 3 m for command input or less than 20 m for the encoder.

2) Use a thick cable (above 2.0 mm^2) as the grounding cable.

3) Class D or higher grounding class (grounding resistance below 100 Ω) is recommended.

4) Adopt single-point grounding.

5) Use a noise filter to prevent radio frequency interference. In domestic applications or applications with noise interference, install the noise filter on the input side of the power cable.

6) To prevent malfunction due to electromagnetic interference, take the following measures:

a) Install the host controller and noise filter near the servo drive.

b) Install a surge protection device on the relay, solenoid and electromagnetic contactor coils.

c) The distance between a high-voltage cable and a low-voltage cable must be at least 30 cm. Do not put these cables in the same duct or bundle them together.

d) Do not share the same power supply with an electric welder or an electric discharge machining device. When the servo drive is placed near a high-frequency generator, install a noise filter on the input side of the power cable.

3.8.1 Anti-interference Wiring Example and Grounding

The servo drive uses high-speed switch elements in the main circuit. The noise of such switches may affect the normal operation of the system due to improper wiring or grounding. Therefore, the servo drive must be properly wired and grounded. A noise filter can be added if necessary.

1 Anti-interference wiring example

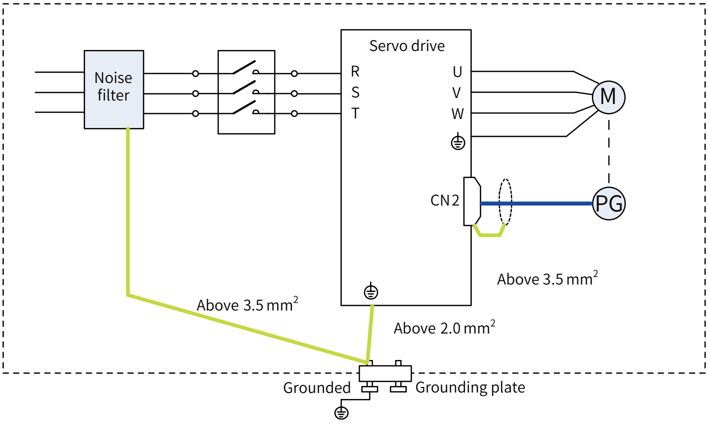


Figure 3-18 Anti-interference wiring example

- For the grounding cable connected to the enclosure, use a thick cable of at least 3.5 mm^2. Braided copper wires are recommended.
- If a noise filter is used, abide by the precautions described in *"3.8.2 Instructions for Use of the Noise Filter"*.

2 Grounding

To prevent potential electromagnetic interference, perform grounding properly according to the following instructions.

- Grounding the enclosure of the servo motor

Connect the grounding terminal of the servo motor to the PE terminal of the servo drive, and ground the PE terminal properly to reduce potential magnetic interference.

- Grounding the shield of the encoder cable

Ground both ends of the shield of the motor encoder cable.

3.8.2 Instructions for Use of the Noise Filter

To prevent interference from power cables and reduce impact of the servo drive to other sensitive devices, install a noise filter on the input side of the power supply according to the magnitude of the input current. In addition, install a noise filter on the power cable of peripheral devices as needed. Abide by the following requirements when installing and wiring the noise filter.

1 **Route the input and output cables of the noise filer through different routes.**

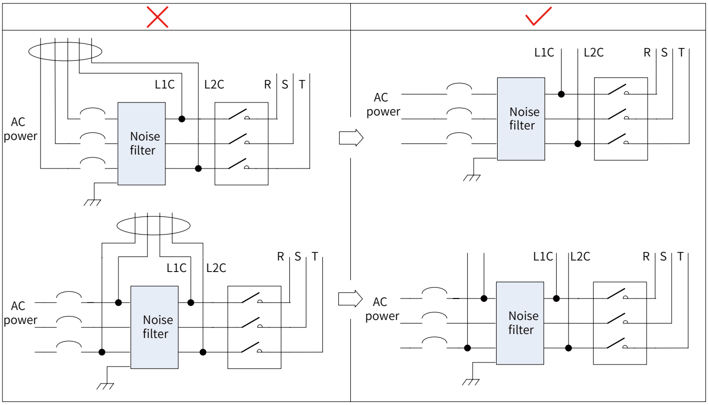


Figure 3-19 Separate routing of I/O cables of the noise filter

2 **Route the grounding cable and the output cable of the noise filter through different routes.**

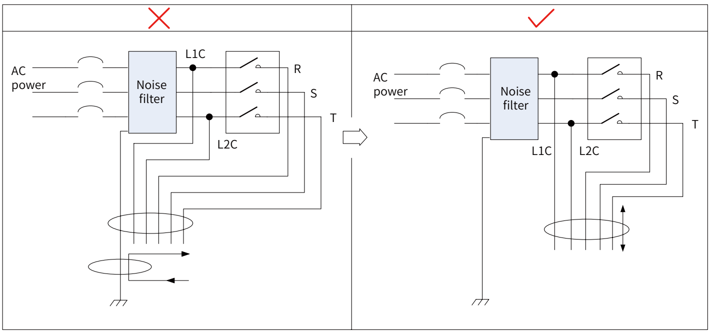


Figure 3-20 Separate routing of the grounding cable and output cable

3 **Use a separate grounding cable as short and thick as possible for the noise filter. Do not share the same grounding cable with other grounding devices.**

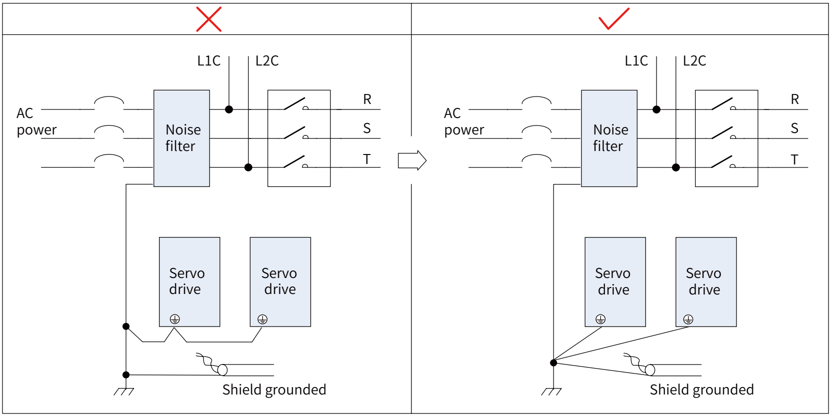


Figure 3-21 Single-point grounding

4 Ground the noise filter installed inside the control cabinet.

If the noise filter and the servo drive are installed in the same control cabinet, fix the noise filter and the servo drive to the same metal plate. Make sure the contact is conductive and ground the metal plate properly.

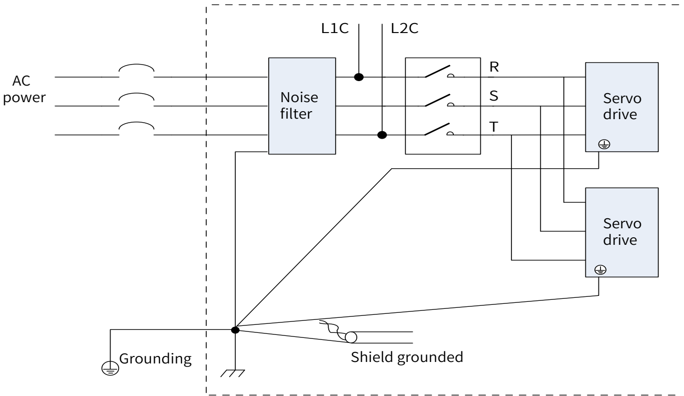


Figure 3-22 Grounding of the noise filter

3.9 Precautions for Use of Cables

1) Do not bend or apply tension to cables. The conductor of a signal cable is only 0.2 mm or 0.3 mm in thickness. Handle the cables carefully to prevent fracture.

2) In cases where cables need to be moved, use flexible cables because regular cables may be easily damaged after being bent for a long time. Cables of small-power servo motors do not fit for drag chains.

3) If a cable drag chain is used, make sure the following requirements are fulfilled:

a) The bending radius of the cable is at least 10 times longer than its outer diameter.

b) Do not fix or bundle the cables inside the cable drag chain. The cables can be bundled and fixed only at the two fixed ends of the cable drag chain.

c) Do not wind or twist the cables.

d) Ensure the space factor inside the cable drag chain is below 60%.

e) Do not mix cables of great differences in size together. This is to prevent thin cables from being crushed by the thick cables. If you need to use them together, place a separator between them.

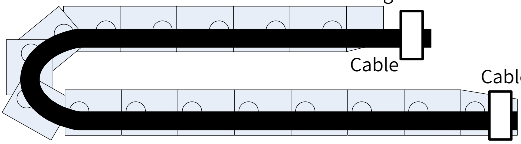


Figure 3-23 Cable drag chain

3.10 General Wiring Diagram

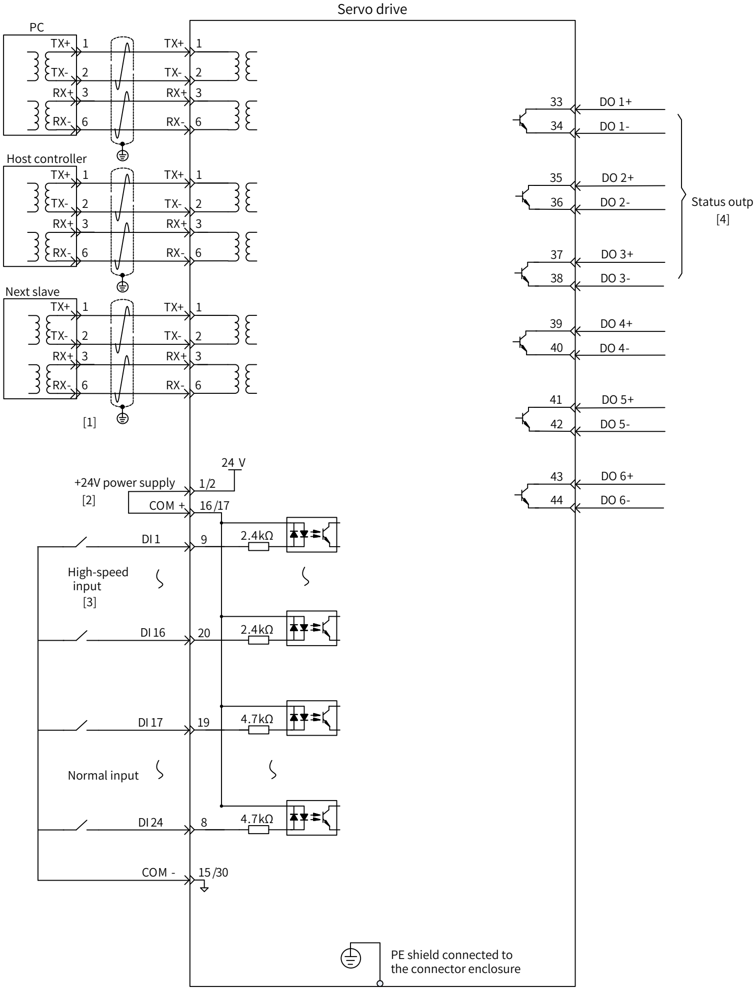


Figure 3-24 General wiring

[1] Use double-shielded Cat 5e cables for network interfaces. Straight-through and crossover Ethernet cables are allowable.

[2] The internal +24 V power supply supports a voltage range of 20 V to 28 V and a maximum operation current of 200 mA.

[3] The high-speed DI terminals DI1 to DI6 must be used according to their functions allocated. If these terminals are used in low-speed applications, increase the set value of internal filter parameters to enhance the anti-interference capacity.

[4] The DO power supply, ranging from 5 V to 24 V, needs to be prepared by users. The DO terminals support a maximum of 30 VDC voltage and 50 mA current.

4 Keypad

4.1 Introduction to the Keypad

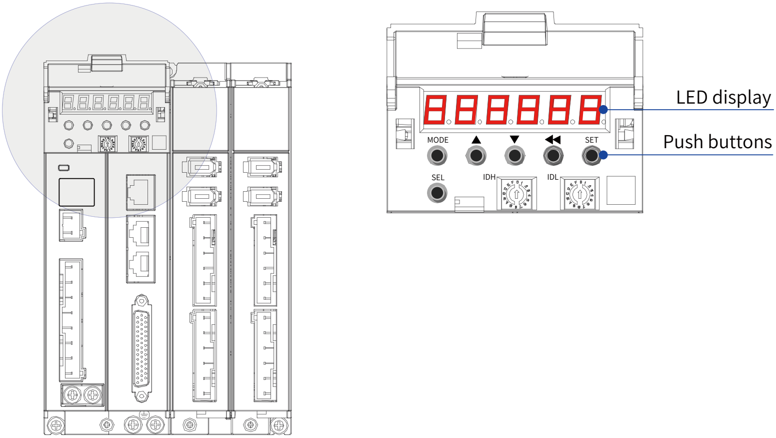


Figure 4-1 Appearance of the keypad

The keypad, which consists of a LED display (six 7-segment LEDs) and six push buttons, is used for display, parameter setting, user password setting and general function execution. When the keypad is used for parameter setting, the push buttons are used for the following purposes.

1 Keypad display area

The six LEDs on the keypad are used to display common status, parameters and the axis No. operated currently.

2 Push buttons

Table 4-1 Functions of push buttons

Push Button	Name	Function
MODE	MODE	Used to switch between different modes and return to the previous menu.
▲	UP	Used to increase the value of the blinking digit.
▼	DOWN	Used to decrease the value of the blinking digit.
◀◀	SHIFT	Used to shift the blinking digit and view the high digits of the number consisting of more than 5 digits.
SET	ENTER	Used to switch to the next menu and execute commands such as saving parameter values.
SEL	SEL	Used to select specific axis No. and operate on parameters of current axis No..

4.2 Keypad Display

■ Transitional relation between the keypad display and the operation object of the host controller

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

Object dictionary index = 0x2000 + Parameter group No.

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

Keypad Display	Object Dictionary Operated by the Host Controller
H00-00	2000-01h
H00-01	2000-02h
…	…
H01-09	2001-0Ah
H01-10	2001-0Bh
…	…
H02-15	2002-10h

NOTE

The following section only describes the display and parameter settings on the keypad (decimal), which are different from those displayed by the software tool (hexadecimal). Make necessary conversions when performing operations through the software tool on the host controller.

■ Keypad display during running

The keypad displays the status, parameters, faults, and the monitoring information during running

Status: current servo drive status, such as servo ready or running

Parameter: parameters and their set values

Fault: faults and warnings that occur on the servo drive

Monitoring information: current running parameters of the servo drive

Axis No.: axis No. operated and displayed currently

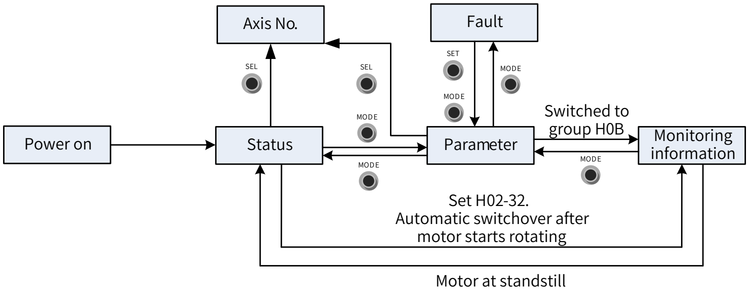
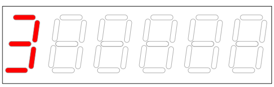
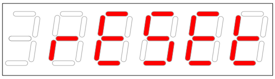
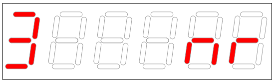
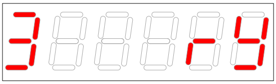
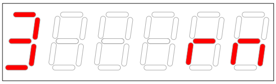
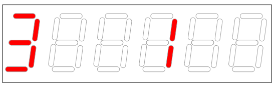
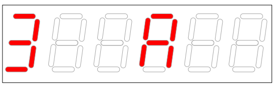
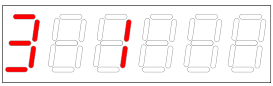
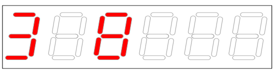


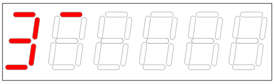
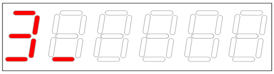
Figure 4-2 Switchover between different types of display

- After power-on, the keypad enters status display mode immediately.
- Press MODE to switch between different modes, as shown in the preceding figure.
- In the status display mode, set H02-32 (Default keypad display) to select the parameters to be monitored. When the motor rotates, the keypad automatically switches to monitoring information display. After the motor stops, the keypad automatically restores to status display.
- In the parameter display mode, set H02-32 to select the parameter to be pre-monitored, and the keypad will switch to the monitoring display mode immediately.
- Once a fault occurs, the keypad immediately enters the fault display mode, and five LEDs blink simultaneously. Press SET to stop the LEDs from blinking, and then press MODE to switch to the parameter display mode.

1 Display of status (Axis 3)

Display	Name	Display Condition	Meaning
	3 Axis No. currently operated	In axis No. selection and parameter display interface (axis No. not displayed in the parameter setting interface)	Parameters displayed on the keypad are parameters of axis 3.

Display	Name	Display Condition	Meaning
 (axis No. not displayed in the reset status)	Reset Servo initialization	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.
	nr Servo not ready	Servo drive not ready after initialization finished	The main circuit is powered on improperly, and the servo drive cannot run.
	ry Servo ready (Ready)	Servo ready	The servo drive is ready to run and waiting for the S-ON signal.
	rn Servo running (run)	S-ON signal activated	The servo drive is in the running status.
 	1 to A Control mode		Displays present running 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 9: Cyclic synchronous velocity mode A: Cyclic synchronous torque mode
 	1–8 Communication status		Displays the status of the slave EtherCAT state machine in the form of characters. 1: Initializing 2: Pre-running 4: Safe running 8: Running

Display	Name	Display Condition	Meaning
	- CN4 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.
	- CN5 connection indication	EtherCAT input connected successfully	

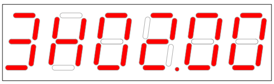
2 Display of parameters (Axis 3)

Parameters are divided into 14 groups based on their functions. A parameter can be located quickly based on the group it belongs to. See "Appendix A List of Object Groups" for the parameter table.

■ Parameter group display

Display	Name	Description
HXX.YY	Parameter group	XX: Parameter group No. YY: Parameter No.

For example, H02-00 is displayed as follows:

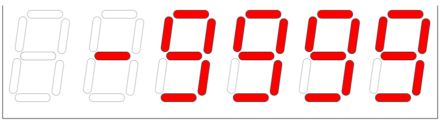
Display	Name	Description
	H02-00	02: Parameter group No. 00: Parameter No.

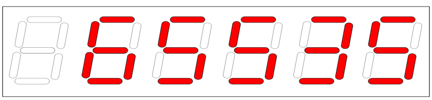
3 Display of the data in different lengths and the negative numbers

a) Signed number comprised of 4 digits and below or unsigned number comprised of 5 digits and below

Such numbers are displayed by a single page (five digits). For the signed number, the highest bit "-" indicates the negative symbol.

For example, -9999 and 65535 are displayed as follows:





b) Signed number comprised of above 4 digits or unsigned number comprised of above 5 digits

Such numbers are displayed from low to high bits (five digits per page) by several pages: Present page + Value on present page, as shown in the following figure. Hold down for more than 2s to switch to the next page.

For example, –1073741824 is displayed as follows:

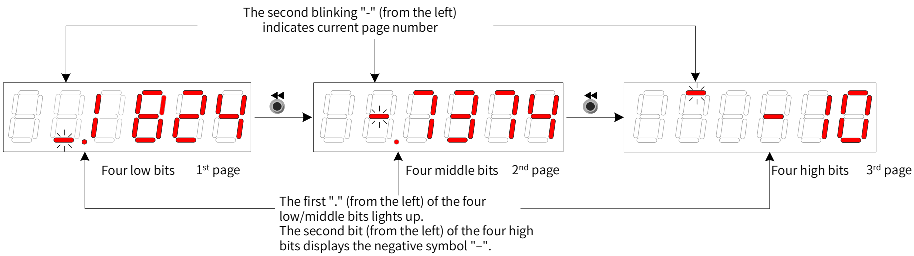


Figure 4-3 Display of "-1073741824"

1073741824 is displayed as follows:

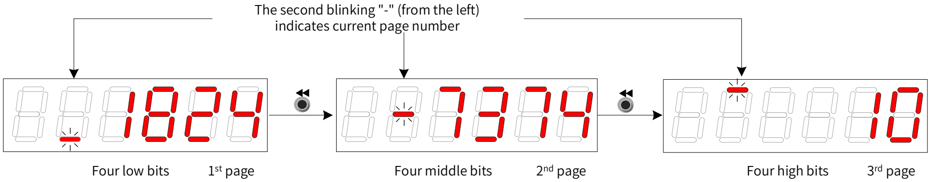
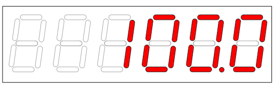


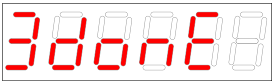
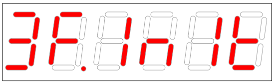
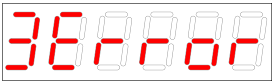
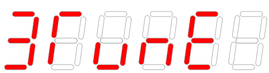
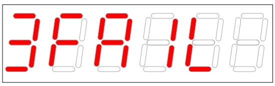
Figure 4-4 Display of "1073741824"

4 Display of decimal points

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

Display	Name	Description
	Decimal point	100.0

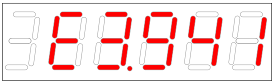
5 Display of parameter settings

Display	Name	Display Condition	Description
	Done Parameter setting done	Parameter setting done	The parameter setting is done and stored in the servo drive. The servo drive can then execute other operations.
	F.InIt Parameter restored to default setting	Parameter initialization 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	User password (H02-30) applied and wrong password entered	The system indicates the parameter entered is wrong, requiring users to enter the password again.
	TunE	One-button tuning enabled	The one-button tuning is in progress.
	FAIL	One-button tuning failed	The one-button tuning fails.

6 Display of faults (Axis 3)

- The keypad displays the present or previous faults and warning codes. For troubleshooting, see "5 Troubleshooting".
- When an individual fault or warning occurs, the keypad displays the present fault or warning code immediately. When multiple faults or warnings occur, the keypad displays the code of the highest-level warning.
- Set in H0B-33 (Fault record) the previous faults to be viewed, and set H0B-34 to view the selected fault or warning code.
- Set H02-31 to 2 to clear information about the latest ten faults or warnings stored in the servo drive.

For example, E3.941 is displayed as follows:

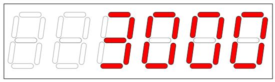
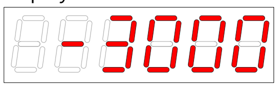
Display	Name	Item
	Present warning code	E3.: Fault or warning occurs on the servo drive 941: Warning code

7 Display of monitoring information

Group H0B: Displays parameters used for monitoring the running status of the servo drive.

Set H02-32 (Default keypad display). After the servo motor runs properly, the keypad switches from servo status display to parameter display and displays the parameter No. defined by H02-32 in group H0B.

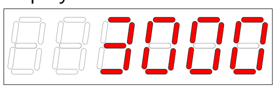
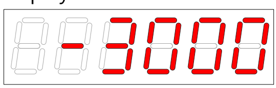
For example, when H02-32 is set to 00, the keypad displays the corresponding value of H0B-00 if the servo motor speed is not 0.

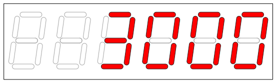
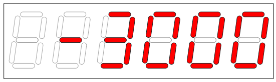
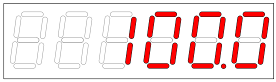
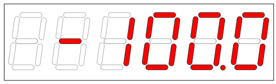
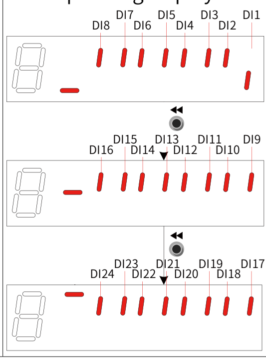
Parameter No.	Name	Unit	Meaning	Example
H0B-00	Actual motor speed	RPM	Displays actual motor speed after round-off in unit of 1 RPM.	Display of 3000 RPM:  Display of –3000 RPM: 

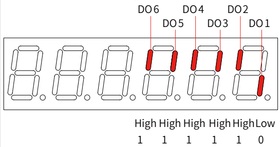
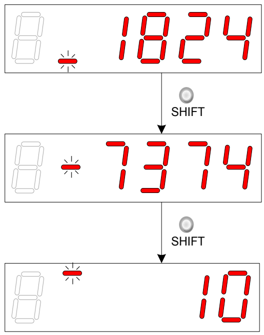
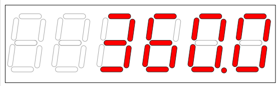
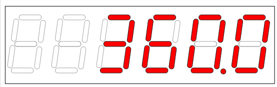
4.3 Parameter Monitoring

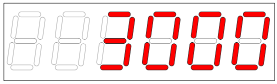
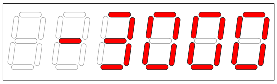
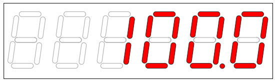
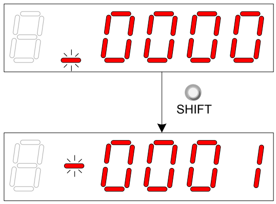
Group H0B: Displays parameters used for monitoring the running status of the servo drive.

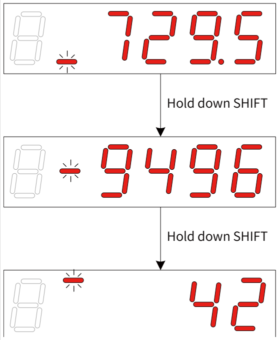
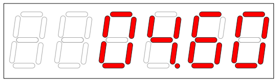
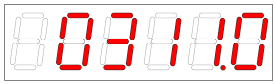
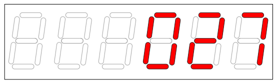
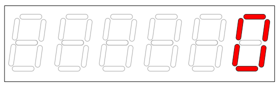
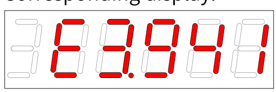
The following table describes the displayed information of group H0B.

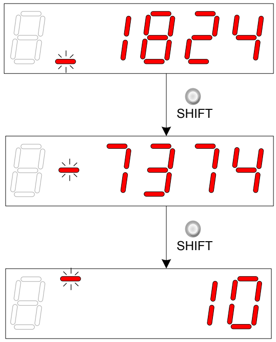
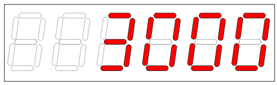
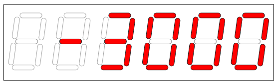
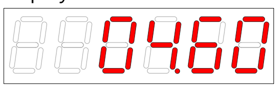
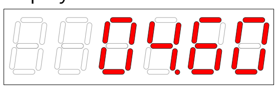
Para. No.	Name	Unit	Meaning	Display Example
H0B-00	Actual motor speed	RPM	Displays actual motor speed after round-off in unit of 1 RPM.	Display of 3000 RPM:  Display of –3000 RPM: 

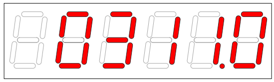
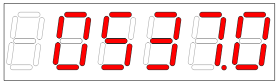
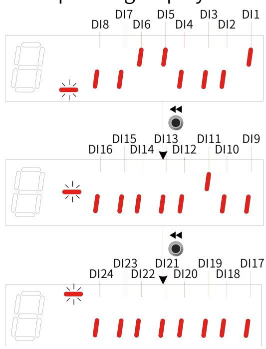
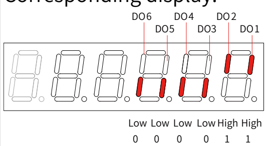
Para. No.	Name	Unit	Meaning	Display Example
H0B-01	Speed reference	RPM	Displays present speed reference of the servo drive.	Display of 3000 RPM:  Display of –3000 RPM: 
H0B-02	Internal torque reference	0.1%	Displays the percentage of the actual motor output torque to the rated motor torque.	Display of 100.0%:  Display of –100.0%: 
H0B-03	Monitored DI status	-	Displays the optocoupler status of 24 DIs: Upper LED segment turned on: The optocoupler is switched off (indicated by "1"). Lower LED segment turned on: The optocoupler is switched on (indicated by "0"). The value of H0B-03 read by the software tool is a decimal number.	For example, when the optocoupler of DI1 is ON and that of DI2 to DI24 is OFF: The corresponding binary value is "11111111 11111111 11111110". The value of H0B-03 read by the software tool is 0xFFFFFE. Corresponding display: 

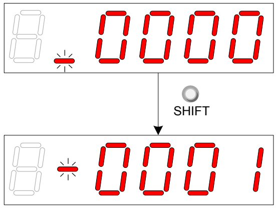
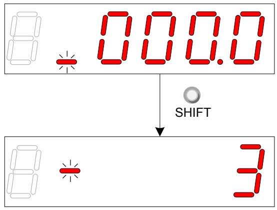
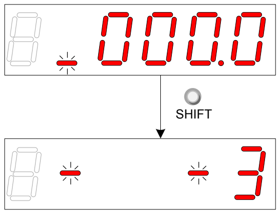
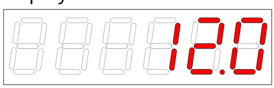
Para. No.	Name	Unit	Meaning	Display Example
H0B-05	Monitored DO status	-	Displays optocoupler status of six DOs: Upper LED segment turned on: The optocoupler is switched off (indicated by "1"). Lower LED segment turned on: The optocoupler is switched on (indicated by "0"). The value of H0B-05 read by the software tool is a decimal number.	For example, when optocoupler of DO1 is ON and that of terminal DO2 to DO6 is OFF: The corresponding binary value is "111110". The value of H0B-05 read by the software tool is 0x3E. Corresponding display: 
H0B-07	Absolute position counter (32-bit decimal number)	Reference unit	Displays the absolute position of the motor (reference unit).	Display of 1073741824 referent units: 
H0B-09	Mechanical angle	0.1°	Displays the present mechanical angle of the motor.	Display of 360.0° : 
H0B-10	Rotation angle (Electrical angle)	0.1°	Displays the present electrical angle of the motor.	Display of 360.0° : 

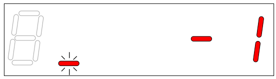
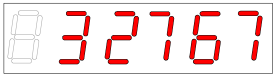
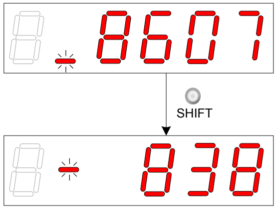
Para. No.	Name	Unit	Meaning	Display Example
H0B-11	Speed corresponding to the position reference	RPM	Displays the speed corresponding to the position reference in an individual control cycle.	Display of 3000 RPM:  Display of –3000 RPM: 
H0B-12	Average load ratio	0.1%	Displays the percentage of the average load torque to the rated motor torque.	Display of 100.0%: 
H0B-15	Encoder position deviation counter (32-bit decimal number)	Encoder unit	Encoder position deviation = Sum of position references (encoder unit) - Sum of pulses fed back by the encoder (encoder unit)	Display of 10000 encoder units: 
H0B-17	Feedback pulse counter (32-bit decimal number)	Encoder unit	Counts and displays the servo motor position feedback (encoder unit). Note: When an absolute motor is used, H0B-17 only shows the low 32-bit value of the motor position feedback. To obtain the actual motor position feedback, view H0B-77 (absolute position (low 32 bits) of absolute encoder) and H0B-79 (absolute position (high 32 bits) of absolute encoder).	Display of 1073741824 encoder units: 

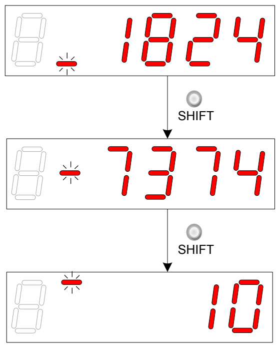
Para. No.	Name	Unit	Meaning	Display Example
H0B-19	Total power-on time (32-bit decimal number)	0.1s	Counts and displays the total power-on time of the servo drive.	Display of 429496729.5s: 
H0B-24	RMS value of phase current	0.01 A	Displays the RMS value of phase current of the servo drive.	Display of 4.60 A: 
H0B-26	Bus voltage	0.1 V	Main circuit DC bus voltage	Display of 311.0 V rectified from 220 VAC: 
H0B-27	Power module temperature	° C	Displays the temperature of the power module inside the servo drive.	Display of 27°C : 
H0B-33	Fault log	-	Displays the previous faults to be viewed. 0: Present fault 1: Last fault 2: 2nd to last fault … 9: 9th to last fault	0: Present fault display: 
H0B-34	Fault code of the selected fault	-	Displays the fault code selected by H0B-33. If no fault occurs, H0B-34 is displayed as "E + Axis No.000."	Take axis 3 as an example: If H0B-33 is set to 0, H0B-34 is set to E3.941, the present fault code will be 941. Corresponding display: 

Para. No.	Name	Unit	Meaning	Display Example
H0B-35	Time stamp upon occurrence of the selected fault	s	Displays the total operating time of the servo drive when the fault selected by H0B-34 occurs. When no fault occurs, H0B-35 is displayed as "0."	H0B-34 = Er.941, H0B-35 = 107374182.4: Indicates the present fault code is 941 and the total operating time of the servo drive is 107374182.4s when the fault occurs. 
H0B-37	Motor speed upon occurrence of the selected fault	RPM	Displays the servo motor speed when the fault selected by H0B-34 occurs. When no fault occurs, the displayed value of H0B-37 is "0".	Display of 3000 RPM:  Display of –3000 RPM: 
H0B-38	Motor phase U current upon occurrence of the selected fault	0.01 A	Displays the RMS value of phase U winding current when the fault selected by H0B-34 occurs. When no fault occurs, H0B-38 is displayed as "0".	Display of 4.60 A: 
H0B-39	Motor phase V current upon occurrence of the selected fault	0.01 A	Displays the RMS value of phase V winding current when the fault selected by H0B-34 occurs. When no fault occurs, H0B-39 is displayed as "0."	Display of 4.60 A: 

Para. No.	Name	Unit	Meaning	Display Example
H0B-40	Bus voltage upon occurrence of the selected fault	0.1 V	Displays the DC bus voltage of the main circuit when the fault selected by H0B-34 occurs. When no fault occurs, H0B-40 is displayed as "0."	Display of 311.0 V rectified from 220 VAC:  Display of 537.0 V rectified from 380 VAC: 
H0B-41	Input terminal status upon occurrence of the selected fault	-	Displays the high/low level status of 24 DIs when the fault selected by H0B-34 occurs. The viewing method is the same as that of H0B-03. When no fault occurs, all the DIs are displayed as low level by H0B-41, and the corresponding hexadecimal value is "0".	In cases where the value of H0B-41 read by the software tool is 0x431: The corresponding binary value is "00000000 00000100 00110001". Corresponding display: 
H0B-43	Output terminal status upon occurrence of the selected fault	-	Displays the high/low level status of six DOs when the fault selected by H0B-34 occurs. The viewing method is the same as that of H0B-05. When no fault occurs, all the DOs are displayed as low level by H0B-42, and the corresponding hexadecimal value is "0".	H0B-43 = 3: Corresponding display: 

Para. No.	Name	Unit	Meaning	Display Example
H0B-53	Position deviation counter (32-bit decimal number)	Reference unit	Position deviation = Sum of position references (reference unit) - Sum of pulses fed back by the encoder (reference unit)	Display of 10000 reference units: 
H0B-55	Actual motor speed	0.1 RPM	Displays the actual motor speed in unit of 0.1 RPM.	Display of 3000.0 RPM:  Display of –3000.0 RPM: 
H0B-57	Control power voltage	0.1 V	Displays the control power DC voltage.	Display of 12.0 V: 
H0B-58	Mechanical absolute position (low 32 bits)	Encoder unit	Displays the mechanical absolute position (low 32 bits) when an absolute encoder is used.	Display of 2147483647 encoder units: 

Para. No.	Name	Unit	Meaning	Display Example
H0B-60	Mechanical absolute position (high 32 bits)	Encoder unit	Displays the mechanical absolute position (high 32 bits) when an absolute encoder is used.	Display of –1 encoder unit: 
H0B-70	Number of absolute encoder revolutions	Rev	Displays the present number of revolutions of an absolute encoder.	Display of 32767: 
H0B-71	Single-turn position feedback of absolute encoder	Encoder unit	Displays the single-turn position feedback of an absolute encoder.	Display of 8388607 encoder units: 
H0B-77	Absolute encoder position (low 32 bits)	Encoder unit	Displays the absolute position (low 32 bits) of the motor when an absolute encoder is used.	Display of 2147483647 encoder units: 
H0B-79	Absolute encoder position (high 32 bits)	Encoder unit	Displays the absolute position (high 32 bits) of the motor when an absolute encoder is used.	Display of –1 encoder unit: 

Para. No.	Name	Unit	Meaning	Display Example
H0B-81	Single-turn position feedback of the load in rotation mode (low 32 bits)	Encoder unit	Displays the position feedback of the mechanical load (low 32 bits) when the absolute system works in the rotation mode.	Display of 2147483647 encoder units: 
H0B-83	Single-turn position feedback of the load in rotation mode (high 32 bits)	Encoder unit	Displays the position feedback of the mechanical load (high 32 bits) when the absolute system works in the rotation mode.	Display of 1 encoder unit: 
H0B-85	Single-turn position of the load in rotation mode	Reference unit	Displays the mechanical absolute position when the absolute system works in the rotation mode.	Display of 1073741824 referent units: 

4.4 Parameter Setting

Parameter setting can be performed through the keypad. For details on parameters, see "Appendix A List of Object Groups". The following figure shows how to change from position control to speed control after power-on.

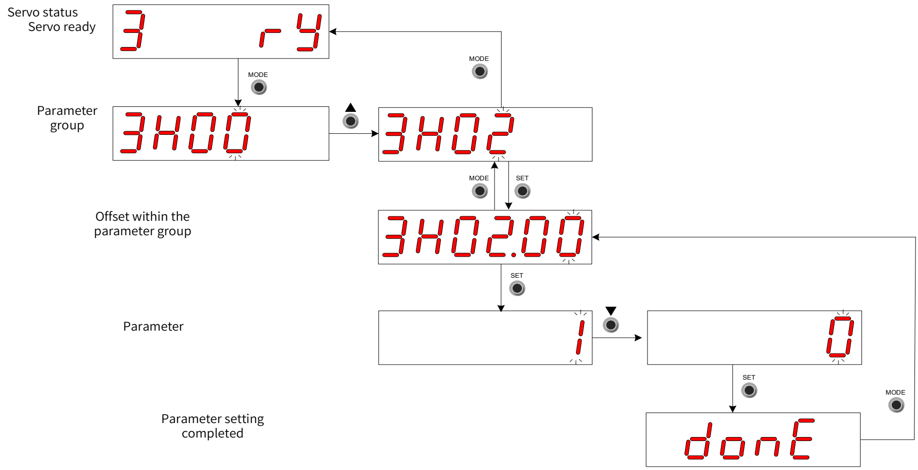


Figure 4-5 Procedures for parameter setting

- MODE: Used to switch the keypad display mode and return to the previous menu.
- " ▲ "/" ▼ ": Used to increase or decrease the value of the blinking digit.
- " ◀◀ ": Used to change the blinking digit.
- "SET": Used to save present settings or switch to the next menu.

When the "Done" interface is displayed after parameter setting is done, press MODE to return to the parameter group display (interface of "H02-00").

4.5 User Password

After the user password (H02-30) is applied, only the authorized user can perform parameter settings. Other operators can only view the parameter.

1 Setting user password

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

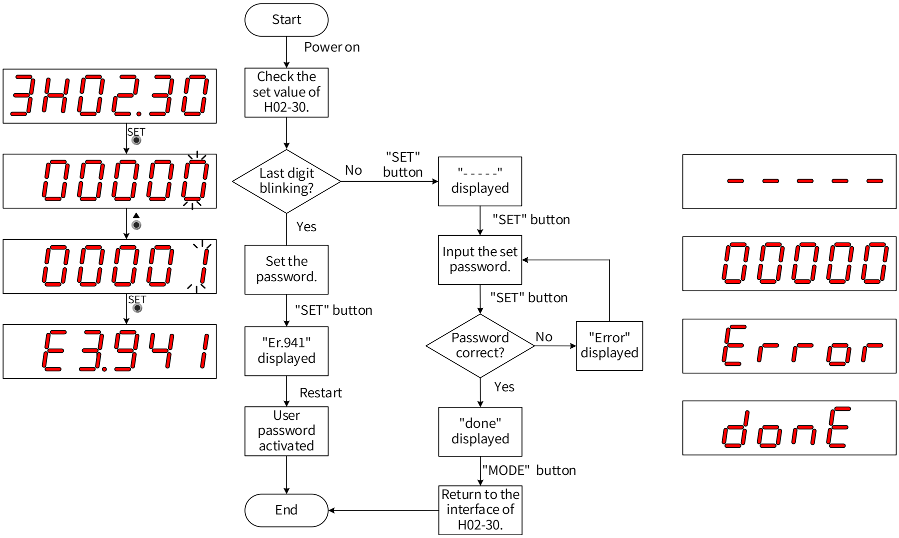


Figure 4-6 Procedures for user password setting

NOTE

- If the last digit does not blink, the present password is protected. If the last digit blinks, no password is set or the password entered is correct.
- To change the user password, input present password first to authorize the access to parameter setting, and then enter H02-30 again to set a new password according to the procedures in the preceding figure.

2 Canceling User Password

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

4.6 Jog

CAUTION	
	◆ When using the jog function, set the S-ON signal to OFF. Otherwise, this function cannot be used. ◆ You can perform trial run on the servo motor and the servo drive through jog.

1 Operating method

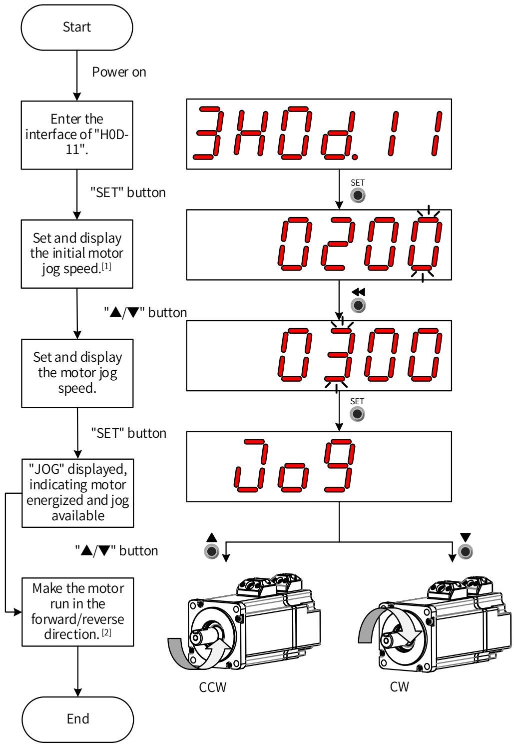


Figure 4-7 Procedures for jog setting

NOTE

- ◆ Press ▲ or ▼ to increase or decrease the motor speed during jogging. The motor speed will be restored to the initial value if the servo drive exits from the jog function.
- ◆ Press ▲ or ▼ to make the servo motor rotate in the forward or reverse direction. If you release the button, the servo motor stops running immediately.

2 Exiting from jogging

Press MODE to exit from jogging status and return to the previous menu.

4.7 DI/DO Function

There are 24 DI signals and 6 DO signals on CN1 of SV820N. Groups H03 (DI function allocation and logic selection) and H04 (DO function allocation and logic selection) can be shared by multiple axes. For all the axes, the DI/DO function can be set and modified through the keypad. If the DI/DO function is modified several times, the final modification prevails.

1 Definition of DI/DO Functions

Code	Name	Function	Description	Remarks
Description: consisting of three digits, with the first one (from left to right) indicating the axis number and the last two indicating the terminal function				
Functions of input signals				
01	S-ON	Servo ON	Invalid: Servo motor disabled in local mode Valid: Servo motor enabled in local mode	The S-ON function is valid in only non-bus control mode. The corresponding terminal logic must be level-triggered.
14	P-OT	Positive limit switch	Valid: Forward drive inhibited Invalid: Forward drive permitted	When the mechanical movement is beyond the movable range, overtravel prevention will be triggered. The corresponding terminal logic is recommended to be level-triggered.
15	N-OT	Negative limit switch	Valid: Reverse drive inhibited Invalid: Reverse drive permitted	When the mechanical movement is beyond the movable range, overtravel prevention will be implemented. The corresponding terminal logic is recommended to be level-triggered.

Code	Name	Function	Description	Remarks
31	HomeSwitch	Home switch	Invalid: Mechanical load beyond the range of home switch Valid: Mechanical load within the range of home switch	The corresponding terminal logic must be set to level-triggered. If the logic is set to 2 (Rising edge-triggered), the servo drive forcibly changes it to 1 (Active high). If the logic is set to 3 (Falling edge-triggered), the servo drive forcibly changes it to 0 (Active low). If the logic is set to 4 (Rising/ Falling edge-triggered), the servo drive forcibly changes it to 0 (Active low).
38	TouchProbe1	Touch probe 1	Invalid: Touch probe not triggered Valid: Touch probe can be triggered	The touch probe logic is only related to the touch probe function (60B8h).
39	TouchProbe2	Touch probe 2		
Functions of output signals				
01	S-RDY	Servo ready	Valid: Servo ready Invalid: Servo not ready	The servo drive is ready to run.
02	TGON	Motor rotating	Invalid: The filtered absolute motor speed is smaller than the set value of H06-16. Valid: The filtered absolute motor speed reaches the set value of H06-16.	-
10	WARN	Warning	Valid: A warning occurs on the servo drive Invalid: No warning occurs on the servo drive or the warning has been reset.	-
11	ALM	Fault	Valid - A fault occurs on the servo drive Invalid - No fault occurs on the servo drive or the fault has been reset.	-

2 DI function setting (H03-02)

Function settings in group H03 require three decimal digits. The first digit is for setting the axis No. and the last two digits are for allocating terminal functions. See the following dashed square in red for details.

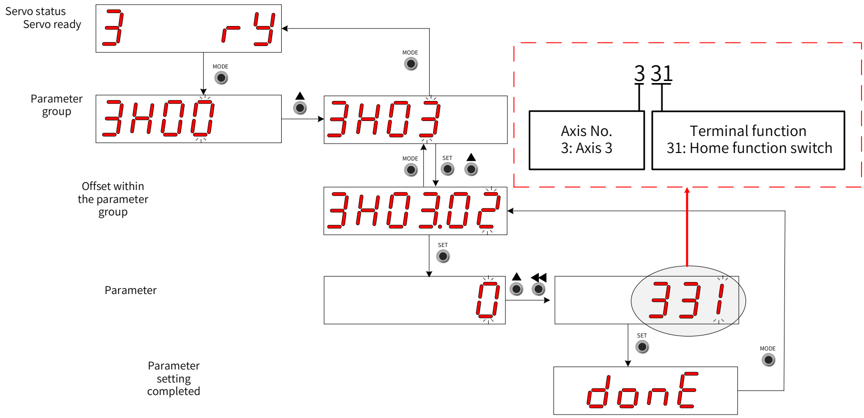


Figure 4-8 Procedures for DI function setting

Example: Set DI1, DI2, DI3 and DI4 as the home signals of four modules respectively. Corresponding parameters can be set to the following values through the software tool or the keypad.

H0302 = 131

H0304 = 231

H0306 = 331

H0308 = 431

NOTE

- Set the DI logic based on the hardware switch used.

3 DO function setting (H04-00)

Function settings of group H04 require three decimal digits. The first digit is for setting the axis No. and last two digits are for allocating terminal functions. See the dashed square in red for details.

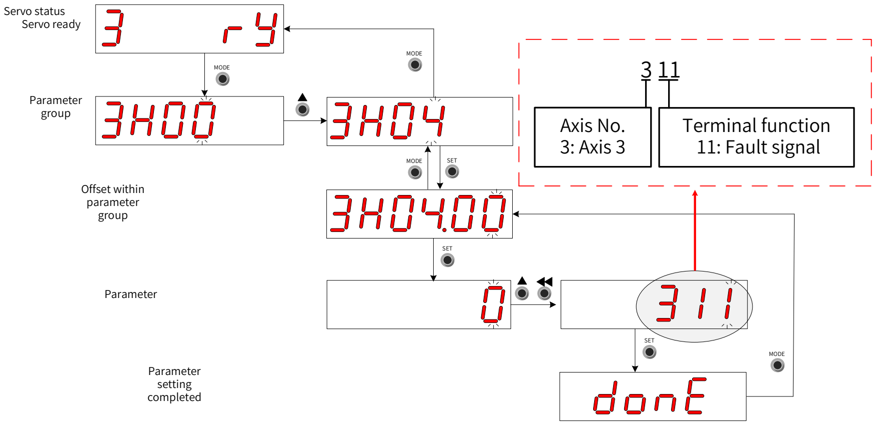


Figure 4-9 Procedures for DO function setting

Example: Set DO1, DO2, DO3 and DO4 as the fault signals of four modules respectively. Corresponding parameters can be set to the following values through the software tool or the keypad.

H0400 = 111

H0402 = 211

H0404 = 311

H0406 = 411

NOTE

◆ Set the DO logic based on the hardware switch used.

5 Troubleshooting

5.1 Faults and Warnings

1 Faults and warning levels

Faults and warnings of the servo drive are divided into three levels based on severity: No. 1 > No. 2 > No. 3. See the following list for details.

No. 1 non-resettable fault

No. 1 resettable fault

No. 2 resettable fault

No. 3 resettable warning

"Resettable" means the keypad stops displaying the fault/warning status once a "Reset signal" is input.

To reset a fault/warning, use one of the following two methods:

Set 200D-02h to 1 (Fault reset).

Set the rising edge of bit7 of the control word 0x6040 through the host controller.

To reset No. 1 and No. 2 faults, switch off the S-ON signal first and then set the DI allocated with fault reset function to ON.

To reset No. 3 warnings, set the DI allocated with the fault reset function to ON.

☆ Related parameters:

Para. No.	Name	Value Range	Function	Setting Condition	Effective Time	Default
200Dh-02h	Fault reset	0: No operation 1: Fault/ Warning reset	Stops fault display when a resettable fault/ warning occurs. Restores to "0: No operation" immediately after fault reset.	At stop	Immediately	0

5.2 Communication Faults and Warning Code List

When the communication or servo drive is abnormal, the SV820 servo drive sends an emergency message to the network，or sends a response abort message when the SDO transmission is abnormal.

1 Fault code list (Axis 3)

Display	Fault Name	Fault Type	Resettable or Not	Fault Range
E3.101	System parameter error	No. 1	No	Servo drive fault
E3.102	Abnormal communication initialization of coprocessor	No. 1	No	Servo drive fault
E3.104	Abnormal communication or interrupt timeout of the coprocessor	No. 1	No	Servo drive fault
E3.105	Internal program error	No. 1	No	Servo drive fault
E3.106	Abnormal communication of the main processor	No. 1	No	Servo drive fault
E3.107	Communication loss of the main processor	No. 1	No	Servo drive fault
E3.108	Parameter storage fault (read/ write)	No. 1	No	Servo drive fault
E3.111	Parameter errors in group 2000h/2001h	No. 1	No	Servo drive fault
E3.120	Mismatch of the product model (no matching motor or servo drive, absolute position parameters and the encoder not match, servo drive and the motor not match, FPGA software incompatible with the encoder)	No. 1	No	Axis fault
E3.121	Invalid S-ON command	No. 2	Yes	Axis fault
E3.122	Mismatch of the absolute position function and the encoder (motor model not match, encoder parameters not match)	No. 1	No	Axis fault
E3.130	DI function setting error	No. 1	Yes	Axis fault
E3.131	DO function setting error	No. 1	Yes	Axis fault
E3.136	Data check error or no parameter stored in the motor ROM	No. 1	No	Axis fault
E3.150	STO signal input protection	No. 1	Yes	Servo drive fault
E3.201	Hardware overcurrent (phase N overcurrent, phase U overcurrent, phase V overcurrent, bus discharge overcurrent)	No. 1	No	Axis or servo drive fault

Display	Fault Name	Fault Type	Resettable or Not	Fault Range
E3.202	Soft start relay fault	No. 1	No	Servo drive fault
E3.206	Switching frequency error	No. 1	Yes	Axis fault
E3.208	FPGA system sampling operation timeout Encoder communication timeout Sigma_Delta modulation fault	No. 1	No	Axis or servo drive fault
E3.210	Output shorted to ground	No. 1	No	Axis fault
E3.220	UVW phase sequence error	No. 1	No	Axis fault
E3.234	Runaway	No. 1	No	Axis fault
E3.400	Main circuit overvoltage	No. 1	Yes	Servo drive fault
E3.410	Main circuit undervoltage	No. 1	Yes	Servo drive fault
E3.420	Main circuit phase loss	No. 2	Yes	Servo drive fault
E3.430	Control power undervoltage	No. 1	No	Servo drive fault
E3.500	Motor overspeed	No. 1	Yes	Axis fault
E3.602	Angle auto-tuning failure	No. 1	Yes	Axis fault
E3.610	Servo drive overload	No. 2	Yes	Axis fault
E3.620	Motor overload	No. 2	Yes	Axis fault
E3.630	Motor rotor locked	No. 2	Yes	Axis fault
E3.650	Heatsink overheat	No. 2	Yes	Axis fault
E3.731	Encoder battery failure	No. 2	Yes	Axis fault
E3.733	Encoder multi-turn counting error	No. 2	Yes	Axis fault
E3.735	Encoder multi-turn counting overflow	No. 2	Yes	Axis fault
E3.740	Encoder interference	No. 1	No	Axis fault
E3.A33	Encoder data read/write error	No. 1	No	Axis fault
E3.B00	Excessive position deviation	No. 2	Yes	Axis fault
E3.B01	Position reference incremental error	No. 2	Yes	Axis fault
E3.B03	Electronic gear ratio over the limit	No. 2	Yes	Axis fault
E3.D09	Software position setting error	No. 2	Yes	Axis fault
E3.D10	Home position setting error	No. 2	Yes	Axis fault
E3.E08	Synchronization loss*	No. 2	Yes	Servo drive fault

Display	Fault Name	Fault Type	Resettable or Not	Fault Range
E3.E09	No synchronization signal*	No. 2	Yes	Servo drive fault
E3.E11	ESI configuration file not programmed*	No. 2	Yes	Servo drive fault
E3.E13	Synchronization cycle setting error*	No. 2	Yes	Servo drive fault
E3.E15	Excessive synchronization cycle*	No. 2	Yes	Servo drive fault

2 Warning code list (Axis 3)

Display	Name	Fault Type	Resettable or Not	Fault Range
E3.601	Homing warning	No. 3	Yes	Axis fault
E3.730	Encoder battery warning	No. 3	Yes	Axis fault
E3.760	Encoder over-temperature	No. 3	Yes	Axis fault
E3.908	IGBT model error	No. 3	No	Axis fault
E3.909	Motor overload	No. 3	Yes	Axis fault
E3.920	Regenerative resistor overload	No. 3	Yes	Servo drive fault
E3.922	Resistance of external regenerative resistor too small	No. 3	Yes	Servo drive fault
E3.939	Motor power cable disconnected	No. 3	Yes	Axis fault
E3.941	Parameter modifications activated at next power-on	No. 3	Yes	Servo drive fault
E3.942	Parameter storage too frequent	No. 3	Yes	Servo drive fault
E3.950	Forward overtravel	No. 3	Yes	Axis fault
E3.952	Reverse overtravel	No. 3	Yes	Axis fault
E3.980	Abnormal encoder algorithm	No. 3	Yes	Axis fault
E3.990	Main circuit power input phase loss	No. 3	Yes	Servo drive fault
E3.998	Homing object dictionary setting error	No. 3	Yes	Axis fault
E3.E20	Ethernet hardware error	No. 3	Yes	Servo drive fault
E3.E21	MAC address not programmed	No. 3	Yes	Servo drive fault
NRD	Servo not ready	-	-	-

NOTE

◆ The preceding table takes axis 3 as an example. If fault 101 occurs, axes 1, 2, 3, and 4 display E1.101, E2.101, E3.101, and E4.101, respectively. The similar applies to other faults.

5.3 Solutions to Faults

Note: This section takes axis 3 as an example.

■ E3.101: System parameter error

Direct cause:

The total number of parameters changes, which generally occurs after software update.

Parameter values in groups 2002h and above exceed the limit, which generally occurs after software update.

Root Cause	Confirming Method	Solution
1. The control power voltage drops instantaneously.	Check whether the voltage drops during control power (L1C, L2C) cutoff or whether instantaneous power failure occurs.	Restore the default settings (2002-20h = 1) and write the parameters again.
	Measure whether the control power voltage on the non-drive side complies with the following specifications: 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)	Increase the power capacity or replace with a power supply of larger capacity. Restore default settings (2002-20h = 1) and write the parameters again.
2. Instantaneous power failure occurs during parameter storage.	Check whether instantaneous power failure occurs during parameter storage.	Power on the system again, restore default settings (2002-20h = 1) and write the parameters again.
3. The number of write operations within a certain period of time exceeds the limit.	Check whether parameters are updated frequently by the host controller.	Change the write method and write parameters again. If the servo drive is faulty, replace it.
4. The software is updated.	Check whether the software is updated.	Reset the servo drive model and servo motor model, and restore default settings (2002-20h = 1).
5. The servo drive is faulty.	If the fault persists after several times of restart and parameter initialization, the servo drive is faulty.	Replace the servo drive.

■ E3.102: Abnormal communication initialization of coprocessor

Direct cause:

Multi-core communication initialization fault occurs or software versions of the CPU cores do not match.

Root Cause	Confirming Method	Solution
1. The software version of FPGA and that of each CPU core do not match.	View the FPGA software version (2001-03h), CUP0 software version (2001-04h), and CUP1 software version (2001-05h) through the keypad or software tool. Check whether the non-zero numbers of the most significant bits of the software versions are consistent.	Contact Inovance for technical support. Update to the matching FPGA or MCU software.
2. The FPGA is faulty.	The fault persists after several times of restart.	Replace the servo drive.

■ E3.104: Abnormal communication or interrupt timeout of coprocessor

Direct cause:

Interrupt timeout occurs on the coprocessor or FPGA, and cyclic access timeout occurs among coprocessors.

Root Cause	Confirming Method	Solution
1. The FPGA is faulty.	The fault persists after the servo drive is powered off and on several times.	Replace the servo drive.
2. The communication handshake between the FPGA and MCU is abnormal.		
3. Interrupt timeout occurs on the MCU.		

■ E3.105: Internal program error

Direct cause:

The total number of parameters is abnormal during EEPROM read/write operation.

The parameter value range is abnormal, which generally occurs after software update.

Root Cause	Confirming Method	Solution
1. An EEPROM fault occurs.	Check the causes according to the method described in E3.101.	Restore default settings (2002-20h = 1) and power on the servo drive again.
2. The servo drive is faulty.	The fault persists after several times of restart.	Replace the servo drive.

■ E3.106: Abnormal communication handshake of the main processor

To distinguish fault causes, the servo drive displays different internal fault codes under the same fault code. You can view these internal fault codes in 200B-2Eh.

Direct cause:

Access timeout occurs between the HOST and FPGA or between the HOST and coprocessor during power-on initialization.

Root Cause	Confirming Method	Solution
1. The FPGA is faulty.	The fault persists after the servo drive is powered off and on several times.	Replace the servo drive.
2. The communication handshake between the FPGA and the HOST is abnormal.		
3. Access timeout occurs between the HOST and the coprocessor.		
4. The versions of the HOST and the coprocessor do not match.	The fault occurs when the HOST software version (H01-00) is set to 2203.2 and above.	Update the software of the servo drive.

■ E3.107: Main processor communication loss

Direct cause:

Cyclic handshake communication loss occurs between the main processor and the coprocessor.

Root Cause	Confirming Method	Solution
Internal communication failure	The fault persists after the servo drive is powered off and on several times.	Replace the servo drive.

■ E3.108: Parameter storage fault

Direct cause:

Parameter values cannot be written to EEPROM.

Parameter values cannot be read from EEPROM.

Root Cause	Confirming Method	Solution
1. The write operation is abnormal.	Modify a parameter, power on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after several times of restart, replace the servo drive.
2. The read operation is abnormal.		

■ E3.111: Abnormal parameters in group 2000h/2001h

Direct cause:

The total number of parameters changes, which generally occurs after software update.

Parameter values in groups 2000 or 2001 exceed the limit, which generally occurs after software update.

Root Cause	Confirming Method	Solution
1. Instantaneous power failure occurs during parameter storage.	Check whether instantaneous power failure occurs during parameter storage.	Set the servo drive model (2001-0Bh) to a wrong value first and power on again, and then set the servo drive model to a correct value and power on again.
2. Instantaneous power failure occurs during writing serial encoder motor parameters.	Check whether instantaneous power failure occurs during writing serial encoder motor parameters.	Write the parameters of the serial encoder motor through the software tool.
3. The software is updated.	Check whether the software is updated.	Set the servo drive model (2001-0Bh) to a wrong value first and power on again, and then set the servo drive model to a correct value and power on again.
4. The servo drive is faulty.	If the fault persists even though the servo drive is powered off and on again and steps 1 and 2 are repeated several times, the servo drive is faulty.	Replace the servo drive.

■ E3.120: Mismatch of the product model

Direct cause:

a) The motor model and the servo drive model do not match.
b) Parameters are set improperly.
c) The auto-tuned drive unit model is wrong.

Root Cause	Confirming Method	Solution
1. The product (encoder, motor or servo drive) code does not exist.	200B-2Eh (Internal fault code) = 1120: View the motor nameplate to check whether the motor is suitable. Check whether 2000-01h (Motor code) is set correctly.	Set 2000-01h correctly according to the motor nameplate or replace with a matching motor.
	200B-2Eh = 2120: View the servo drive model in 2001-0Bh and check whether this model exists according to "1.1 Nameplate and Model Number".	If the servo drive model does not exist, set it correctly according to the servo drive nameplate in section 1.1.
2. The power ratings of the servo motor and servo drive do not match.	200B-2Eh = 3120: View the servo drive model in 2001-0Bh and the serial encoder motor model in 2000-06h, and check whether they are matching.	Replace the unmatched product according to "1.4 Servo System Configuration Specifications".

Root Cause	Confirming Method	Solution
3. The model of the drive unit is set improperly and does not match the auto-tuned result.	Check whether 2001-0Bh and 2001-3Fh of the faulty axis are set to the same value.	Set 2001-0Bh and 2001-3Fh to the same value. Replace the drive unit.
4. The FPGA software does not support the motor code.	200B-2Eh = 0x6120 Select the appropriate FPGA software according to 2000-01h.	2001-03 = 0 Supporting the motor code in cases where 2000-01h = 14000/14101 2001-03 = 1 Supporting the motor code in cases where 2000-01h = 14120 Other motor serial numbers are not supported.

■ E3.121: Invalid S-ON command

Direct cause:

A redundant S-ON signal is sent when some auxiliary functions are used.

Root Cause	Confirming Method	Solution
1. When the servo drive is enabled internally, the S-ON signal is switched on through communication.	Check whether the S-ON signal is sent from the host controller when the auxiliary functions (200D-03h, 200D-04h, 200D-0Ch) are used.	Switch off the S-ON signal sent from the host controller.

■ E3.122: Motor mismatch in absolute position mode

Cause	Confirming Method	Solution
1. The motor does not match in the absolute position mode or the motor code is set incorrectly.	View the motor nameplate to check whether the motor carries a multi-turn absolute encoder. Check whether H00-00 (Motor code) is set correctly.	Reset H00-00 (Motor code) according to the motor nameplate or replace by a matching motor.

■ E3.130: DI function setting error

Cause	Confirming Method	Solution
1. The same function is allocated to different DIs.	Check whether 2003-03h, 2003-05h, and 2003-07h to 2003-11h are allocated with the same non-zero DI function No.	Allocate different DI functions to parameters allocated with the same DI function, and restart the control circuit to activate the allocation, or switch off the S-ON signal and send a "RESET" signal to activate the allocation.
2. The DI function setting is wrong.	Check whether the set values of 2003-03h, 2003-05h, 2003-07h to 2003-11h meet the requirement. Requirement on set values: Axis No. + Supported DI function No.	Set the values again according to the preceding requirement, and restart the control circuit to activate the setting, or switch off the S-ON signal first and send a "RESET" signal to activate the setting.

■ E3.131: DO function setting error

Cause	Confirming Method	Solution
The DO function setting is wrong.	Check whether the set values of 2004-01h (DO1 logic selection) and 2004-03h (DO2 logic selection) meet the requirement. Requirements on set values: Axis No. + Supported DO function No.	Set the values again according to the preceding requirement, and restart the control circuit to activate the setting, or switch off the S-ON signal first and send a "RESET" signal to activate the setting.

■ E3.136: Data check error or no parameter stored in the motor encoder ROM

Direct cause:

When reading parameters from the encoder ROM, the servo drive detects that no parameters are saved there or parameter values are inconsistent with the agreed values.

Root Cause	Confirming Method	Solution
1. The servo drive model and the motor model do not match.	View the servo drive and servo motor nameplates to check whether the equipment used is the Inovance SV820 series servo drive and servo motor.	Replace by a matching servo drive and servo motor.

Root Cause	Confirming Method	Solution
2. A parameter check error occurs or no parameter is stored in the ROM of the serial incremental encoder.	Check whether the encoder cable provided by Inovance is used. For cable specifications, see "1.4 Servo System Configuration Specifications". The cable must be connected reliably without scratching, breaking or poor contact. Measure signals PS+, PS-, +5V and GND at both ends of the encoder cable and observe whether signals at both ends are consistent. For the signal definition, see hardware connections.	Use the encoder cable provided by Inovance. Ensure that the cable is connected to the motor securely and tighten the screws on the servo drive side. Use a new encoder cable if necessary. Do not bundle the encoder cables with the power cables (RST, UVW). Route encoder cables and power cables through different routes.
3. The encoder cables are connected improperly or loosely.	Check the encoder cable connections. Check whether the ambient vibration is too large, which loosens the encoder cable and damages the encoder.	Connect the encoder cables according to the correct wiring diagram and ensure the encoder terminals are connected securely.
4. The servo drive is faulty.	The fault persists after the servo drive is restarted.	Replace the servo drive.

■ E3.150: STO input protection

Cause:

The STO input protection applies.

■ E3.201: Overcurrent

Direct cause:

Hardware overcurrent is detected.

Root Cause	Confirming Method	Solution
1. Commands are input simultaneously upon start or the command input is too early.	Check whether a command is input before the keypad displays "ry".	Command sequence: After the keypad displays "ry", switch on the S-ON signal and then input a command. Add reference filter time constant or increase the acceleration/deceleration time if allowed.
2. The 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 loosened.	Tighten the cables that are loosened or disconnected.

Root Cause	Confirming Method	Solution
3. The motor cables are grounded.	After ensuring the servo drive power cables and motor cables are connected securely, measure whether the insulation resistance between the servo drive UVW sides and the grounding cable (PE) is at MΩ-level.	Replace the motor if the insulation is poor.
4. The motor UVW cables are short circuited.	Disconnect the motor cables and check whether short-circuit occurs among U, V, and W phases and whether burrs exist on the cable connections.	Connect the motor cables correctly.
5. The motor is burnt down.	Disconnect the motor cables and measure whether the resistance among U, V, and W phases of the motor cable is balanced.	Replace the motor if the resistance is unbalanced.
6. The gain is set improperly and the motor oscillates.	Check whether motor oscillates or generates a sharp noise during motor start and running, or view the current feedback through the software tool.	Carry out gain adjustment.
7. The encoder cable is wired incorrectly, aging, or corroded, or the encoder connector is loosened.	Check whether the encoder cable provided by Inovance is used and whether the cable is aging or corroded, or the connector is loosened. Switch off the S-ON signal, rotate the motor shaft manually, and check whether the value of 200B-12h (electrical angle) changes as the motor rotates.	Re-solder, tighten or replace the encoder cable.
8. The servo drive is faulty.	The fault persists although the motor cables are disconnected and the servo drive is restarted.	Replace the servo drive.
9. Regenerative resistor overcurrent	Check whether resistance of the external regenerative resistor is too small or the regenerative resistor is short-circuited (P and C ends at main circuit input terminal).	Select new resistance value and model of the regenerative resistor. Connect the cables again.

■ E3.202: Soft start relay disconnected

Cause:

The soft start relay is disconnected.

■ E3.206: Switching frequency error

Cause:

The motor control is abnormal.

■ E3.208: FPGA sampling operation timeout

Find the fault cause through internal fault code (200B-2Eh) when E3.208 occurs.

Cause	Confirming Method	Solution
1. Communication timeout occurs on the encoder.	200B-2Eh (Internal fault code) = 2208: The encoder wiring is incorrect. The encoder cables are connected loosely. The encoder cable is too long. The encoder communication suffers from interference. The encoder is faulty.	It is recommended to use the cables provided by Inovance. If a customized encoder cable is used, check whether this cable complies with the specifications and whether it is a shielded twisted pair cable. Check whether the connectors at both ends of the encoder are in good contact and whether any pin retracts. Contact the manufacturer. Route motor cables and encoder cables through different routes Ensure the servo motor and servo drive are grounded properly. Replace the servo motor.
2. Current sampling timeout occurs.	200B-2Eh (Internal fault code) = 3208: Check whether there is large equipment generating interference or there are interference sources such as variable-frequency devices inside the cabinet. The internal current sampling chip is damaged.	Route high-voltage cables and low-voltage cables through different routes. Replace the servo drive.
3. FPGA operation timeout occurs.	200B-2Eh (Internal fault code) = 0208: Determine the fault cause according to preceding causes 1, 2, 3, and 4.	Handle the fault according to solutions to preceding causes 1, 2, 3, and 4.

■ E3.210: Output shorted to ground

Direct cause:

The servo drive detects abnormal motor phase current or bus voltage during self-check upon power-on.

Root Cause	Confirming Method	Solution
1. The servo drive power cables (UVW) are shorted to ground.	Disconnect the motor cables, and measure whether the servo drive power cables (UVW) are shorted to ground (PE).	Re-connect or replace the servo drive power cables.
2. The motor is shorted to ground.	After ensuring the servo drive power cables and motor cables are connected securely, measure whether the insulation resistance between the servo drive UVW sides and the grounding cable (PE) is at MΩ-level.	Replace the motor.
3. The servo drive is faulty.	Remove the power cables from the servo drive, but the fault persists after the servo drive is powered off and on several times.	Replace the servo drive.

■ E3.220: Wrong UVW phase sequence

Direct cause:

Incorrect UVW phase sequence is detected during angle auto-tuning.

Root Cause	Confirming Method	Solution
The phase sequence of the power cable is incorrect.	Check whether the phase sequence of the power cable is correct.	Change any two phase sequences and perform angle auto-tuning again.

■ E3.234: Runaway

Direct cause:

The torque reference direction is in reverse 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.

Root Cause	Confirming Method	Solution
1. The UVW phase sequence is incorrect.	Check whether the servo drive power cables are in the same phase sequence as the servo drive UVW cables and motor UVW cables.	Connect the UVW cables according to the correct phase sequence.

Root Cause	Confirming Method	Solution
2. The interference signal causes an error in the initial phase detection of the motor rotor.	The UVW phase sequence is correct, but E3.234 occurs when the servo drive is enabled.	Power 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 equipment used is the Inovance SV820 series servo drive and 20-bit servo motor.	Replace with a matching servo drive and servo motor. Check the motor model, encoder type, and encoder cable connections.
4. The encoder cable is wired improperly, corroded or connected loosely.	Check whether the encoder cable provided by Inovance is used and whether the cable is aging or corroded, or the connector is loosened. Switch off the S-ON signal, rotate the motor shaft manually, and check whether the value of 200B-12h (electrical angle) changes as the motor rotates.	Re-solder, tighten or replace the encoder cable.

■ E3.400: Main circuit overvoltage

Direct 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

Root Cause	Confirming Method	Solution
1. The voltage input to the main circuit is too high.	Measure whether the input voltage on the main circuit side (RST) complies with the following specifications: 220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V)	Replace or adjust the power supply according to the specifications.
2. The power supply is unstable or affected by lightning.	Check whether the power supply is unstable, affected by lightning or compliant with the preceding specifications.	Connect a surge protection device and then switch on the power supply. If the fault persists, replace the servo drive.

Root Cause	Confirming Method	Solution
3. The regenerative resistor does not work.	If an external regenerative resistor is used (2002-1Ah = 1/2), measure the resistance between P and C. See "1.5 Regenerative Resistor Specifications" for specifications of the regenerative resistor.	If the resistance is " ∞ " (infinite), the regenerative resistor is internally disconnected. If an external regenerative resistor is used, replace it with a new one. Set 2002-1Bh (Power of external regenerative resistor) and 2002-1Ch (Resistance of external regenerative resistor) correctly according to the resistor specifications.
4. The resistance of the external regenerative resistor is too large, and energy absorption during braking is insufficient.	Measure the resistance of the external regenerative resistor between P and C. Compare the measured value with the recommended value.	Connect a new external regenerative resistor of recommended resistance between P and C. Set 2002-1Bh (Power of external regenerative resistor) and 2002-1Ch (Resistance of external regenerative resistor) correctly according to the resistor specifications.
5. The motor is in abrupt acceleration/ deceleration status and the maximum braking energy exceeds the energy absorption value.	Check 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 ensuring the main circuit voltage input complies with specifications, increase the acceleration/deceleration time properly.
6. The bus voltage sampling value deviates greatly from the measured value.	Check whether 200B-1Bh (Bus voltage) complies with the following specifications: 220 V servo drive: 200B-1Bh > 420 V Measure the DC bus voltage between P and N and check whether the DC bus voltage is smaller than the value of 200B-1Bh.	Contact Inovance for technical support.
7. The servo drive is faulty.	The fault persists after the main circuit is powered off and on several times.	Replace the servo drive.

■ E3.410: Main circuit undervoltage

Direct cause:

The DC bus voltage between P and N is lower than the fault threshold.

220 V servo drive:
Normal value: 310 V
Overvoltage threshold: 200 V

<table>
<tr><th>Root Cause</th><th>Confirming Method</th><th>Solution</th></tr>
<tr><td>1. The power supply of the main circuit is unstable or power failure occurs.</td><td rowspan="2">Measure whether the input voltage of the main circuit cables on the non-drive side and the drive side complies with the following specifications:
220 V servo drive:
Effective value: 220 V to 240 V
Allowable deviation: –10% to +10% (198 V to 264 V)
The voltages of all three phases need to be measured.</td><td rowspan="3">Increase the power capacity.</td></tr>
<tr><td>2. Instantaneous power failure occurs.</td></tr>
<tr><td>3. The power voltage drops during running.</td><td>Monitor the power input voltage and check whether the main circuit power supply is applied to other devices, resulting in insufficient power capacity and voltage dip.</td></tr>
<tr><td>4. Phase loss occurs because a single-phase power supply is used for a three-phase servo drive.</td><td>Check whether the main circuit wiring is correct and reliable, and whether the phase loss fault detection (200A-01h) is hidden.</td><td>Replace the cables and connect the main circuit cables properly.
Three-phase: L1, L2, L3
Single-phase: L1, L2</td></tr>
<tr><td>5. The servo drive is faulty.</td><td>Check whether 200B-1Bh (Bus voltage) complies with the following specifications:
220 V servo drive: 200B-1Bh < 200 V
The fault persists after the main circuit is powered off and on several times.</td><td>Replace the servo drive.</td></tr>
</table>

■ E3.420: Main circuit phase loss

Direct cause:

Phase loss occurs on a three-phase servo drive.

Root Cause	Confirming Method	Solution
1. The three-phase input cables are connected improperly.	Check whether the cables between the non-drive side and the main circuit input terminals are in good condition and connected securely.	Replace the cables and connect the main circuit cables properly.

<table>
<tr><th>Root Cause</th><th>Confirming Method</th><th>Solution</th></tr>
<tr><td>2. A single-phase power supply is used for a three-phase servo drive.</td><td rowspan="2">Check the power input specification of the servo drive and the actual input voltage. Measure the main circuit input voltage to check whether it complies with the following specifications:
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 voltages of all three phases need to be measured.</td><td rowspan="2">A three-phase servo drive of 0.75 kW (model: H01-10 = 5) can be connected to a single-phase power supply. If the input voltage fulfills the specifications, set H0A-00 to 2 (Inhibit fault and warning). If the input voltage does not fulfill the specifications, replace or adjust the power capacity according to the specifications.</td></tr>
<tr><td>3. The three-phase power supply is imbalanced or the voltages of the three phases are too low.</td></tr>
<tr><td>4. The servo drive is faulty.</td><td>The fault persists after the main circuit is powered off and on several times.</td><td>Replace the servo drive.</td></tr>
</table>

■ E3.430: Control power undervoltage

Direct cause:

Phase loss occurs on the AC input of the control circuit.

Root Cause	Confirming Method	Solution
The AC input of the control circuit is unstable.	Check whether the control power cables are well connected and measure whether the AC input voltage of the control power fulfills specifications.	Re-connect or replace control power cables.

■ E3.500: Motor overspeed

Direct cause:

The actual speed of the servo motor exceeds the overspeed threshold.

Root Cause	Confirming Method	Solution
1. The UVW phase sequence of the motor cable is incorrect.	Check whether the servo drive power cables are connected in the correct phase sequence on both sides.	Connect the cables according to the correct phase sequence.

Root Cause	Confirming Method	Solution
2. 200A-09h is set improperly.	Check whether the overspeed threshold is smaller than the maximum motor speed needed in actual running. Overspeed threshold = 1.2 times the maximum motor speed (200A-09h = 0). Overspeed threshold = 200A-09h (200A-09h ≠ 0, and 200A-09h < 1.2 times the maximum motor speed).	Re-set the overspeed threshold according to 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, view the gear ratio 6091-01h/6091-02h to check the position reference increment per synchronization cycle and convert it to the speed information. In PP mode, view the gear ratio 6091-01h/6091-02h and check the value of 6081h (Profile velocity). In HM mode, view the gear ratio 6091-01h/6091-02h, and determine the value of 6099-01h and 6099-02h. Speed control mode: View the gear ratio 6091-01h, and the values of 60FFh (Target velocity) and 607Fh (Max profile velocity). Torque control mode: View the value of 607Fh in the torque control mode.	Position control mode: CSP: Decrease the position reference increment per synchronization cycle. The host controller should cover the position ramp when generating references. PP: Decrease the value of 6081h, or increase the acceleration/deceleration ramp (6083h, 6084h). HM: Decrease the value of 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 velocity ramp. Torque control mode: Set the speed limit to a value smaller than the overspeed threshold.
4. The motor speed overshoot occurs.	Check whether the speed feedback exceeds the overspeed threshold through the software tool.	Adjust the gain or mechanical running conditions.
5. The servo drive is faulty.	The fault persists after the servo drive is powered on again.	Replace the servo drive.

■ E3.602: Angle auto-tuning failure

Direct cause:

Abnormal jitter occurs on the encoder feedback during angle auto-tuning.

Root Cause	Confirming Method	Solution
Encoder feedback data error occurs.	Check if the encoder communication suffers from interference.	Check the encoder cable connections.

■ E3.610: Servo drive overload

Cause:

The servo motor temperature reaches the over-temperature threshold.

■ E3.620: Motor overload

Direct cause:

The servo motor temperature reaches the over-temperature threshold.

Root Cause	Confirming Method	Solution
1. The motor and encoder cables are connected improperly or in poor contact.	Check the wiring among the servo drive, servo motor and 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 cables according to the hardware wiring instructions.
2. The load is too heavy, and the effective torque output by the motor keeps exceeding the rated torque during continuous operation.	Confirm the overload characteristics of the servo drive or motor. Check whether the average load ratio (200B-0DH) is greater than 100.0% for a long time.	Replace with a servo drive of larger 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. Then view 2008-10h (Load inertia ratio). Confirm the single running cycle during cyclic running.	Increase the acceleration/deceleration time during single-cycle running.
4. The gain adjustment is improper or the stiffness level is too high.	Check whether the motor vibrates and produces abnormal noise during running.	Adjust the gain again.

Root Cause	Confirming Method	Solution
5. The model of the servo drive or servo motor is set incorrectly.	View the serial encoder motor model in 2000-06h and the servo drive model in 2001-0Bh.	View the servo drive nameplate and set the servo drive model in 2001-0Bh correctly. Use a matching servo motor according to *"2.3 Dimension Drawing of MS1H1 Series Servo Motors"*.
6. Locked-rotor occurs due to mechanical factors, resulting in overload during running.	Check the RUN command and the motor speed (200B-01h) through the software tool or the keypad: RUN command in the position control mode: 200B-0Eh (Position reference counter) RUN command in the speed control mode: 200B-02h (Speed reference) RUN command in the torque control mode: 200B-03h (Internal torque reference) Check whether the RUN command is not 0 but the motor speed is 0 in the corresponding mode.	Eliminate the mechanical factors.
7. The servo drive is faulty.	The fault persists after the servo drive is powered off and on again.	Replace the servo drive.

■ E3.630: Locked-rotor over-temperature protection

Direct cause:

The actual motor speed is lower than 10 RPM but the torque reference reaches the limit and such status lasts for the time defined by 200A-21h.

Root Cause	Confirming Method	Solution
1. UVW output phase loss or incorrect phase sequence occurs on the servo drive.	Perform motor trial run without load and check cable connections.	Connect cables again according to the correct wiring diagram or replace the cables.
2. The servo drive UVW cables or the encoder cables are disconnected.	Check the cable connections.	Connect the cables again according to the correct wiring diagram or replace the cables.

Root Cause	Confirming Method	Solution
3. Locked-rotor occurs due to mechanical factors.	Check the RUN command and the motor speed (200B-01h) through the software tool or keypad: RUN command in the position control mode: 200B-0Eh (Position reference counter) RUN command in the speed control mode: 200B-02h (Speed reference) RUN command in the torque control mode: 200B-03h (Internal torque reference) Check whether the RUN command is not 0 but the motor speed is 0 in the corresponding mode.	Eliminate the mechanical factors.

■ E3.650: Heatsink over-temperature

Direct cause:

The temperature of the power module is higher than the over-temperature protection threshold.

Root Cause	Confirming Method	Solution
1. The ambient temperature is too high.	Measure the ambient temperature.	Improve the cooling conditions of the servo drive to reduce the ambient temperature.
2. The servo drive is restarted several times to reset the overload fault.	View the fault records (set 200B-22h and view 200B-23h). Check whether an overload fault/warning (E3.610, E3.620, E3.630, E3.650) occurs.	Change the fault reset method. After overload occurs, wait for 30s before reset. Increase the capacity of the servo drive and servo motor, increase the acceleration/deceleration time and reduce the load.
3. The fan is damaged.	Observe whether the fan works during running.	Replace the servo drive.
4. The installation direction and the clearance reserved for the servo drive 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 5 minutes after power-off.	Replace the servo drive.

Root Cause	Confirming Method	Solution
6. The model of the drive unit is set improperly.	The drive unit model of this axis (H01-10) is to 6000X. The temperature of this axis (H0B-27) under normal ambient environment is 95°C .	Set the drive unit model (H01-10) of this axis to X.

■ E3.731: Encoder battery failure

Direct cause:

The battery voltage of the absolute encoder is lower than 3.0 V.

Root Cause	Confirming Method	Solution
The battery is not connected during power-off.	Check whether the battery is connected during power-off.	Set 200D-15h to 1 to clear the fault.
The battery voltage of the encoder is too low.	Measure the battery voltage.	Replace with a new battery of matching voltage.

■ E3.733: Encoder multi-turn counting error

Direct cause:

The encoder multi-turn counting value is wrong.

Root Cause	Confirming Method	Solution
The encoder is faulty.	Set 200D-15h to 2 to clear the fault, but the fault persists after the serve drive is powered off and on again.	Replace the motor.

■ E3.735: Encoder multi-turn counting overflow

Cause	Confirming Method	Solution
The number of unidirectional revolutions of the absolute encoder exceeds 32767 in linear mode.	View the value of H0B-70 and check whether the encoder continues to run in the same direction after the value of H0B-70 reaches 32767.	See the operation instructions for the absolute encoder. 1. This fault can be hidden in cases where no multi-turn absolute position is needed but the absolute position during running needs to be recorded. 2. The rotation mode applies to occasions where only the single-turn absolute position needs to be recorded.

■ E3.740: Encoder interference

Direct cause:

The encoder communication suffers from interference, resulting in communication error.

Root Cause	Confirming Method	Solution
1. The encoder wiring is incorrect.	Check the encoder wiring.	Connect the encoder cables according to the correct wiring diagram.
2. The encoder cable is connected loosely.	Check whether the ambient vibration is too large, which loosens the encoder cable and damages the encoder.	Connect the encoder cables again and ensure the encoder terminals are connected securely.
3. The encoder Z signal suffers from interference.	Check the cable layout on site. Check whether there is large-scale equipment generating interference and whether multiple interference sources such as variable-frequency devices are present inside the cabinet. Make the servo drive stay in "Rdy" status and rotate the motor shaft counterclockwise (CCW) manually and observe whether the value of 200B-12h (Electrical angle) increases/decreases smoothly. Turning one circle corresponds to five 0-360° (applicable to Z series motors). For X series motors, turning one circle corresponds to four 0-360° . If the value of 200B-12h changes abnormally when you rotate the motor shaft, the encoder is faulty. If no alarm occurs during rotating but an alarm is reported during running, interference does exist.	It is recommended to use the cables provided by Inovance. If a customized cable is used, check whether the cable is a shielded twisted pair cable that complies with the specifications. Route motor cables and encoder cables through different routes. Ensure the servo motor and servo drive are well grounded. Check whether plugs at both ends of the encoder are in good contact and whether any pin retracts.
4. The encoder is faulty.	Replace with a new encoder cable. If the fault no longer occurs after cable replacement, it indicates the original encoder cable is damaged. Keep the motor in a certain position, power on the servo drive several times and check the value change of 200B-12h (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	Replace by 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.

■ E3.A33: Encoder data read/write error

Direct cause:

Internal parameters of the encoder are abnormal.

Rout Cause	Confirming Method	Solution
1. The serial incremental encoder cable is disconnected or loosened.	Check the cable connections.	Check whether encoder cables are connected improperly or whether disconnection or poor contact occurs. Ensure the motor cables and encoder cables are routed through different routes.
2. The read-write operation on serial incremental encoder parameters is abnormal.	If the fault persists after the servo drive is powered off and on several times, the encoder is faulty.	Replace the servo motor.

■ E3.B00: Excessive position deviation

Direct cause:

The position deviation is larger than the value of 6065h in the position control mode.

Root Cause	Confirming Method	Solution
1. UVW output phase loss or incorrect phase sequence occurs on the servo drive.	Perform motor trial run without load and check cable connections.	Connect cables again according to the correct wiring diagram or replace the cables.
2. The servo drive UVW cables or the encoder cables are disconnected.	Check the cable connections.	Re-connect the cables. The servo motor power cables must be connected in the correct phase sequence. Replace all the cables with new cables if necessary and ensure the cables are connected properly.
3. Locked-rotor occurs due to mechanical factors.	Check the RUN command and motor speed (200B-01h) through the software tool or keypad: RUN command in the position control mode: 200B-0Eh (Position reference counter) RUN command in the speed control mode: 200B-02h (Speed reference) RUN command in the torque control mode: 200B-03h (Internal torque reference) Check whether the RUN command is not 0 but the motor speed is 0 in the corresponding mode.	Eliminate the mechanical factors.

Root Cause	Confirming Method	Solution
4. The servo drive gain is too low.	Check the position loop gain and speed loop gain of the servo drive. 1st gain: 2008-01h to 2008-03h 2nd gain: 2008-04h to 2008-06h	Adjust the gain manually or perform gain auto-tuning.
5. The position reference increment is too large.	Position control mode: In CSP mode, view the gear ratio 6091-01h/6091-02h to check the position reference increment per synchronization cycle and convert it to the speed information. In PP mode, view the gear ratio 6091-01h/6091-02h and check the value of 6081h (Profile velocity). In HM mode, view the gear ratio 6091-01h/6091-02h, and determine the value of 6099-01h and 6099-02h.	CSP: Decrease the position reference increment per synchronization cycle. The host controller should cover the position ramp when generating references. PP: Decrease the value of 6081h, or decrease the acceleration/deceleration ramp (6083h, 6084h). HM: Decrease 6099-01h and 6099-02h, or decrease the acceleration/deceleration ramp (609Ah). Decrease the gear ratio according to actual conditions.
6. The value of 6065h (Following error window) is too small in relation to the running condition.	Check whether the set value of 6065h is too small.	Increase the value of 6065h.
7. The servo drive or motor is faulty.	Monitor the running waveform through the oscilloscope function in the software tool: position references, position feedback, speed references, torque references	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

■ E3.B01: Position reference incremental error

Direct cause:

The target position increment in CSP mode is too large.

Root Cause	Confirming Method	Solution
1. The position reference increment is too large.	Check the target position increment of the adjacent synchronization cycle.	Decrease the position reference speed, or set a certain acceleration/deceleration curve when the host controller profiles the target position.

Root Cause	Confirming Method	Solution
2. The target position is not aligned with the present position before mode switchover.	Check whether mode switchover is performed in the controller software.	Assign the value of present position to the target position before mode switchover.
3. The target position is not aligned with the present position when the servo drive is switching to S-ON status.	Check whether the S-ON operation is performed in the controller software.	Assign the value of present position to the target position when the servo is switching to S-ON status.
4. The target position value is abnormal.	When software or hardware limit is activated, the target position overflows near $2^{31}–1$ or $–2^{31}$.	When software or hardware limit is activated, the target position must be limited between [$–2^{31}$, $2^{31}–1$].
5. The gear ratio is set improperly.	Check whether 6091-01h and 6091-02h are set improperly. Check whether host controller scaling factors related to the machine and motor encoder are set improperly.	Modify the gear ratio and related scale factors according to actual applications.
6. The model of the motor selected is improper.	Check whether the maximum motor speed is less than the maximum running speed needed.	Select a motor that matches the requirement or reduce the maximum running speed needed.

■ E3.B03: Electronic gear ratio over the limit

Direct cause:

The electronic gear ratio exceeds the limit: (0.001 x Encoder resolution/10000, 4000 x Encoder resolution/10000).

Root cause	Confirming Method	Solution
1. The set electronic gear ratio exceeds the preceding range.	Check whether the value of 6091-01h/6091-02h exceeds the preceding range.	Set the gear ratio according to the preceding range.

■ E3.D09: Software position setting error

Direct cause:

The lower limit of the software position is larger than the upper limit.

Root Cause	Confirming Method	Solution
The lower limit of the software position is set to a value larger than the upper limit.	The value of 607D-01 (Min. position limit) is larger than the value of 607D-02 (Max. position limit).	Reset the parameters.

■ E3.D10: Home setting error

Cause	Confirming Method	Solution
1The home offset is beyond the software limit.	The value of 607Ch (Home offset) is beyond the values of 607D-01 (Min. position limit) and 607D-02 (Max. position limit).	Reset the parameters.

5.4 Solutions to Warnings

■ E3.601: Homing warning

Direct cause:

a) The home is not found within the time defined by 2005-24h during homing.

b) The home or limit switch is abnormal.

Root Cause	Confirming Method	Solution
1. The home switch is faulty.	There is only high-speed searching but no low-speed searching during homing. After high-speed searching, the servo drive keeps low-speed searching in the reverse direction.	If a hardware DI is used, check whether the 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 200B-04h (Monitored DI status) to monitor whether the servo drive receives corresponding DI level changes. If the home signal is Z signal and the home signal cannot be found, check the condition of the Z signal.
2. The duration of homing is too short.	Check whether the value of 2005-24h (Duration limit of homing) is too small.	Increase the value of 2005-24h.

Root Cause	Confirming Method	Solution
3. The speed of high-speed searching for home switch is too slow.	Check the distance between the initial homing position and the home switch to see whether the value of 6099-01h (Speed during search for switch) is too small, resulting in a prolonged searching for home switch.	Increase the value of 6099-01h.
4. The home switch is set improperly.	Check whether the limit signals on both sides are activated simultaneously. Check whether a limit signal is activated simultaneously with the home signal.	Set the position of the hardware switch properly.

■ E3.730 Encoder battery warning

Cause	Confirming Method	Solution
The battery voltage of the absolute encoder is lower than 3.0 V.	Measure the battery voltage.	Use a new battery of matching voltage.

■ E3.908: Abnormal drive unit model

Direct cause:

The model of the drive unit detected is abnormal.

Root Cause	Confirming Method	Solution
1. The model of the drive unit is set improperly (1).	H0B45 = 0x3908 Check whether the value of H01-10 is consistent with the drive unit.	Set H01-10 to a proper value according to the value of H01-62.
2. The contact of the drive unit is abnormal.	H0B45 = 0x2908 Check whether the flat cable terminals of the drive unit are in good contact.	Ensure the drive unit is in good contact with the baseplate.
3. The version of the drive unit is outdated.	H0B45 = 0x0908: Not all the information in the EEPROM of the drive unit is correct. H0B45 = 0x1908: There is no information in the EEPROM of the drive unit. H0B45 = 0x2908: The communication with EEPROM of the drive unit fails. The fault persists after causes 1 and 2 are removed.	Set H0A-37 to 1 to hide this warning.

Root Cause	Confirming Method	Solution
4. The model of the drive unit is set improperly (2).	H0B45 = 0x4908 This warning occurs only on axis 1: The drive unit model of axis 1 (H01-10) is X. The temperature of axis 1 (H0B-27) under normal ambient temperature is 12°C . This warning occurs to two axes of one drive unit: The drive unit model of axes 1 and 2 are both X. Temperatures of axis 1 and axis 2 under normal ambient temperature are 12°C and above 95°C respectively. The fan operates even though the servo drive is not enabled.	Set the drive unit model (H01-10) of the two axes to 6000X (X is the serial number for general drive unit model).
5. The model of the drive unit is set improperly (3).	H0B45 = 0x4908 The drive unit model of the axis (H01-10) is 6000X. The temperature of the axis (H0B-27) under normal ambient temperature is 12°C .	Set the drive unit model (H01-10) of the axis to X.

■ E3.909: Motor overload

Direct cause:

The temperature of 60Z series motor (200 W and 400 W) reaches the over-temperature threshold.

Root Cause	Confirming Method	Solution
1. The motor cables and encoder cables 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 cables according to the hardware wiring instructions.
2. The load is too heavy, and the effective torque output by the motor keeps exceeding the rated torque during continuous operation.	Check the overload characteristics of the servo drive or motor. Check whether the average load ratio (200B-0Dh) keeps exceeding 100.0%.	Replace with a servo drive of larger 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.	Check the mechanical inertia ratio or perform inertia auto-tuning, and view the value of 2008-10h (load inertia ratio). Check the individual running cycle when the servo motor runs cyclically.	Increase the acceleration/ deceleration time.

Root Cause	Confirming Method	Solution
4. The gain is improper or the stiffness level is too high.	Check whether the motor vibrates and generates abnormal noise during running.	Adjust the gain.
5. The model of the servo drive or servo motor is set incorrectly.	View the servo motor model in 2000-06h and the servo drive model in 2001-0Bh.	View the servo drive nameplate and set the servo drive model in 2001-0Bh correctly and use a matching servo motor according to "2.3 Dimension Drawing of MS1H1 Series Servo Motors" on page 38.
6. Locked-rotor occurs due to mechanical factors, resulting in overload during running.	Check the RUN command and motor speed (200B-01h) through the software tool or keypad: RUN command in the position control mode: 200B-0Eh (Position reference counter) RUN command in the speed control mode: 200B-02h (Speed reference) RUN command in the torque control mode: 200B-03h (Internal torque reference) Check whether the value of the RUN command is not 0 or too large but the motor speed is 0 in the corresponding mode.	Eliminate the mechanical factors.
7. The servo drive is faulty.	Power off and on the servo drive again.	Replace the servo drive if the fault persists after the servo drive is powered on again.

■ E3.920: Regenerative resistor overload

Direct cause:

The temperature of the regenerative resistor exceeds the set value.

Root Cause	Confirming Method	Solution
1. The cable of external regenerative resistor is in poor contact, disconnected or loosened.	Remove the external regenerative resistor and measure whether its resistance is " ∞ " (infinite). Measure whether the resistance between P and C is " ∞ ".	Use a new external regenerative resistor. If the resistance measured is the same as the nominal value, connect the regenerative resistor between P and C.
		Connect the external regenerative resistor between P and C with a new cable.
2. H02-25 is set improperly.	View the set value of H02-25. Measure the resistance of the external regenerative resistor between P and C, and compare it with the value listed in "1.5 Regenerative Resistor Specifications". Check whether the set value of H02-27 is larger than resistance of the external regenerative resistor connected between P and C.	Set H02-25 correctly. H02-25 = 1 (external, naturally ventilated) H02-25 = 2 (external, forcible air cooling)
3. The resistance of the external regenerative resistor is too large.		Select a proper regenerative resistor according to the value listed in section 1.5.
4. The value of H02-27 (Resistance of external regenerative resistor) is larger than the resistance of the external regenerative resistor in use.		Set H02-27 according to the resistance of the external regenerative resistor in use.
5. The input voltage of the main circuit exceeds the specifications.	Check whether the input voltage of the main circuit on the servo drive side complies with the following specifications: 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)	Replace or adjust the power supply according to the specifications.

Root Cause	Confirming Method	Solution
6. The load moment of inertia is too large.	Perform moment of inertia auto-tuning according to inertia auto-tuning or calculate the total inertia of the machine according to mechanical parameters. Check whether the actual load inertia ratio exceeds 30.	Select an external regenerative resistor of large capacity and set H02–26 to a value consistent with the actual resistor power. Select a servo drive with large capacity. Reduce the load if allowed. Increase the acceleration/deceleration time if allowed. Increase the motor running cycle if allowed.
7. The motor speed is too high, resulting in an incomplete deceleration within the set time. The motor is in continuous deceleration status in cyclic running.	View the motor speed curve during cyclic running and check whether the motor is in the deceleration status for a long time.	
8. The capacity of the servo drive or the regenerative resistor is insufficient.	View the motor speed curve in an individual cycle and calculate whether the maximum braking energy can be absorbed completely.	
9. The servo drive is faulty.	-	Replace with a new servo drive.

■ E3.922: Resistance of the external regenerative resistor too small

Direct cause:

The value of H02-27 (Resistance of external regenerative resistor) is smaller than the value of H02-21 (Permissible minimum resistance of external regenerative resistor).

Root Cause	Confirming Method	Solution
The resistance of the external regenerative resistor is smaller than the value of H02-21.	Measure the resistance of the external regenerative resistor between P and C and check whether it is smaller than H02-21.	If yes, connect an external regenerative resistor that matches the servo drive between P and C, and then set H02-27 according to the actual resistance. If not, set H02-27 according to the actual resistance.

■ E3.939: Motor power cable disconnected

Direct cause:

The actual phase current of the motor is smaller than 10% of the rated current. The actual motor speed is small but the internal torque reference is large.

Root Cause	Confirming Method	Solution
The motor power cable is disconnected.	Check whether the difference between 200B-19h (RMS value of phase current) and 200B-03h (Internal torque reference) exceeds 500%, and whether 200B-01h (Actual motor speed) is smaller than 1/4 of the rated motor speed.	Re-connect the motor power cables. Replace with new cables if necessary.

■ E3.941: Parameter modifications activated at next power-on

Direct cause:

Modifications of some parameters take effect only after servo drive is powered on again. If these parameters are modified, the servo drive reminds users to power on the servo drive again.

Root Cause	Confirming Method	Solution
The parameters you modified are designed to be activated at next power-on.	Check whether parameters you modified are those whose "Effective time" is "Next power-on".	Power on the servo drive again.

■ E3.942: Parameter storage too frequent

Direct cause:

The total number of parameters modified at a time exceeds 200.

Root Cause	Confirming Method	Solution
A great number of parameters are modified and stored frequently in EEPROM (200E-02h = 1).	Check whether parameters are modified frequently from the host controller.	Check the running mode. For parameters that need not be stored in EEPROM, set 200E-02h to 0 before the write operation of the host controller.

■ E3.950: Forward overtravel

Cause	Confirming Method	Solution
The logic of the DI allocated with DI function 14 (FunIN.14: P-OT, positive limit switch) is valid.	Check whether a DI in group 2003h is allocated with DI function 14. Check whether the DI logic of the corresponding bit of 200B-04h (Monitored DI status) is valid.	Check the running mode. On the prerequisite of ensuring safety, send a reverse command or rotate the motor to deactivate the logic of the DI allocated DI function 14.
The position feedback exceeds the positive position limit defined by the software.	The position feedback exceeds the positive position limit defined by the software (607D-02).	Confirm whether the command profile is proper.

■ E3.952: Reverse overtravel

Cause	Confirming Method	Solution
The logic of the DI allocated with DI function 15 (FunIN.15: N-OT, negative limit switch inhibited) is valid.	Check whether a DI in group 2003h is allocated with DI function 15. Check whether the DI logic of the corresponding bit of 200B-04h (Monitored DI status) is valid.	Check the running mode. On the prerequisite of ensuring safety, send a reverse command or rotate the motor to deactivate the logic of DI allocated with DI function 15.
The position feedback exceeds the negative position limit defined by the software.	The position feedback exceeds the negative position limit defined by the software (607D-01).	Confirm whether the command profile is proper.

■ E3.980: Encoder fault

Direct cause:

An internal fault occurs on the encoder.

Root Cause	Confirming Method	Solution
An encoder algorithm error occurs.	If the fault persists after the servo drive is powered off and on several times, the encoder is faulty.	Replace the servo motor.

■ E3.990: Power input phase loss warning

Direct cause:

A three-phase servo drive of 1 kW is allowed to run under a single-phase power supply but the power input phase loss (H0A-00) fault/warning is enabled.

Root Cause	Confirming Method	Solution
When H0A-00 is set to 1 (Enable phase loss fault and warning), a phase loss warning will be reported if a three-phase servo drive of 0.75 kW (H01-02 = 5) allowing single-phase power input is connected to a single-phase power supply.	Check whether the three-phase servo drive is allowed to run under a single-phase power supply.	If the warning persists when a three-phase servo drive is connected to a three-phase power supply, see Er.420 (Main circuit phase loss). If the warning persists when a three-phase servo drive allowing single-phase power input is connected to a single-phase power supply, set H0A-00 (Power input phase loss protection) to 0 (Enable phase loss fault and inhibit phase loss warning).

■ E3.998: Homing object dictionary setting error

Direct cause:

The homing mode (6098h) is set to a value beyond specifications.

Root Cause	Confirming Method	Solution
The set value of object 6098h is not supported.	Check the set value of object 6098h.	Set parameters according to the specifications.

■ E3.E20: Ethernet hardware error

Cause	Confirming Method	Solution
An Ethernet hardware fault occurs.	If the fault persists after the servo drive is powered off and on several times, the Ethernet is faulty.	Replace the servo drive.

■ E3.E21: MAC address not programmed

Cause	Confirming Method	Solution
The MAC address of the servo drive is not programmed.	If the fault persists after the servo drive is powered off and on several times, it indicates the MAC address of the servo drive is not programmed.	Consult with the service personnel of the manufacturer.

5.5 Solutions to Communication Faults

This section describes the solutions to communication faults.

■ E3.E08: Abnormal switchover of network status

Direct cause:

The synchronization signal of the master is abnormal during synchronous communication.

Root Cause	Confirming Method	Solution
1. During synchronous communication, the slave performs abnormally in data receiving.	Check whether the shielded twisted pair cable is used as the communication cable. Check whether the servo drive is well grounded. Check whether the network port of the servo drive is damaged.	Use the shielded twisted pair cable. Connect the cable according to the wiring instructions. Check the network connection status through the first LED on the keypad.

Root Cause	Confirming Method	Solution
2. During synchronous communication, the master performs abnormally in data transmitting.	The synchronous clock of the host controller is not activated. The synchronous clock error is too large.	Measure the synchronization cycle through an actual oscilloscope or the oscilloscope tool in the software tool. If the synchronization cycle is 0, the synchronous clock of the host controller 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 cables are connected in the correct sequence, restart the network directly without the need for prior check. If the synchronization cycle is not 0 and within the permissible fluctuation range (2 μs) of the servo drive, increase the synchronization loss threshold of the slave (200E-21h).
3. The network switches from OP to non-OP status when the servo drive is enabled.	Check whether the network status switches from OP to non-OP status.	Check the network status switchover program of the host controller.

■ E3.E09: No synchronization signal

Direct cause:

The clock is not configured when the host controller requests for OP.

Root Cause	Confirming Method	Solution
1. The communication synchronous clock is configured improperly, leading to improper master communication configuration.	Replace with another master such as a Beckhoff PLC or an Omron PLC.	Fix the problems in master communication configuration.
2. The IN and OUT ports for EtherCAT communication is connected reversely.	Check whether the IN and OUT ports are connected correctly.	Connect cables to the IN and OUT ports in the correct sequence.

Root Cause	Confirming Method	Solution
3. The controller chip of the slave is damaged.	If the problem persists after the master is changed, measure the synchronization signal generated from the slave controller chip with an oscilloscope. If there is no signal, the slave controller chip is damaged.	Replace the slave controller chip.

■ E3.E11: ESI configuration file not programmed

Direct cause:

The ESI configuration file is not programmed.

Root Cause	Confirming Method	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.	Check whether the servo drive is faulty.	Replace the servo drive.

■ E3.E13: Synchronization cycle configuration error

Direct cause:

The synchronization cycle is not an integer multiple of the command scheduling cycle after the network switches to the running mode.

Root Cause	Confirming Method	Solution
The synchronization cycle is not an integer multiple of the command scheduling cycle	Check the set value of the synchronization cycle in the controller.	Modify the setting of the synchronization cycle to an integer multiple of the command scheduling cycle. The command scheduling cycle can be calculated through parameters (H01-60 and H01-61).

■ E3.E15: Synchronization cycle error too large

Direct cause:

The error of the controller synchronization cycle is too large.

Root Cause	Confirming Method	Solution
The synchronization cycle error exceeds the threshold.	Measure the synchronization cycle of the controller through the digital oscilloscope or the oscilloscope function in software tool.	Increase the value of 200E-21h.

6 Trial Run

6.1 Pre-running Inspection

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

Checklist before running

Record	No.	Description
Wiring		
☐	1	The main circuit power input terminals of the servo drive are connected correctly.
☐	2	The motor power cables are connected in the correct phase sequence.
☐	3	No short circuit exists in the main circuit power input terminals or the output terminals U, V, W of the servo drive.
☐	4	The control signal cables such as the brake and overtravel protection signal cables are connected properly.
☐	5	The servo drive and servo motor are grounded reliably.
☐	6	The cable tension is within the permissible range.
☐	7	The wiring terminals are insulated.
Environment and Mechanical Conditions		
☐	1	No foreign objects (such as the cable end or metal powder) which may cause short circuit of signal cables and power cables exist inside or outside the servo drive.
☐	2	The servo drive or external regenerative resistor does not come into contact with flammable objects.
☐	3	The servo motor installation and the shaft and mechanical connections are reliable.
☐	4	The servo motor and the machine that the servo motor is connected to are ready to run.

6.2 Power-on

After switching on the power supply, if the bus voltage indicator is in normal status and the keypad displays "reset" → "nr" → "ry" in sequence, it indicates the servo drive is ready to run and waiting for the S-ON signal to be sent from the host controller.

6.3 Jogging Through the Keypad

The SV820N series servo drive allows you to perform jogging by setting parameters through the keypad. See "4.6 Jog" for details.

6.4 Jogging Through the Software Tool

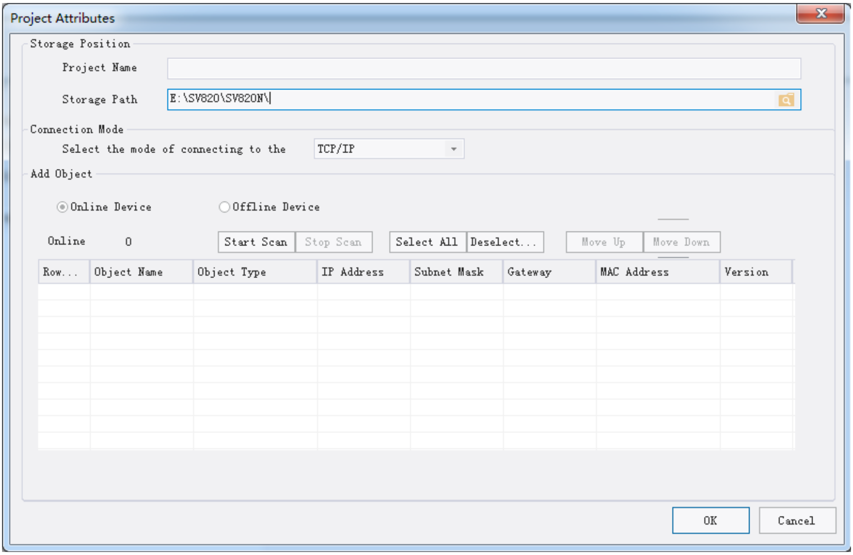
To perform jogging through the software tool, ensure the corresponding axis is not in EtherCAT control mode.

1 Communication setting

Open the software tool **InoDriveStudio.exe** and perform functions like real-time monitoring, parameter configuration, real-time sampling, single-sampling trigger and emergency stop on the PC through InoDriveShop. The software icon is as follows:

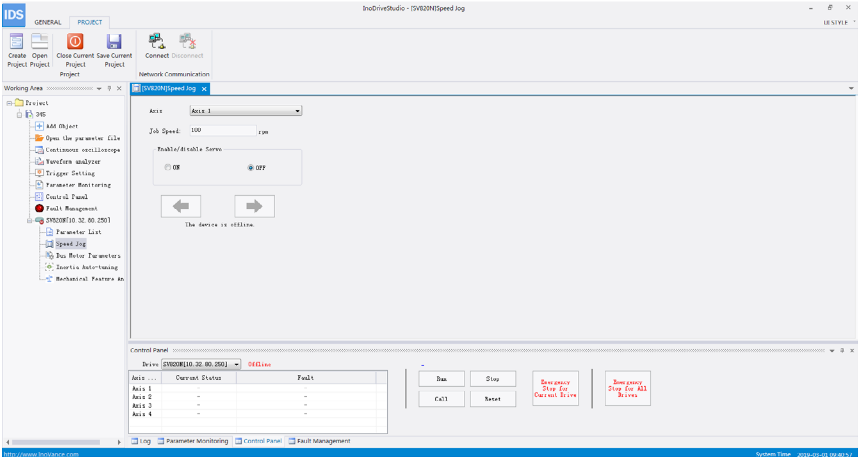
Select the corresponding serial number and baud rate from the Communication Wizard.

Double click the software icon to open the software. Add devices through online scanning or offline mode.



2 Jogging

Enter the interface of **Speed JOG**, and execute jogging on 4 axes respectively.



Function Description: The Speed JOG function is mainly used for trial run of the motor speed mode. Select the corresponding axis number in the drop-down box, set the running speed in JOG speed, and set the servo status to S-ON to enable the motor. Next, click and hold down the left arrow button to make the motor run forwardly at the set JOG speed. To stop the motor, release the left arrow button. Similarly, hold down the right arrow button can make the motor run reversely. Set the S-ON status to OFF to disable the motor.

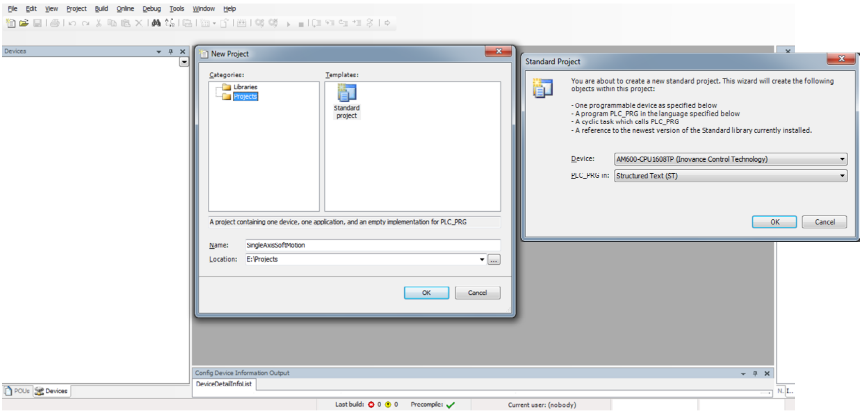
6.5 Cyclic Synchronous Position Mode with AM600

The following description takes Inovance AM600 controller as the master to introduce the communication settings of SV820N series servo drives.

Note: To better fit for SV820N, the software tool of version 1.10 and later is recommended for AM600.

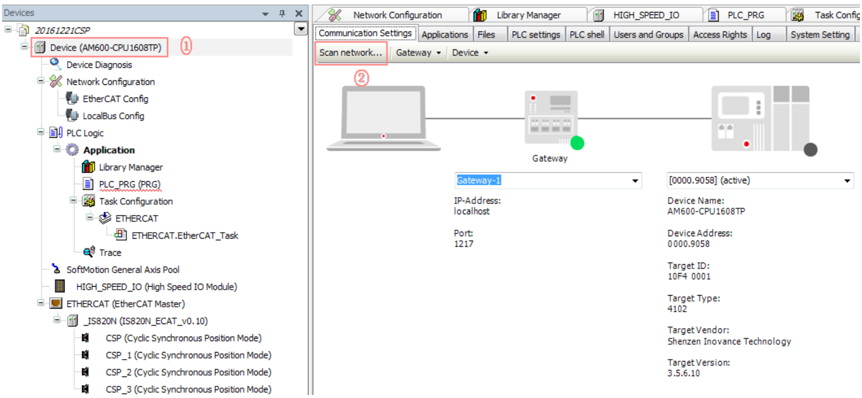
1 Creating a project

Create an AM600 project. Select **AM600-CPU1608TP**, as shown below.

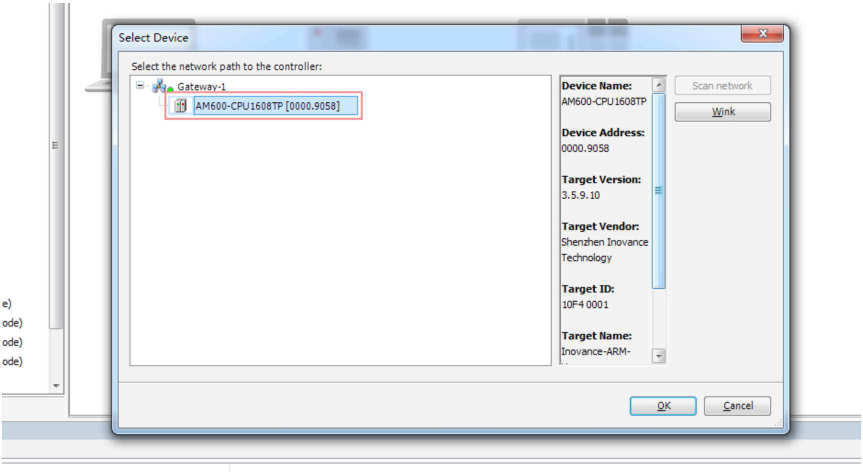


2 Communication setting

Connect the communication cables properly. To set up a normal communication connection, set the IP address of the PC to the same network segment (192.168.1.xxx) as AM600.

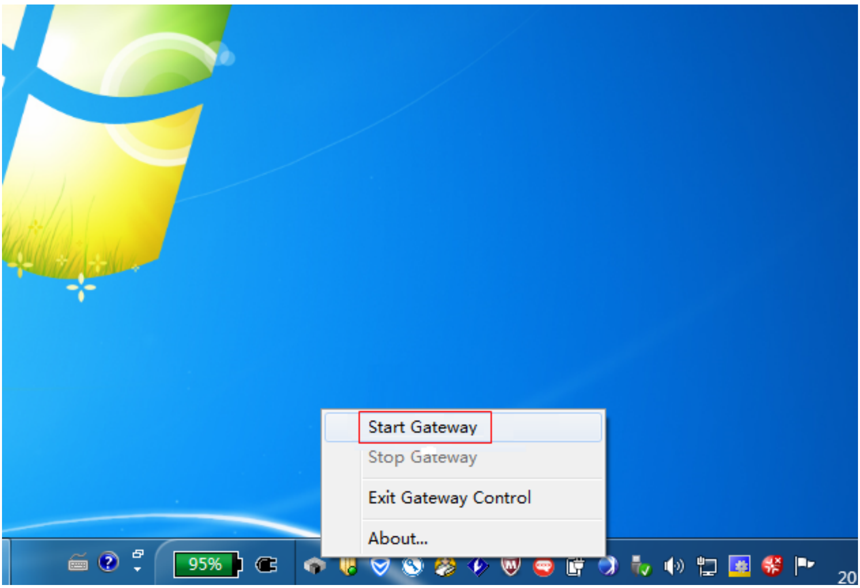


Click **Scan network**.



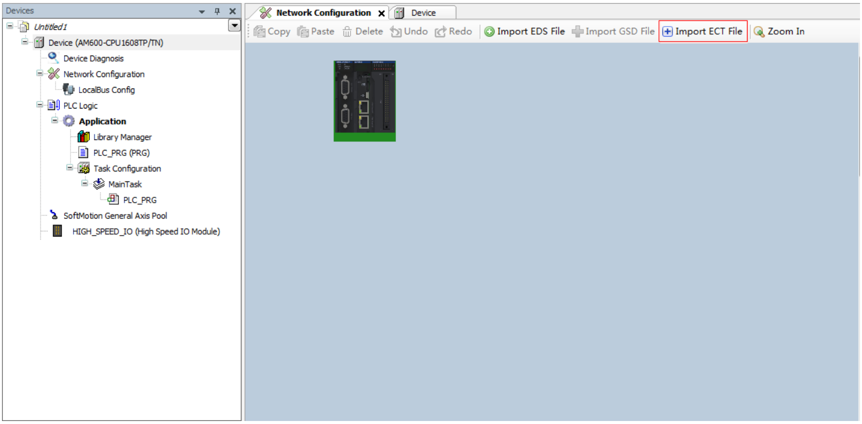
Select the AM600 device scanned. Now the communication connection between PLC and PC is established. Next, configure the device.

Note: If the AM600 device cannot be scanned in InoPro, check whether the CoDeSys gateway is started. If not, start the gateway and perform scanning again. Check whether the CoDeSys gateway in the taskbar at the bottom right of the PC is turned on. If it is in STOP status, click **Start Gateway**.

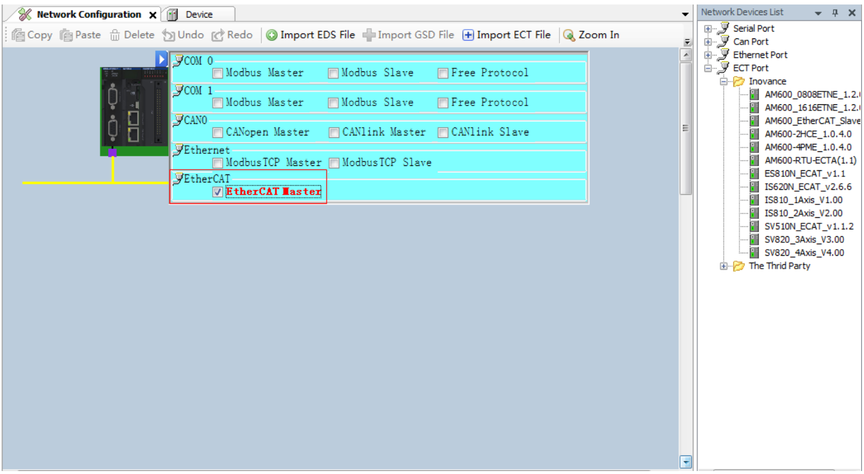


3 Adding devices

a) Add the XML file of SV820N: Click **Import ECT File** in **Network Configuration** to add XML files. Visit the official website of Inovance to download the XML files.

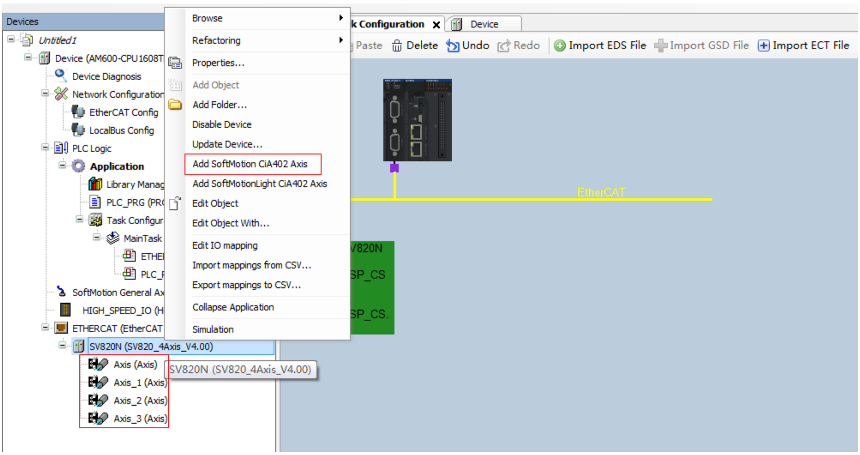


b) Perform device configuration on the system: First add the EtherCAT bus, then add the SV820N device. (Directly drag the SV820N_ECAT_V0.10 into the configuration interface.)

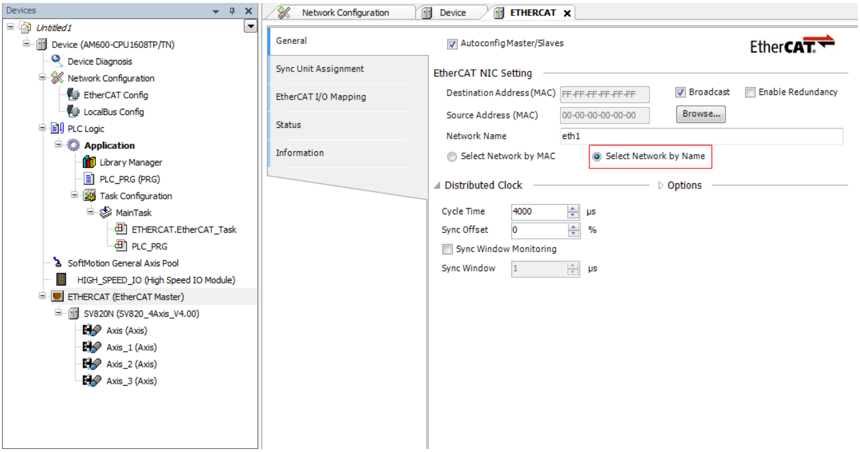


c) If the software tool version of AM600 is earlier than V1.10, add the four motor axes manually.

Right click the SV820N device option to add four motor axes.

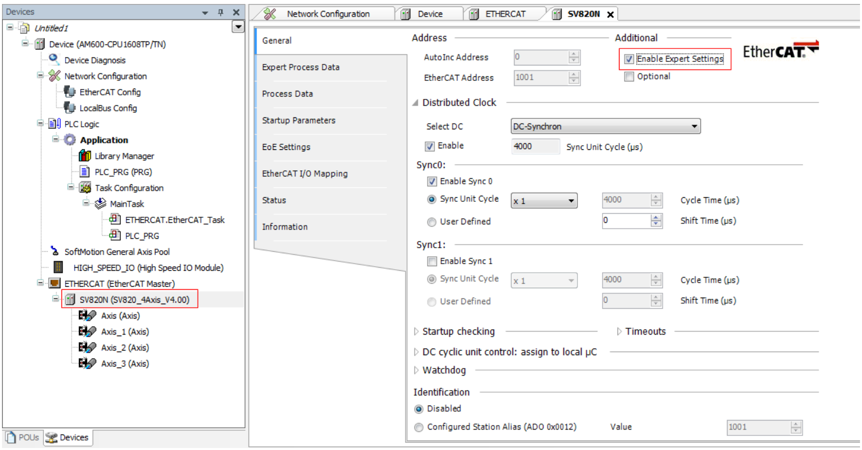


d) Configure EtherCAT master communication parameters: Use the default value and select **eth1** for the network.

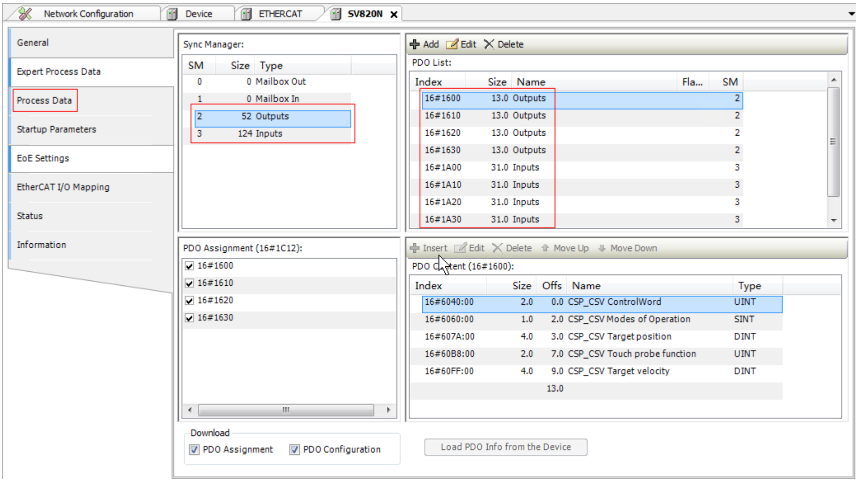


4 Configuring PDO Mapping of the slave

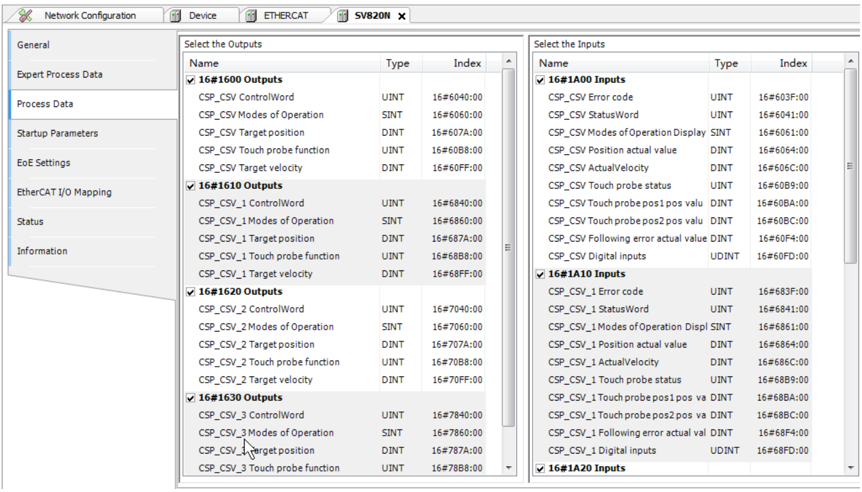
a) Enable expert settings.



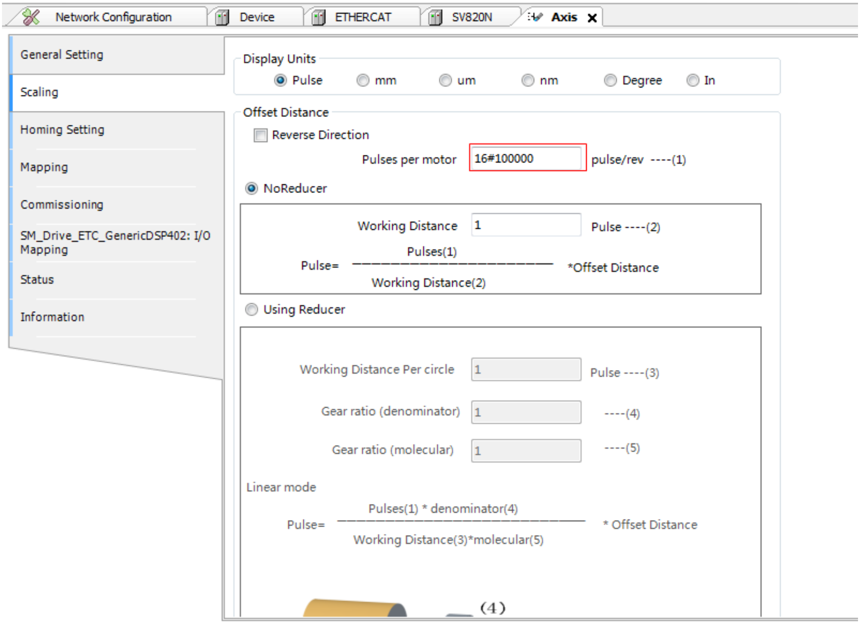
b) Check the corresponding PDO list. On the PDO configuration interface, process data required by 4-axis CSP mode can be configured. Click SV820N (SV820N_ECAT_v0.10) list.



The PDO list configured according to the CSP (Position) + CSV (Velocity) + TP (Touch Probe) mode is as follows.

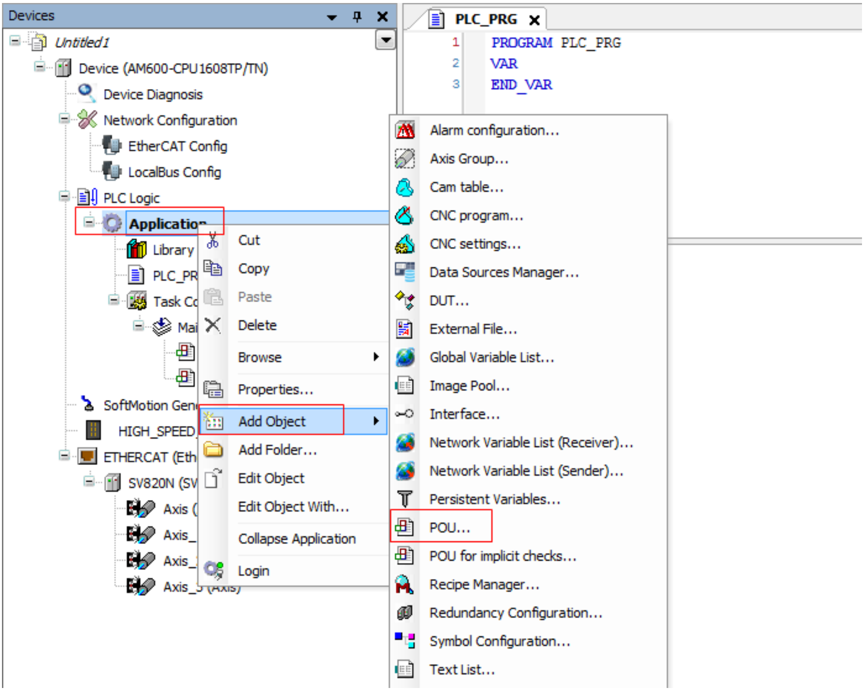


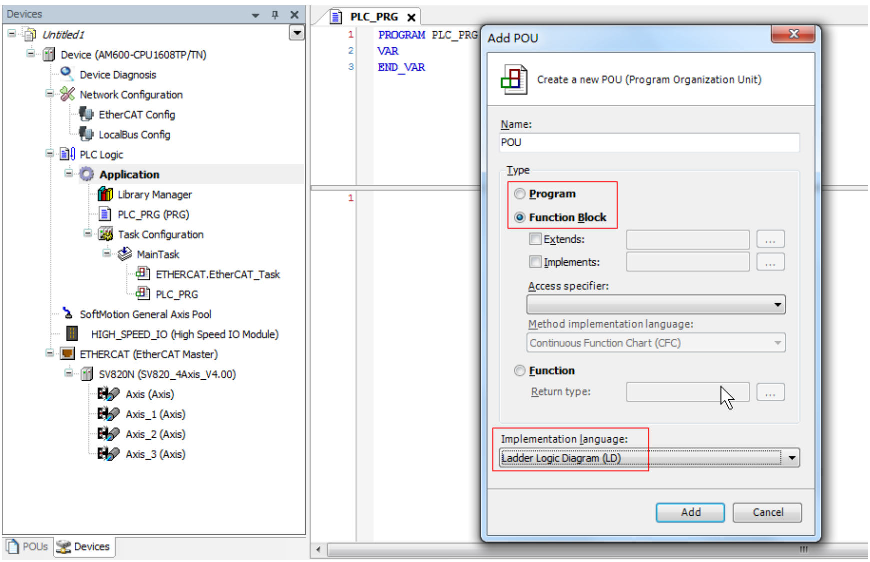
5 Axis scaling



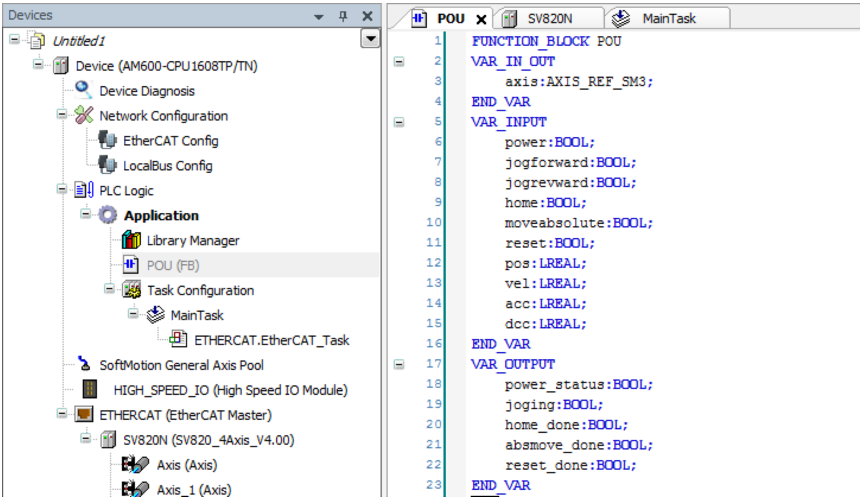
6 PLC Program

a) Add a FB file used for function block edit in **Application**.

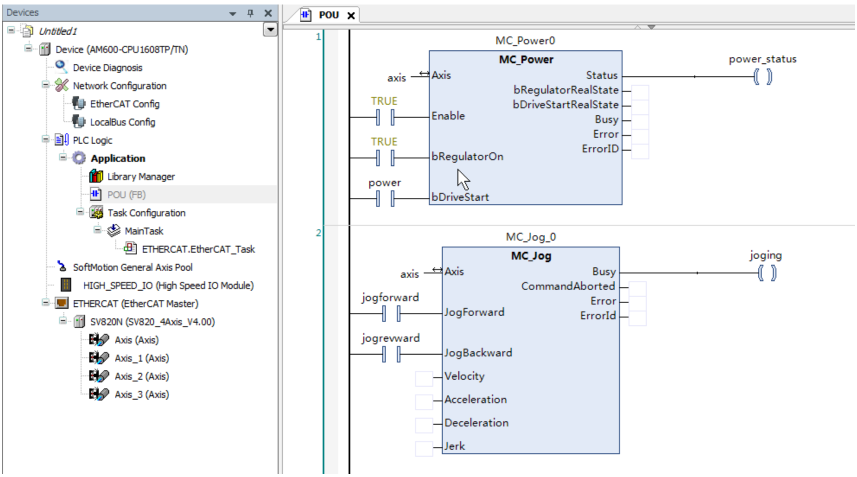




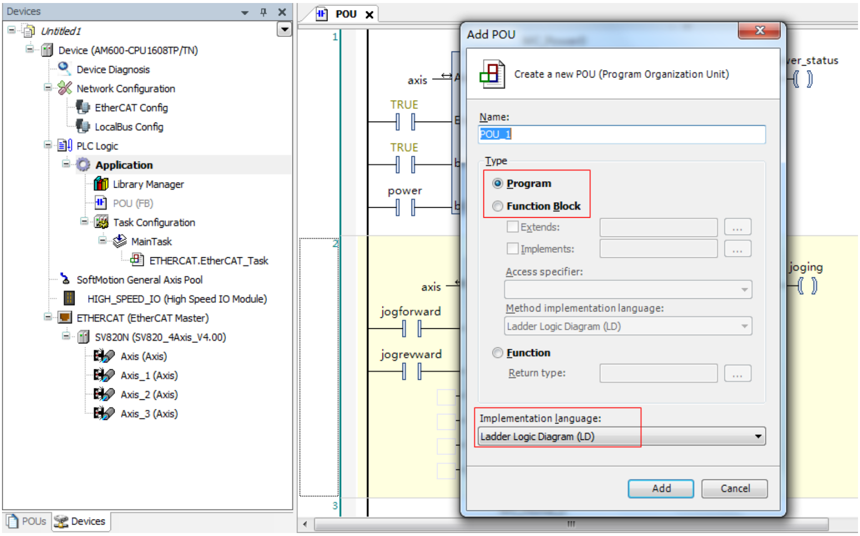
b) Definition part of FB



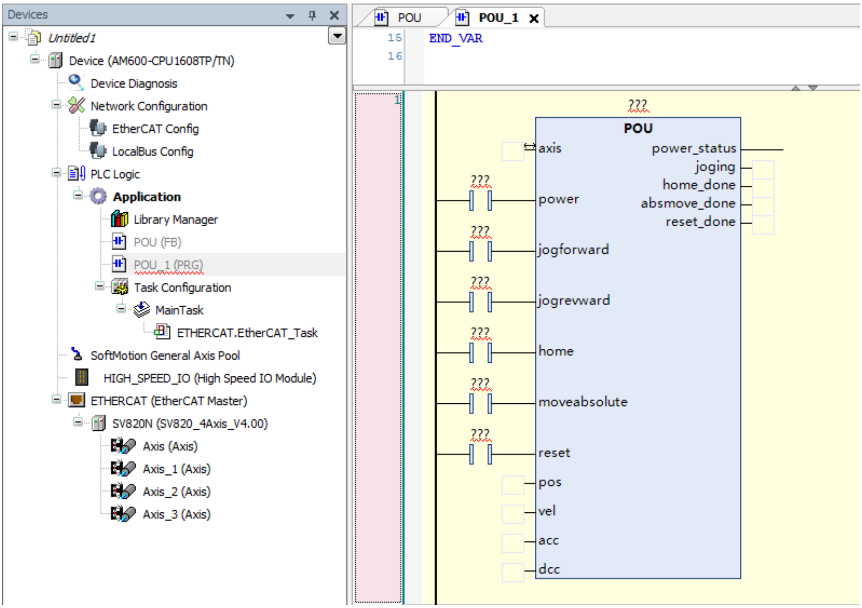
c) Five function blocks in FB



d) Add another POU as shown in step a).

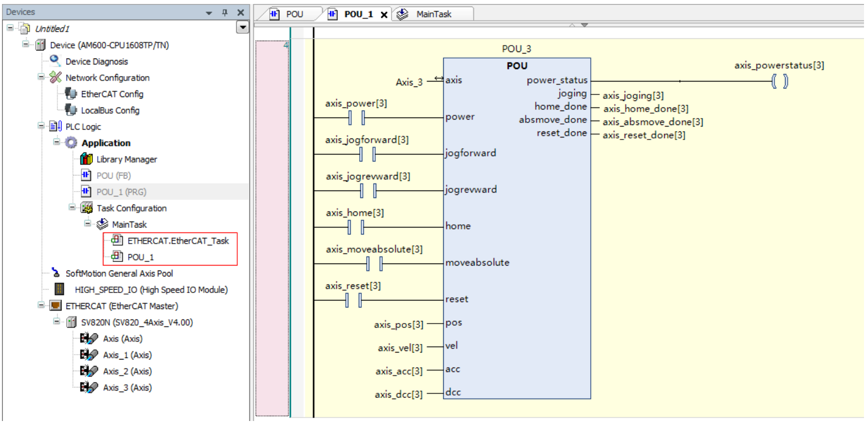


e) Add the FB function block to the newly created POU. Related codes are as follows.

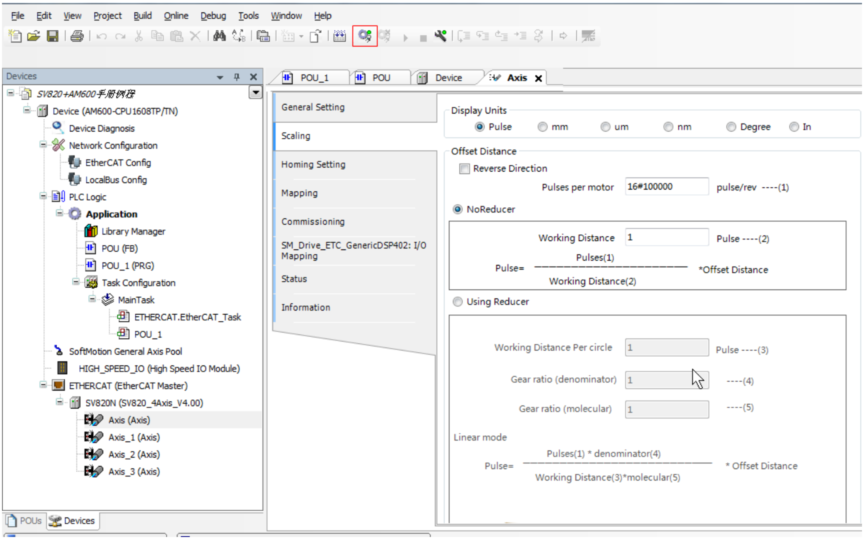


f) Instantiate this FB into four function blocks, and assign them to four axes respectively.

g) After calling this program in the EtherCAT task, you can perform operations like enable, jog, homing, and running in absolute position.



Log onto the PLC to run the bus manually.

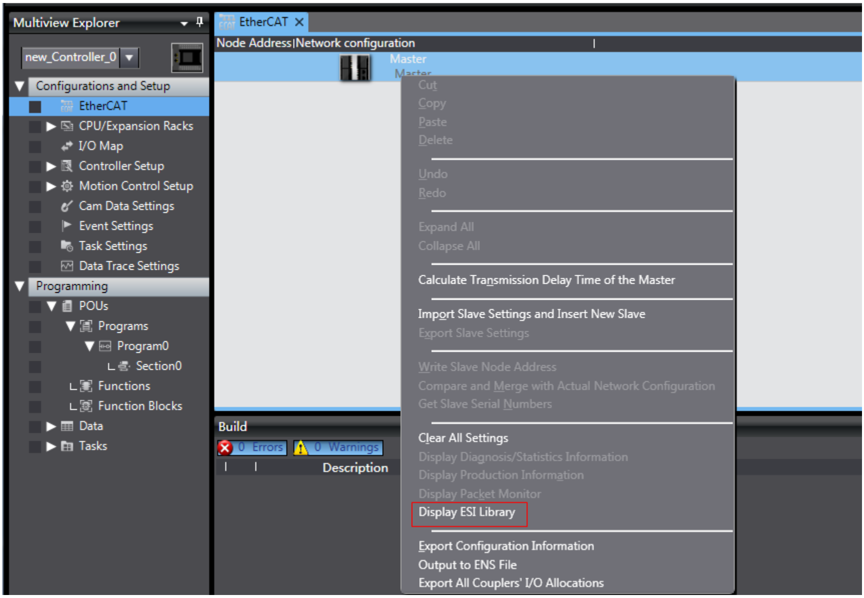

File Edit View Project Build Online Debug Tools Window Help
Devices
Device (AM600-CPU1608TP/TN)
Device Diagnosis
Network Configuration
EtherCAT Config
LocalBus Config
PLC Logic
Application
Library Manager
POU (FB)
POU_1 (PRG)
Task Configuration
MainTask
ETHERCAT.EtherCAT_Task
POU_1
SoftMotion General Axis Pool
HIGH_SPEED_IO (High Speed IO Module)
ETHERCAT (EtherCAT Master)
SV820N (SV820_4Axis_V4.00)
Axis (Axis)
Axis_1 (Axis)
Axis_2 (Axis)
Axis_3 (Axis)
POUs Devices
POU_1 POU Device Axis
General Setting
Scaling
Homing Setting
Mapping
Commissioning
SM_Drive_ETC_GenericDSP402: I/O Mapping
Status
Information
Display Units
Pulse mm um nm Degree In
Offset Distance
Reverse Direction
Pulses per motor 16#100000 pulse/rev ----(1)
NoReducer
Working Distance 1 Pulse ----(2)
Pulse= Pulses(1) / Working Distance(2) *Offset Distance
Using Reducer
Working Distance Per circle 1 Pulse ----(3)
Gear ratio (denominator) 1 ----(4)
Gear ratio (molecular) 1 ----(5)
Linear mode
Pulse= Pulses(1) * denominator(4) / Working Distance(3)*molecular(5) * Offset Distance

6.6 Commissioning of SV820N with Omron NJ Controller

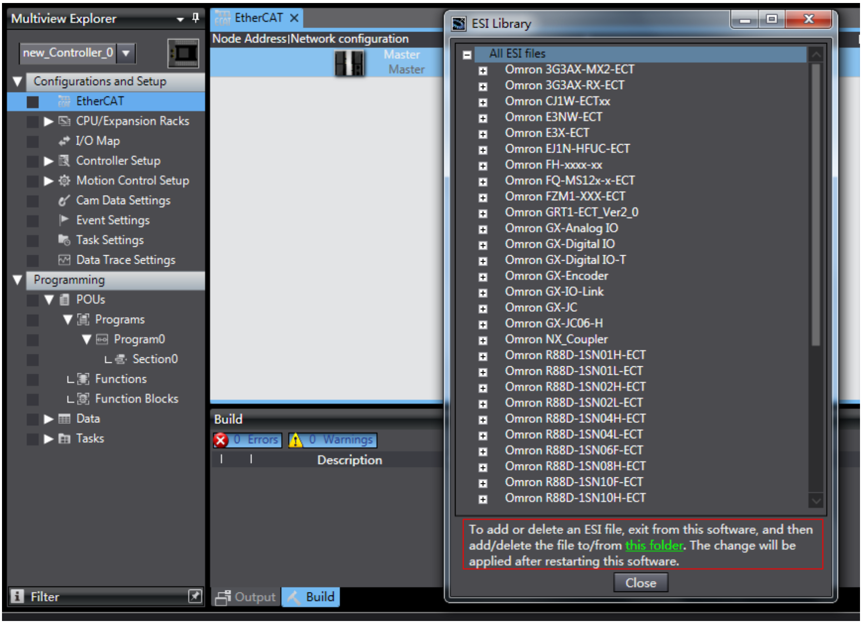
6.6.1 Network Configuration Settings

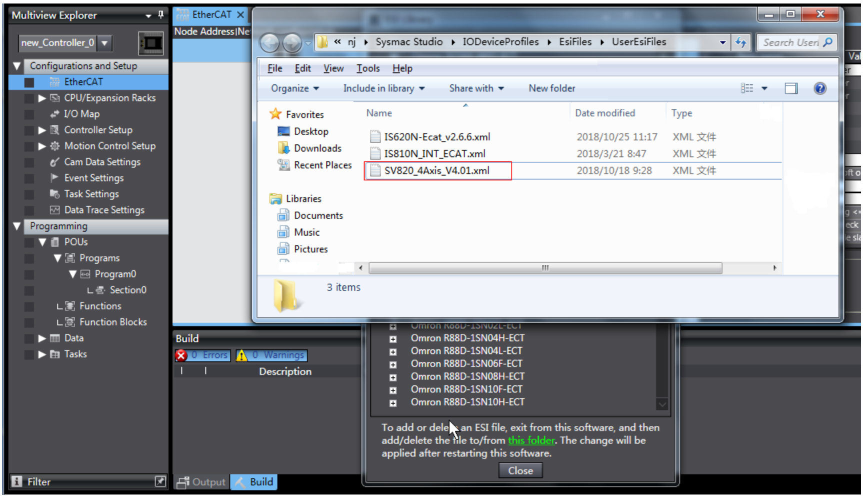
1 After creating a project, right click the master icon on the EtherCAT device interface to open the menu bar. Click **"Display ESI Library"**.

Note: Add the XML files of SV820N (Visit Inovance official website to download XML files).

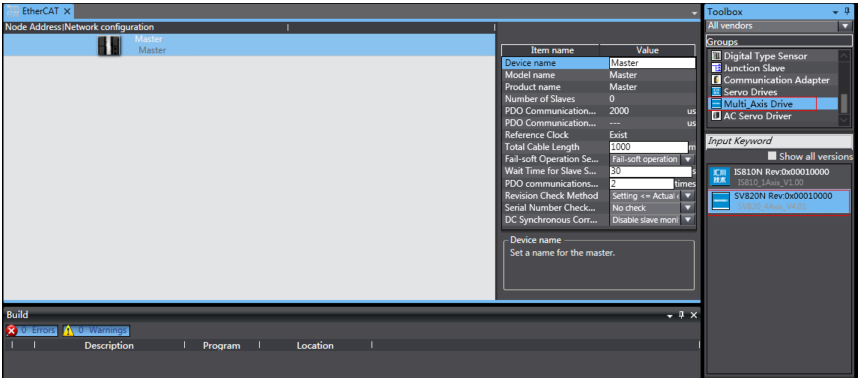


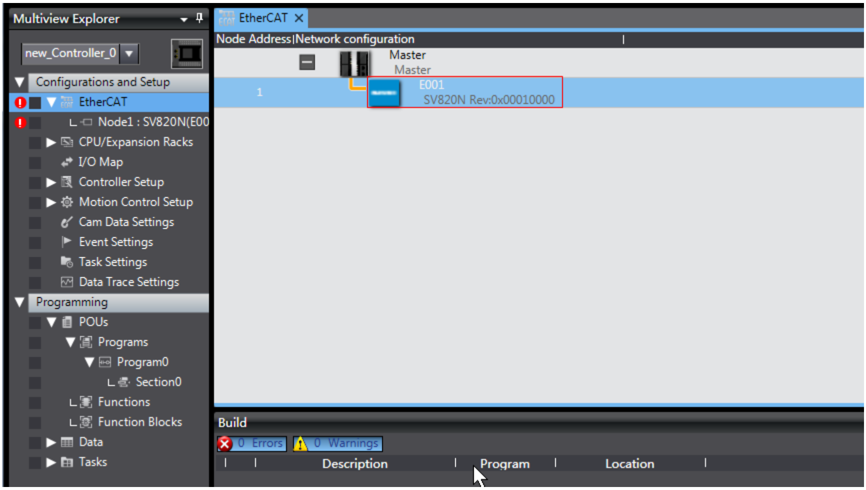
2 In the ESI library list, open the link **"this folder"** below and put the XML files into this folder. Then, exit from Sysmac Studio and open the software again to activate preceding operations.



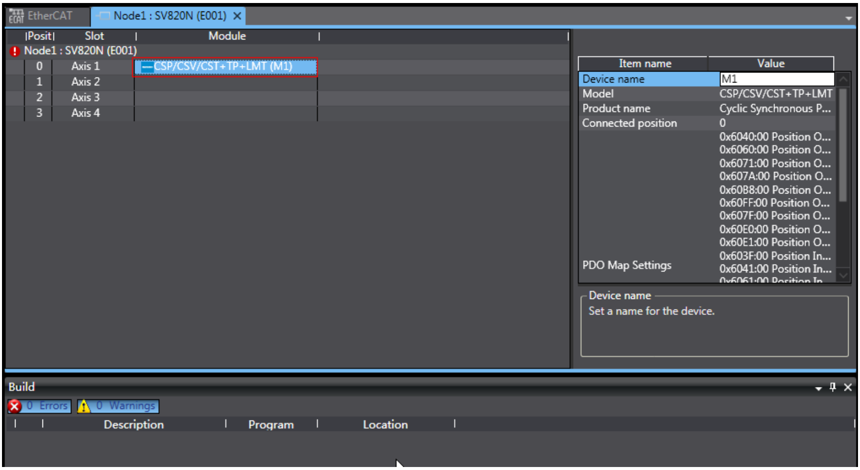


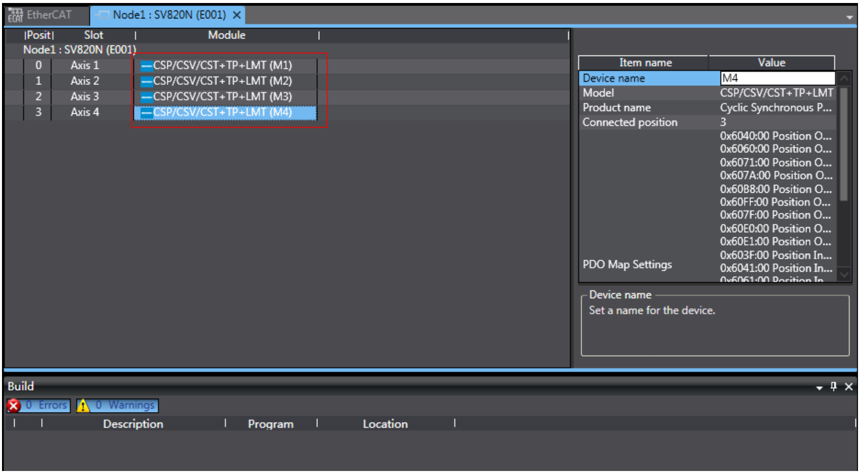
3 On the upper right of the software, click **"All suppliers"** and select **"Inovance"** in the drop-down menu. Next, double click **"SV820N"** in the device list to add the device to the configuration list. (If the network is already configured, skip to step 4 and use the online upload configuration.)





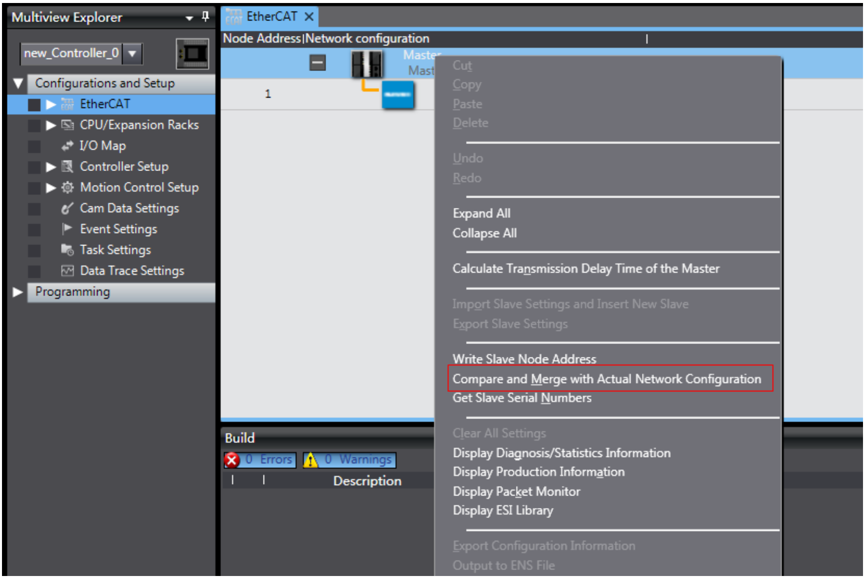
The SV820N is a 4-in-1 servo drive with PDO list pre-planed for easy use of each axis. Select a mode you need from "CSP/CSV+TP, CSP+TP, CST, CSP/CST+TP, CSP/CST/CSV+TP, PP+TP, PP\PV\PT+TP", and the PDO list needed by this mode will be selected by XML files through working with the controller. All the axes in this application example are selected with CSP/CST/CSV+TP mode.

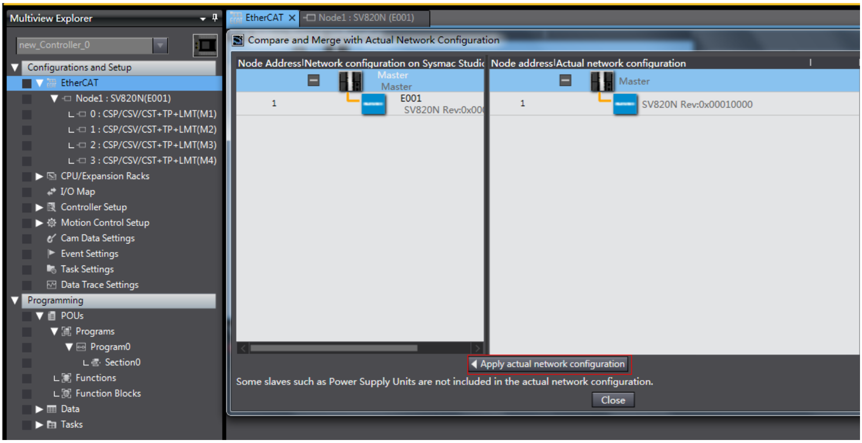




4 Set the EtherCAT communication site address through H0E-21 (available only for NJ and not needed by Beckhoff Twincat). Perform a power cycle after setting. For easier configuration management , it is recommended to set the address according to the actual physical connection order.

5 Configure the master modification as online mode. Compare and merge with the physical network configuration in the menu bar. Configure the actual physical network to the network configuration of Sysmac software.

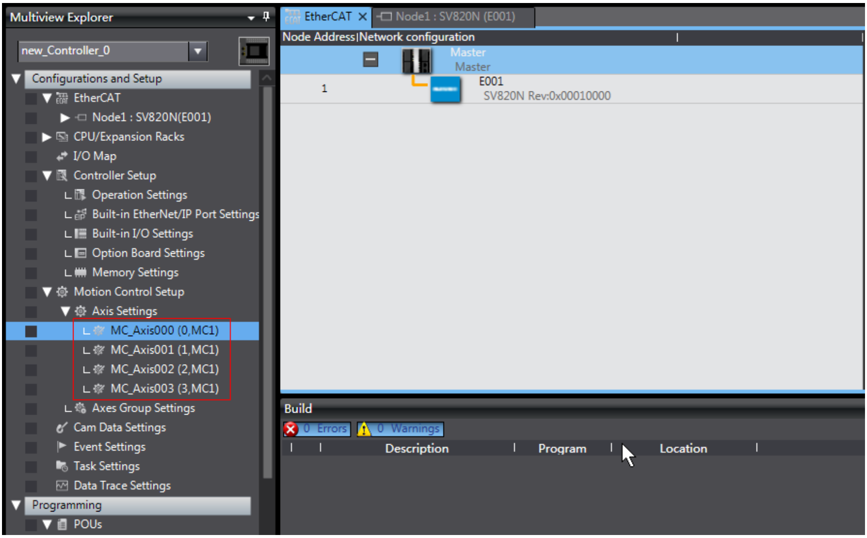




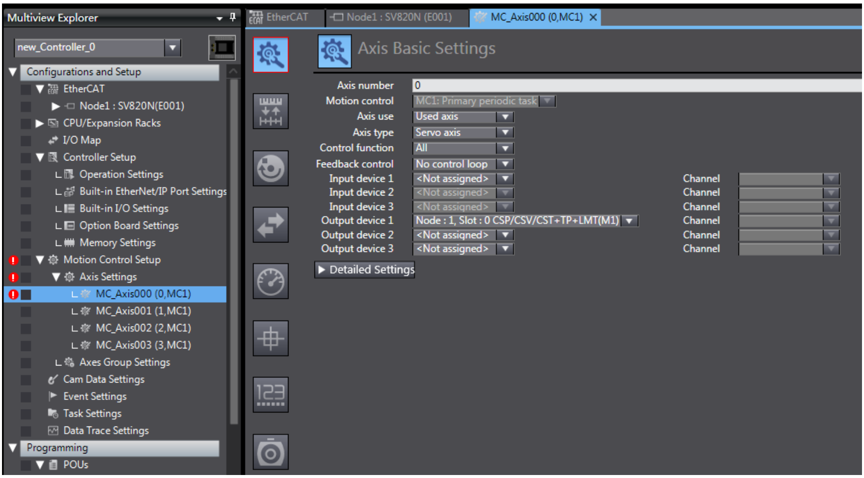
6.6.2 Communication Data Configuration

1 Motion control axis setting

a) Add axis settings in motion control. Double-click **MC_Axis000** and configure the SV820N device at the corresponding site in the corresponding interface, as shown in the following figure. **MC_Axis000** can be renamed. For example, if it is renamed as "right unwinding", the axis variable "right unwinding" used in the NJ program represents control on this axis.

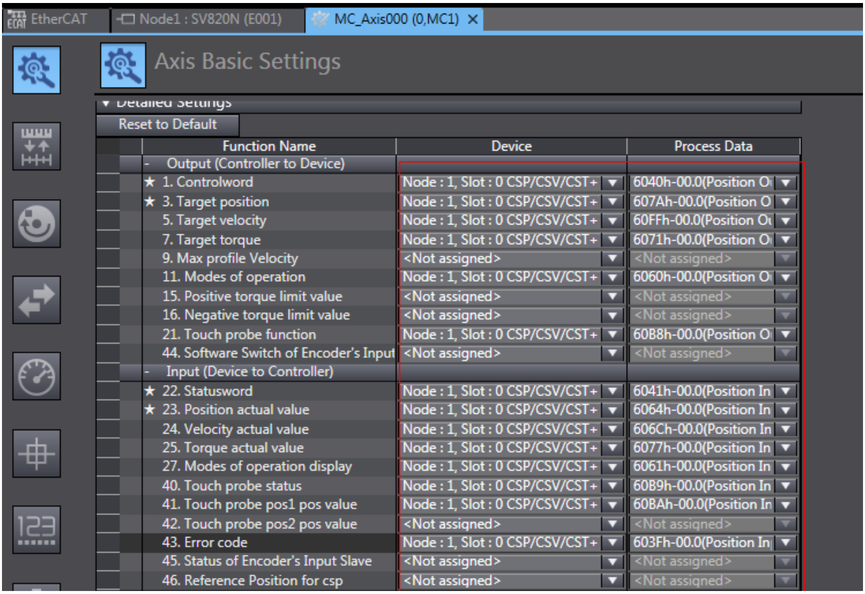


b) Perform detailed configurations for the axis parameters: All four axes under each slave need to be configured according to the same process. If the number of axes is less than 4, set the value of H02-00 to 255 to hide this axis. The axes in normal use can be configured according to the normal process. The following example shows how to configure one of the axes.



2 Configuration of mapping variables in servo axis communication

Click **Detailed Settings** to expand the parameter configurations. Perform object mapping configuration according to the following figure. The axis configuration needs to be performed manually due to the limit on software tool configurations of Omron.



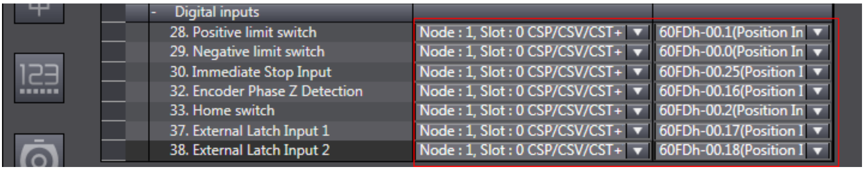
EtherCAT | Node1 : SV820N (E001) | MC_Axis000 (0,MC1)

Axis Basic Settings

Detailed Settings

Reset to Default

Function Name	Device	Process Data
- Output (Controller to Device)		
★ 1. Controlword	Node : 1, Slot : 0 CSP/CSV/CST+	6040h-00.0(Position O
★ 3. Target position	Node : 1, Slot : 0 CSP/CSV/CST+	607Ah-00.0(Position O
5. Target velocity	Node : 1, Slot : 0 CSP/CSV/CST+	60FFh-00.0(Position O
7. Target torque	Node : 1, Slot : 0 CSP/CSV/CST+	6071h-00.0(Position O
9. Max profile Velocity	<Not assigned>	<Not assigned>
11. Modes of operation	Node : 1, Slot : 0 CSP/CSV/CST+	6060h-00.0(Position O
15. Positive torque limit value	<Not assigned>	<Not assigned>
16. Negative torque limit value	<Not assigned>	<Not assigned>
21. Touch probe function	Node : 1, Slot : 0 CSP/CSV/CST+	60B8h-00.0(Position O
44. Software Switch of Encoder's Input	<Not assigned>	<Not assigned>
- Input (Device to Controller)		
★ 22. Statusword	Node : 1, Slot : 0 CSP/CSV/CST+	6041h-00.0(Position In
★ 23. Position actual value	Node : 1, Slot : 0 CSP/CSV/CST+	6064h-00.0(Position In
24. Velocity actual value	Node : 1, Slot : 0 CSP/CSV/CST+	606Ch-00.0(Position In
25. Torque actual value	Node : 1, Slot : 0 CSP/CSV/CST+	6077h-00.0(Position In
27. Modes of operation display	Node : 1, Slot : 0 CSP/CSV/CST+	6061h-00.0(Position In
40. Touch probe status	Node : 1, Slot : 0 CSP/CSV/CST+	60B9h-00.0(Position In
41. Touch probe pos1 pos value	Node : 1, Slot : 0 CSP/CSV/CST+	60BAh-00.0(Position In
42. Touch probe pos2 pos value	<Not assigned>	<Not assigned>
43. Error code	Node : 1, Slot : 0 CSP/CSV/CST+	603Fh-00.0(Position In
45. Status of Encoder's Input Slave	<Not assigned>	<Not assigned>
46. Reference Position for csp	<Not assigned>	<Not assigned>



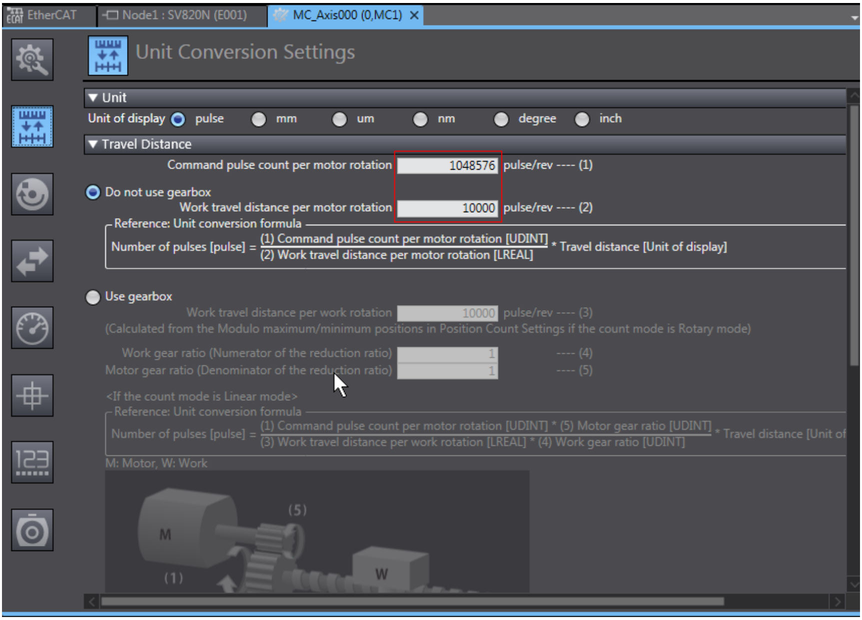
Function Name	Device	Process Data
- Digital inputs		
28. Positive limit switch	Node : 1, Slot : 0 CSP/CSV/CST+	60FDh-00.1(Position In
29. Negative limit switch	Node : 1, Slot : 0 CSP/CSV/CST+	60FDh-00.0(Position In
30. Immediate Stop Input	Node : 1, Slot : 0 CSP/CSV/CST+	60FDh-00.25(Position I
32. Encoder Phase Z Detection	Node : 1, Slot : 0 CSP/CSV/CST+	60FDh-00.16(Position I
33. Home switch	Node : 1, Slot : 0 CSP/CSV/CST+	60FDh-00.2(Position In
37. External Latch Input 1	Node : 1, Slot : 0 CSP/CSV/CST+	60FDh-00.17(Position I
38. External Latch Input 2	Node : 1, Slot : 0 CSP/CSV/CST+	60FDh-00.18(Position I

3 Servo axis parameter configuration

Unit conversion setting

Select 8388608 PPR for the SV820N motor and use the default working stroke per revolution.

Such conversion is similar to the electronic gear conversion performed on the host controller, which removes the need for setting the internal conversion ratio.

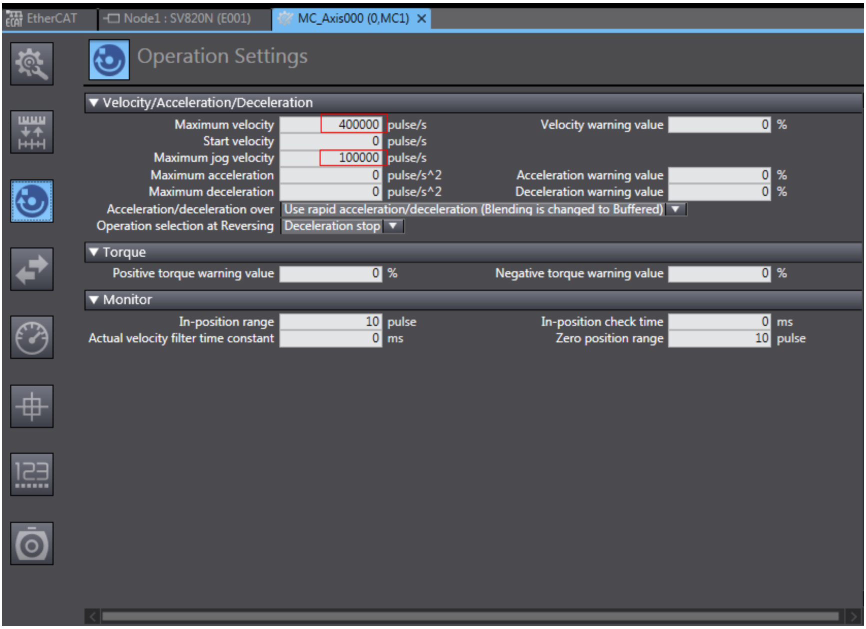


4 Operation setting

After the electronic gear ratio is set, a warning will be reported if the maximum speed is reached. In this case, reset the parameters.

10000 pulses/s represents 1 R/S (60 RPM) of the servo motor.

Set the maximum speed and jogging speed according to actual conditions. Other parameters can be left unset if there is no special requirement.

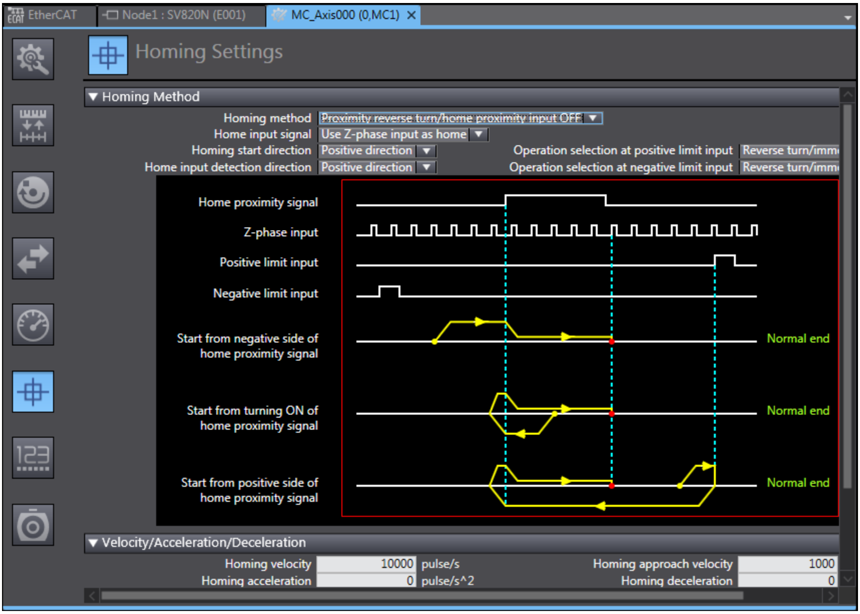


5 Homing

Pay attention to the setting of the homing mode as it involves the cooperation between the servo drive and the host controller. Set the homing mode according to the following table.

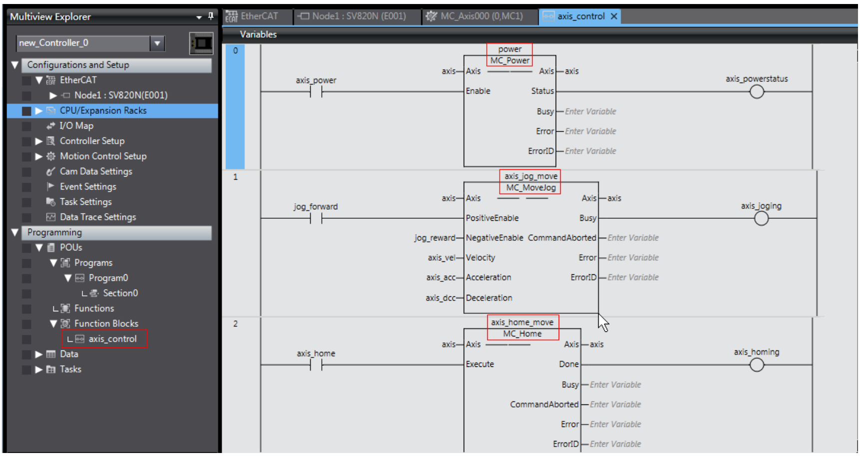
NJ Software Description	Servo Drive Function	Terminal Configuration
Home near signal	Home switch (FUN31)	DI9
External home input	Probe 1 (FUN38)	DI8
Phase Z signal input	Motor encoder phase Z signal	N/A
Positive limit input	P-OT (FUN14)	DI1
Negative limit input	N-OT (FUN15)	DI2

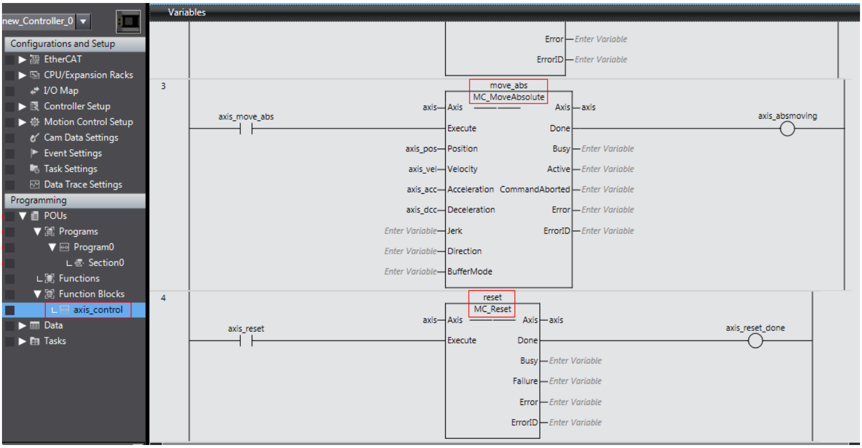
Note: The Z signal and external home switch signal cannot stay active at the same time.



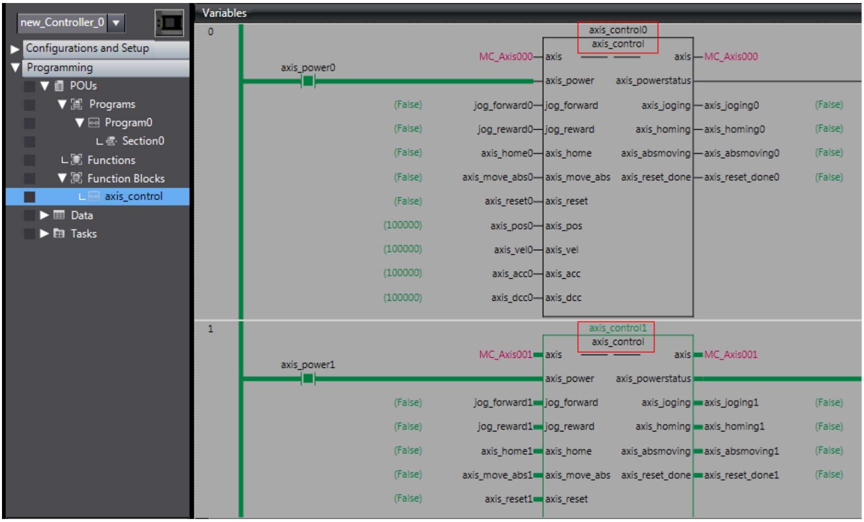
6.6.3 Program-Controlled Operations

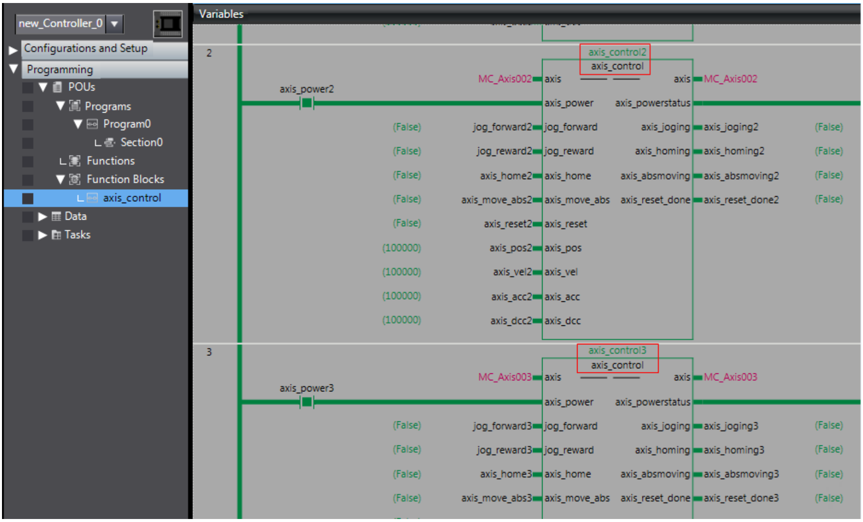
After configurations are done, you can control the servo drive operations through the PLC program. To facilitate programming, a packetized function block is used for the convenience of testing. This function block contains MC_power, MC_moveabsolute, MC_jog, MC_home, and MC_reset.





Call the function block in section0, and you can make the shaft rotate through the bus.



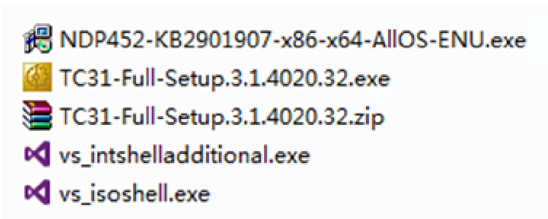


6.7 Cyclic Synchronous Position Mode and NC Axis Jogging

The following takes the Beckhoff TwinCAT master as an example to show how to configure the SV820N servo drive in cyclic synchronous position (CSP) mode.

1 Installing the TwinCAT software

The twinCAT3 software, which can be downloaded from the official website of Beckhoff, supports 32/64-bit WIN7 systems. The following takes the 32-bit WIN7 system as an example.

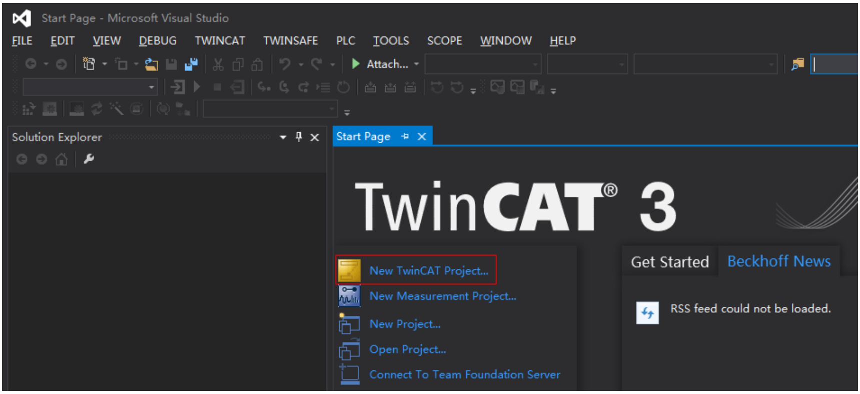


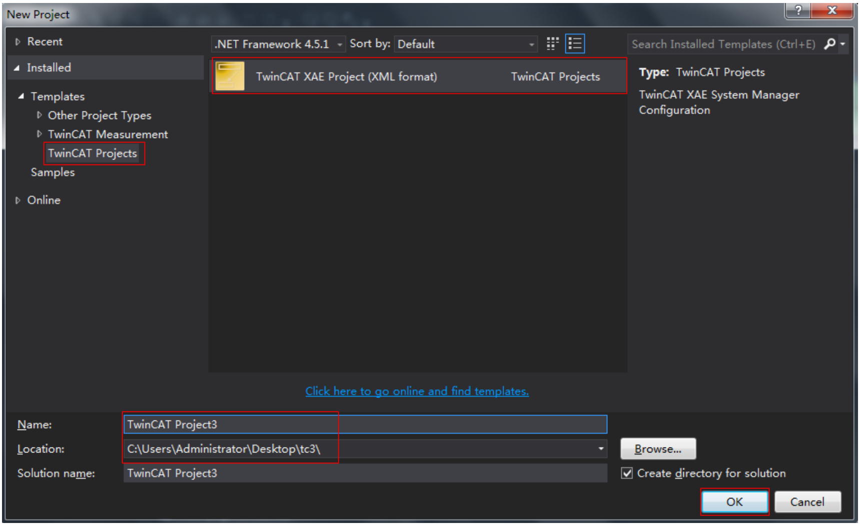
Note:

A Fast Ethernet (FE) card with Intel chip must be used in the case of direct drive by a PC. If the network card of other brands is used, the EtherCAT operation may fail.

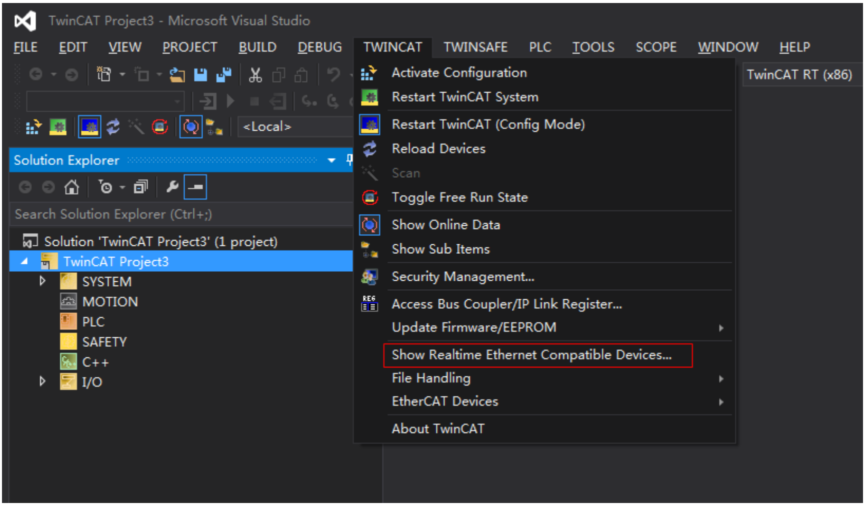
2 Copy the EtherCAT configuration file (Ino_MultiAxesDrive_ECAT_V0.10.xml) of SV820N to the TwinCAT installation directory: \TwinCAT\IO\EtherCAT.

3 Open Visual studio, and create a **New Twincat3 Project**.

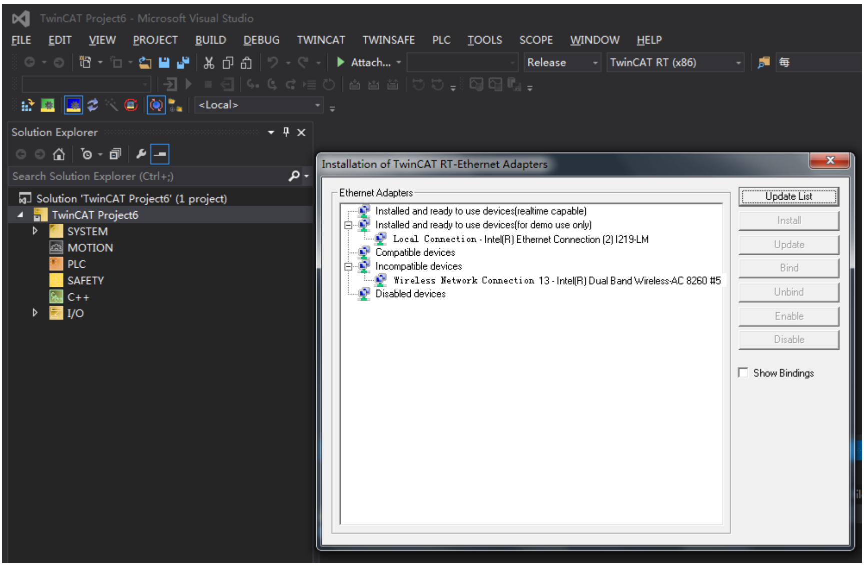

Start Page - Microsoft Visual Studio
FILE EDIT VIEW DEBUG TWINCAT TWINSAFE PLC TOOLS SCOPE WINDOW HELP
Attach...
Solution Explorer
Start Page
TwinCAT® 3
New TwinCAT Project...
New Measurement Project...
New Project...
Open Project...
Connect To Team Foundation Server
Get Started
Beckhoff News
RSS feed could not be loaded.


New Project
Recent
Installed
Templates
Other Project Types
TwinCAT Measurement
TwinCAT Projects
Samples
Online
.NET Framework 4.5.1
Sort by: Default
Search Installed Templates (Ctrl+E)
TwinCAT XAE Project (XML format)
TwinCAT Projects
Type: TwinCAT Projects
TwinCAT XAE System Manager Configuration
Click here to go online and find templates.
Name: TwinCAT Project3
Location: C:\Users\Administrator\Desktop\tc3\
Solution name: TwinCAT Project3
Browse...
Create directory for solution
OK
Cancel

4 Installing the TwinCAT card drive

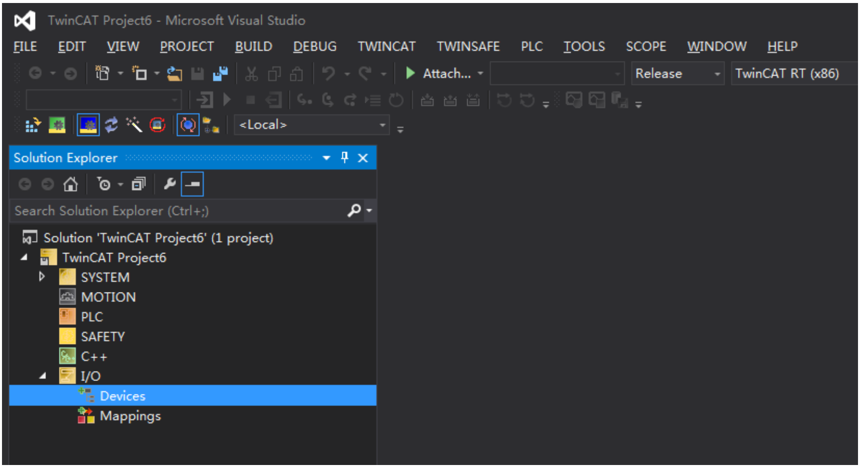


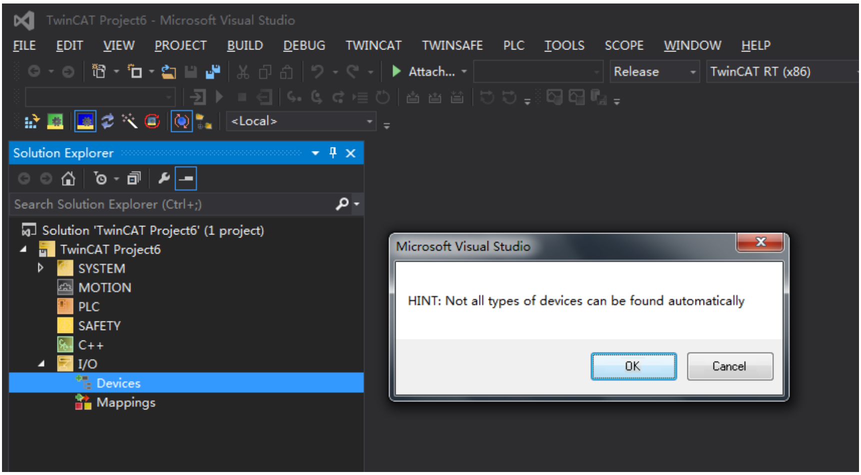
Open **Show Realtime Ethernet Compatible Devices...** in the menu shown in the preceding figure. In the pop-up dialog box shown below, select local network in **Incompatible devices**, and click **Install**. After the installation is done, the network card installed is displayed in **Installed and ready to use devices**.



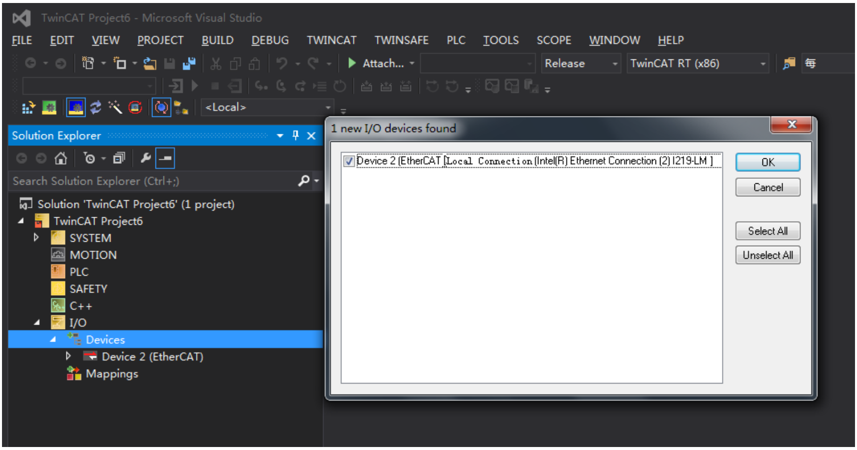
5 Searching for devices

Create a project and start searching for devices. Select " Devices " , and click "  " as shown in the following figure.

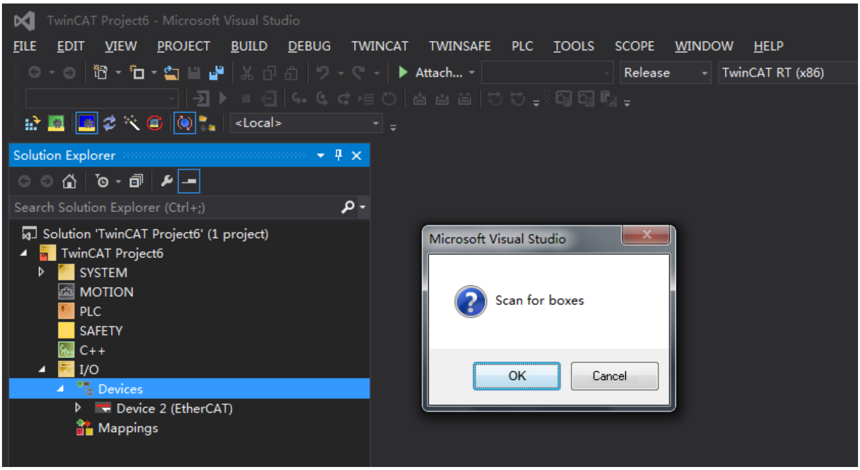




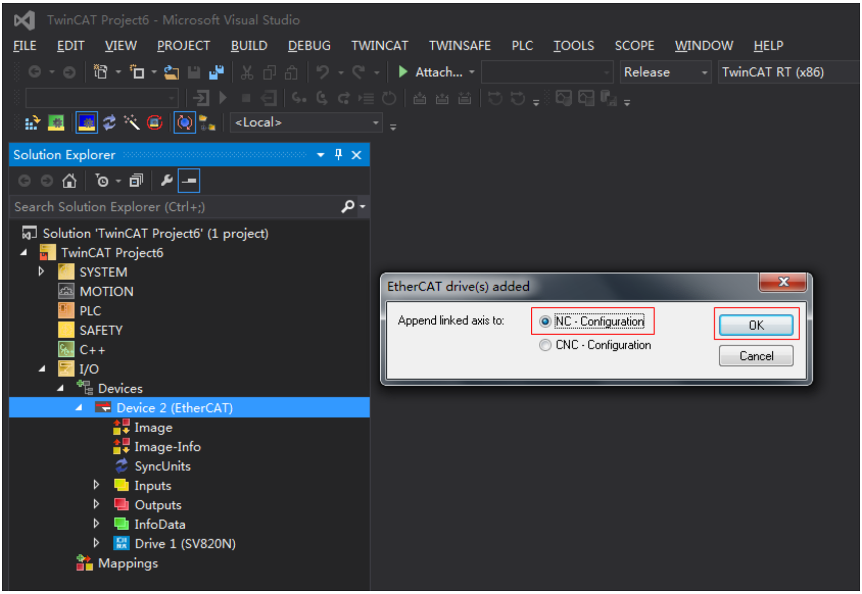
Click **OK**.



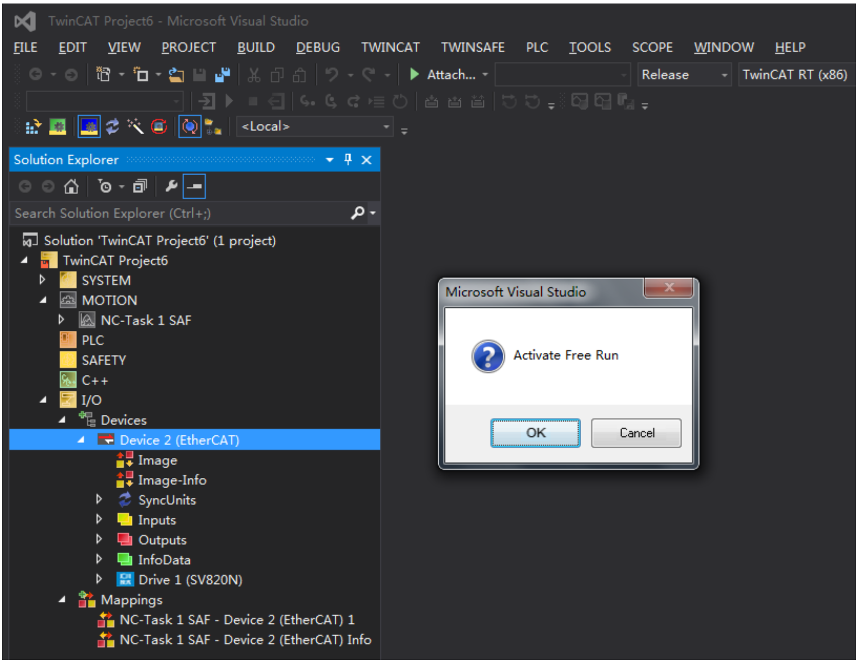
Click **OK**.



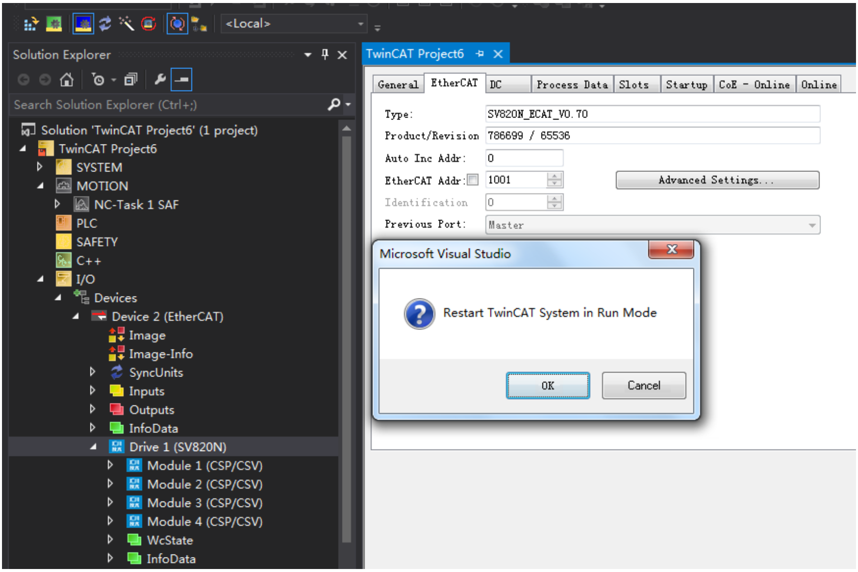
Click **OK**.



Click **OK**.



Click **Cancel**. The device search is completed, as shown in the following figure.



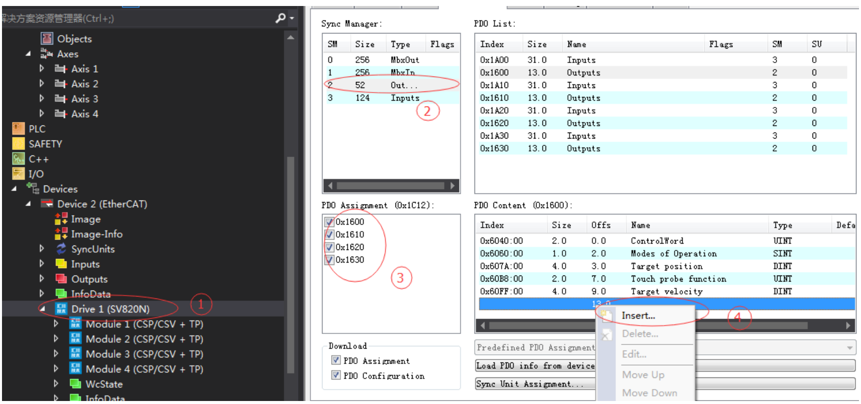
6 Configuring PDO content

Take CSP mode as an example:

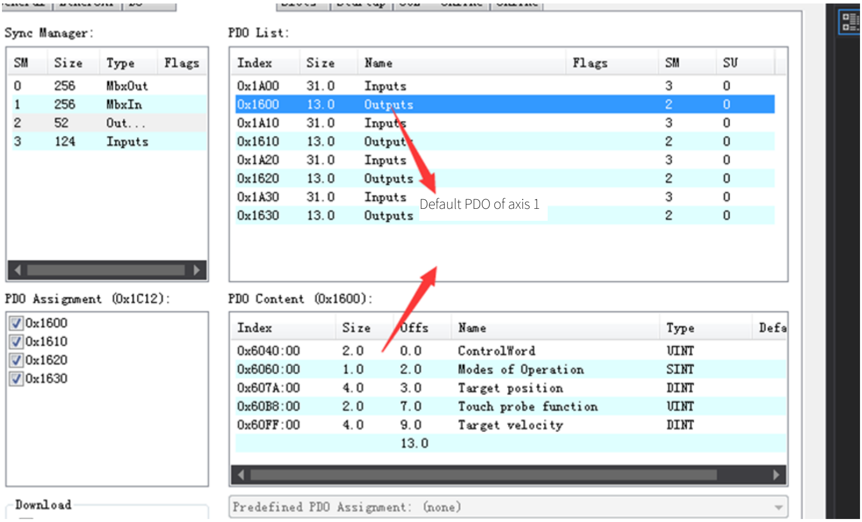
a) Configure RPDO: If 4 axes are used, select 0x1600, 0x1610, 0x1620, and 0x1630

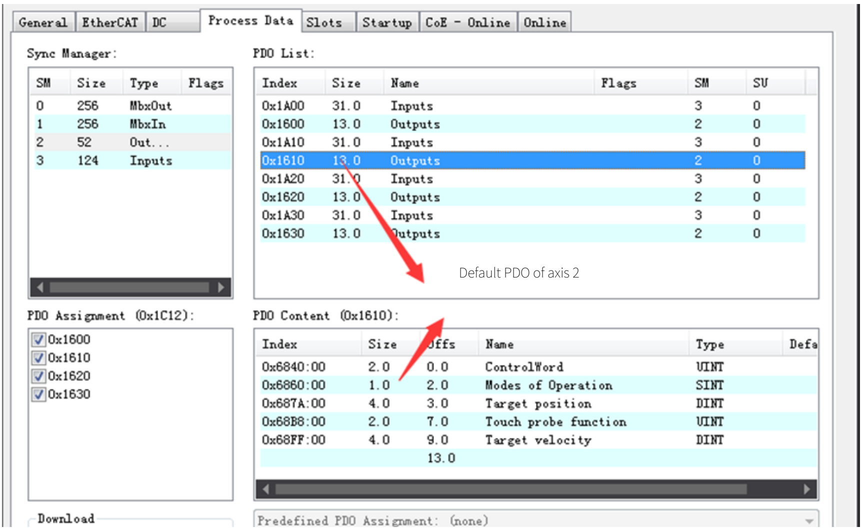
b) The procedures for configuring RPDO are as follows:

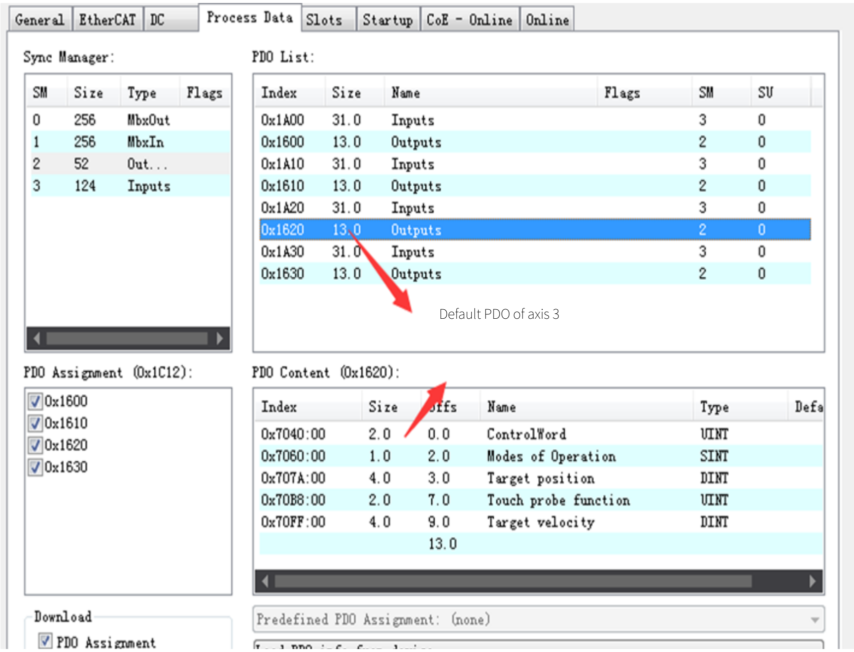
If the servo drive is running in the position mode, configurations need no change. If the servo drive is running in other modes, change the PDO list to fit the running mode. To change the PDO list, right click the **PDO Content** window,click **Delete** to delete the redundant default PDOs, and click **Insert** to add the PDOs needed.

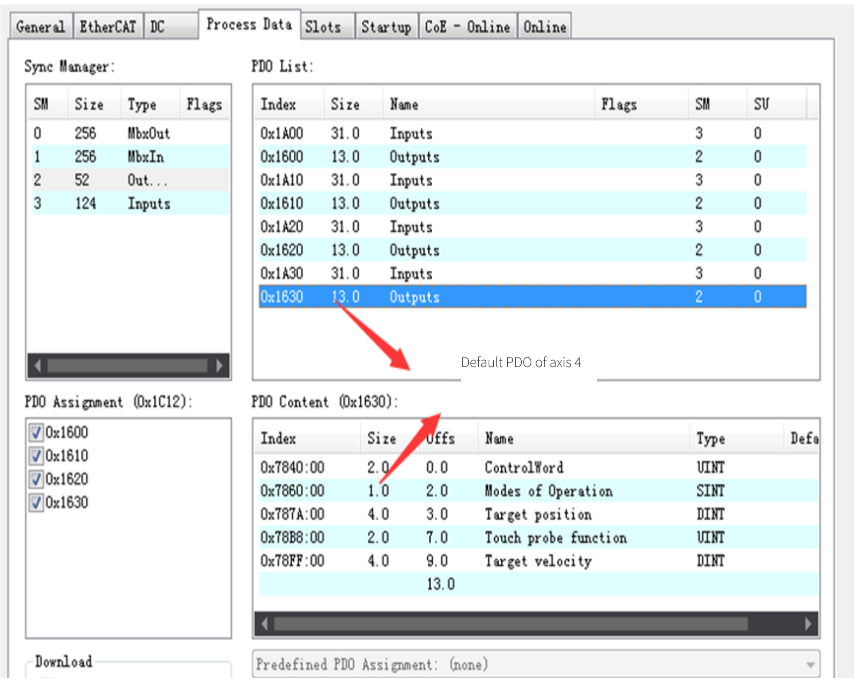


c) The default RPDO list is as follows:






General
EtherCAT
DC
Process Data
Slots
Startup
CoE - Online
Online
Sync Manager:
SM Size Type Flags
0 256 MbxOut
1 256 MbxIn
2 52 Out...
3 124 Inputs
PDO List:
Index Size Name Flags SM SU
0x1A00 31.0 Inputs 3 0
0x1600 13.0 Outputs 2 0
0x1A10 31.0 Inputs 3 0
0x1610 13.0 Outputs 2 0
0x1A20 31.0 Inputs 3 0
0x1620 13.0 Outputs 2 0
0x1A30 31.0 Inputs 3 0
0x1630 13.0 Outputs 2 0
Default PDO of axis 3
PDO Assignment (0x1C12):
0x1600
0x1610
0x1620
0x1630
PDO Content (0x1620):
Index Size Offs Name Type Defa
0x7040:00 2.0 0.0 ControlWord UINT
0x7060:00 1.0 2.0 Modes of Operation SINT
0x707A:00 4.0 3.0 Target position DINT
0x70B8:00 2.0 7.0 Touch probe function UINT
0x70FF:00 4.0 9.0 Target velocity DINT
13.0
Download
PDO Assignment
Predefined PDO Assignment: (none)


General
EtherCAT
DC
Process Data
Slots
Startup
CoE - Online
Online
Sync Manager:
SM Size Type Flags
0 256 MbxOut
1 256 MbxIn
2 52 Out...
3 124 Inputs
PDO List:
Index Size Name Flags SM SU
0x1A00 31.0 Inputs 3 0
0x1600 13.0 Outputs 2 0
0x1A10 31.0 Inputs 3 0
0x1610 13.0 Outputs 2 0
0x1A20 31.0 Inputs 3 0
0x1620 13.0 Outputs 2 0
0x1A30 31.0 Inputs 3 0
0x1630 13.0 Outputs 2 0
Default PDO of axis 4
PDO Assignment (0x1C12):
0x1600
0x1610
0x1620
0x1630
PDO Content (0x1630):
Index Size Offs Name Type Defa
0x7840:00 2.0 0.0 ControlWord UINT
0x7860:00 1.0 2.0 Modes of Operation SINT
0x787A:00 4.0 3.0 Target position DINT
0x78B8:00 2.0 7.0 Touch probe function UINT
0x78FF:00 4.0 9.0 Target velocity DINT
13.0
Download
Predefined PDO Assignment: (none)

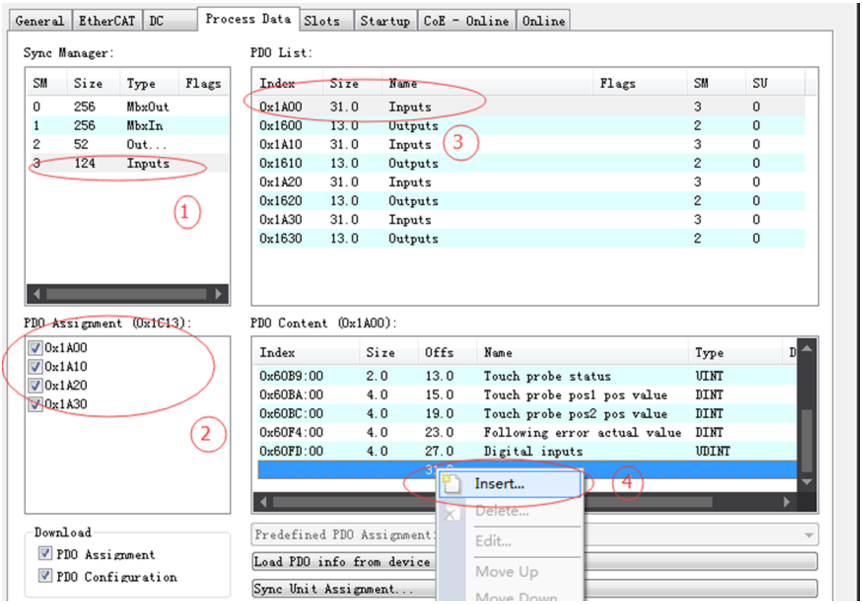
d) Example: CSP (Position) + CSV (Velocity) + TP (Touch probe)

Configuring TPDO: If four axes are used, select 0x1A00, 0x1A10, 0x1A20, and 0x1A30.

The procedures for configuring RPDO are as follows:

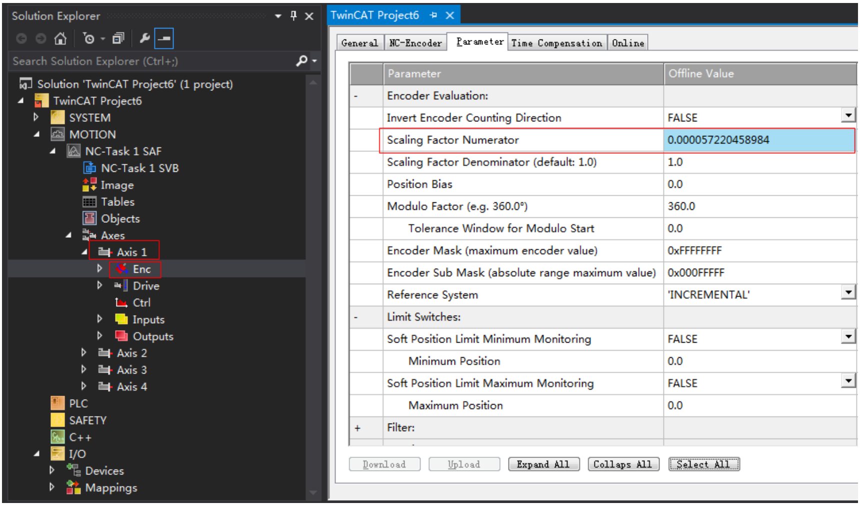
If the servo drive is running in the position mode, configurations need no change. If the servo drive is running in other modes, change the PDO list to fit the running mode.

To change the PDO list, right click the **PDO Content** window,click **Delete** to delete the redundant default PDOs, and click **Insert** to add the PDOs needed.

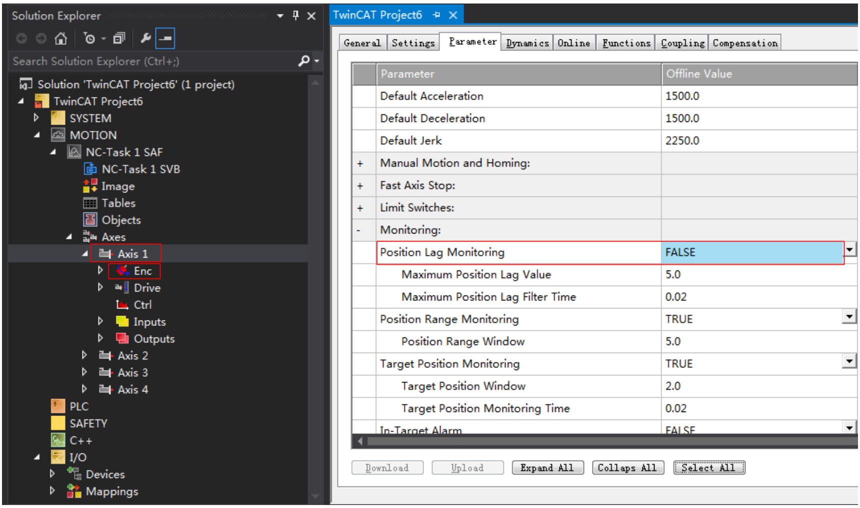


The similar process can be applied to 0x1A00, 0x1A10, 0x1A20, and 0x1A30 lists.

Click **Axis 1** in **Axes**, select **Parameter** and set the scaling parameter of the device axis. In this example, set the displacement unit per revolution to 60 mm, and the value in **Scaling Factor Numerator** is 60/1048576 (same settings as the other axes).

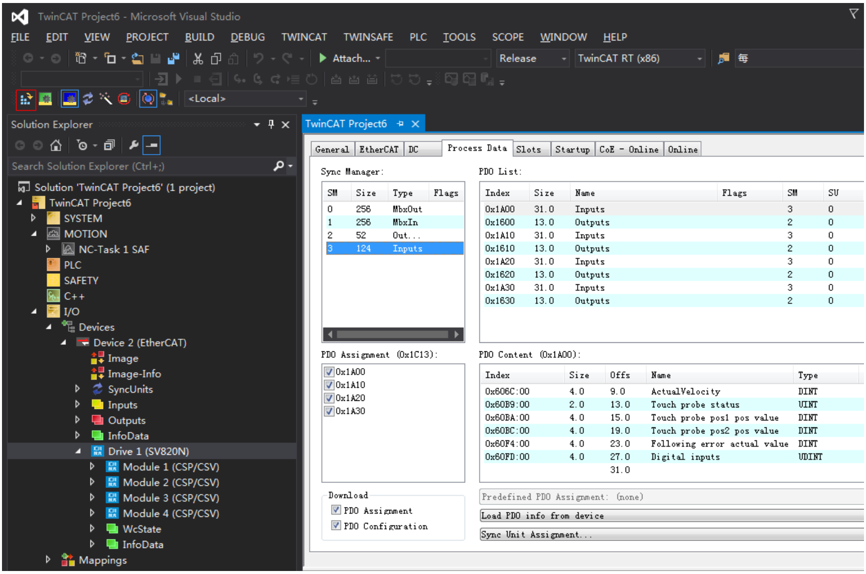


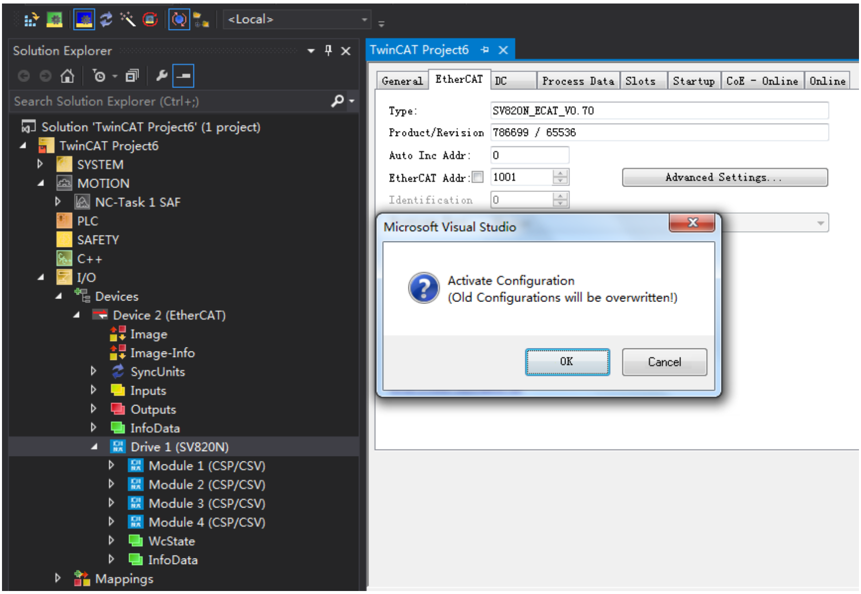
Click **Axis 1** in **Axes**, select **Parameter**, and hide the system deviation temporarily (same as other axes).



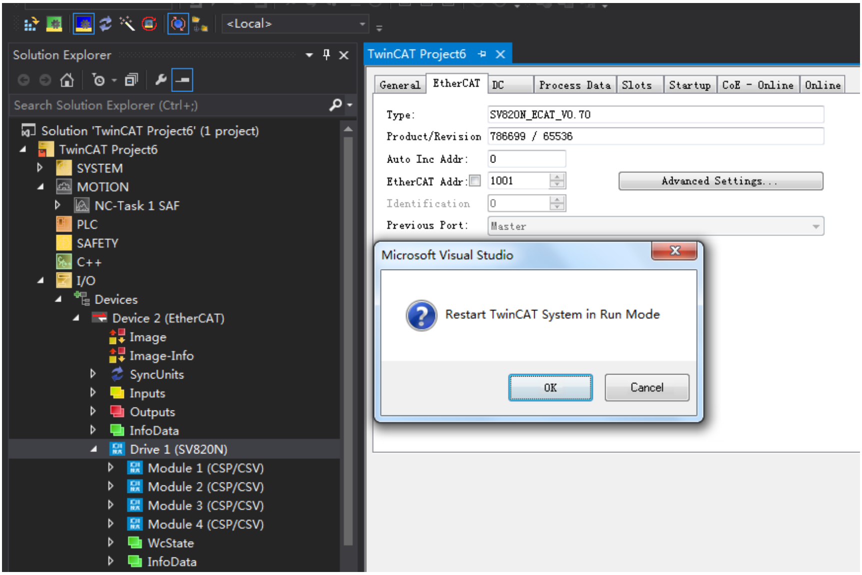
7 Activate the configuration and switch to the running mode.

Click 

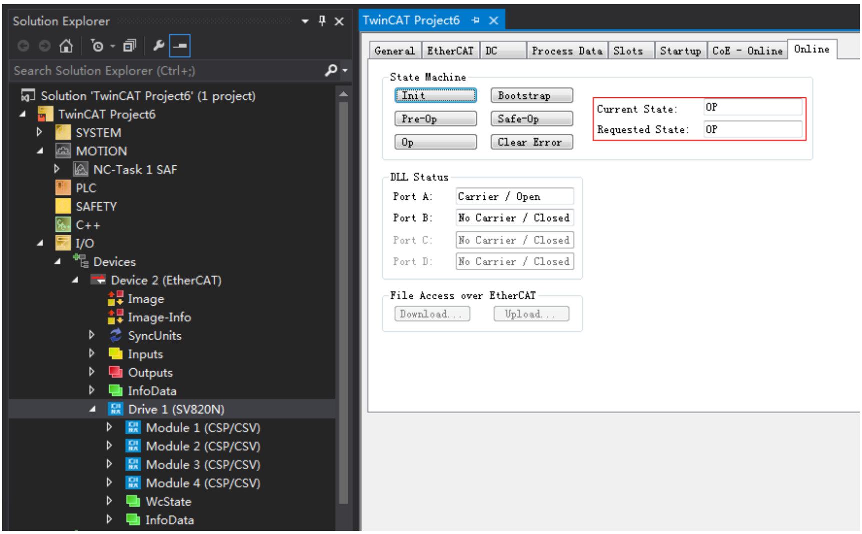




Click **OK**.

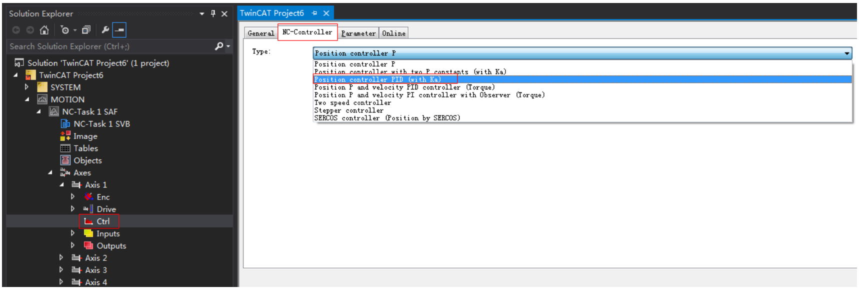


After clicking **OK**, you can observe through the **Online** interface that the device enters OP status, and the second LED on the servo drive keypad displays "8", and the keypad displays "1_88RY".



8 Servo drive controlled through NC axis or PLC

a) Setting the control type

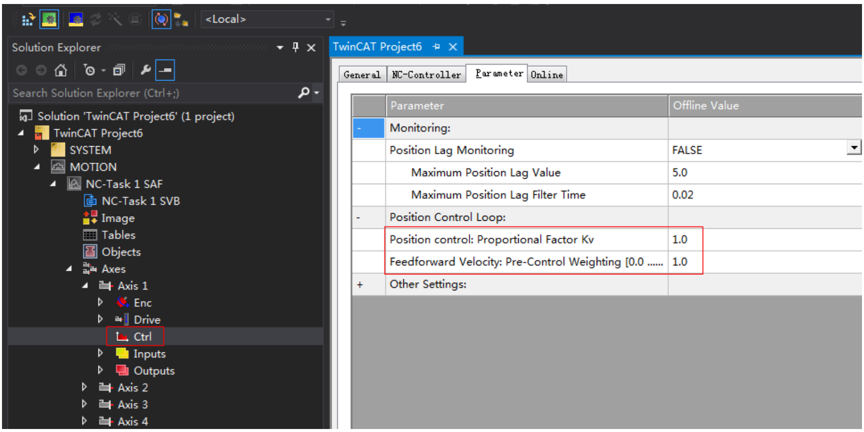


b) The PID types of the control loop are shown in the following table.

Position loop: servo drive Speed loop: servo drive	Servo drive: position mode	Position Controller P
Position loop: TWinCAT NC Speed loop: servo drive	Servo drive: velocity mode	Position Controller PID (With Ka)

Note: Speed loop can also be performed through TWinCAT NC with the target torque transmitted to the servo drive per cycle. However, this mode is not recommended due to massive additional loads imposed on the CPU and network.

c) Setting control parameters

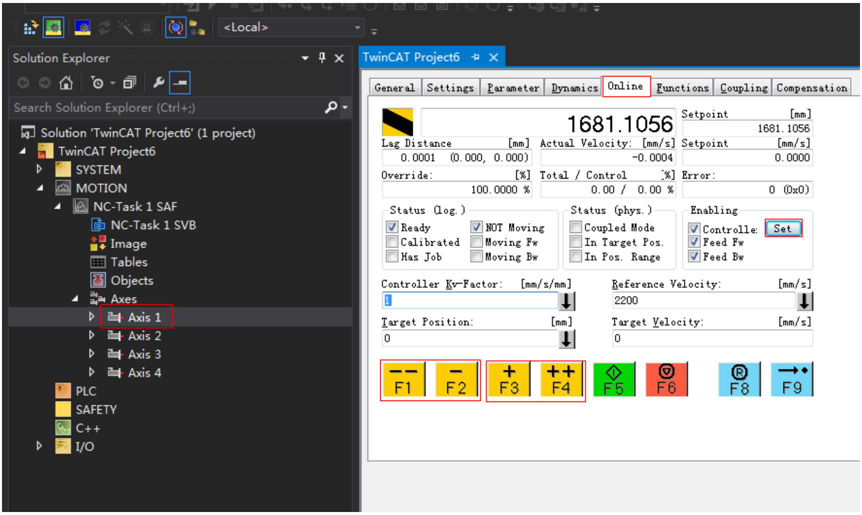


Adjust the position loop proportion based on actual responses.

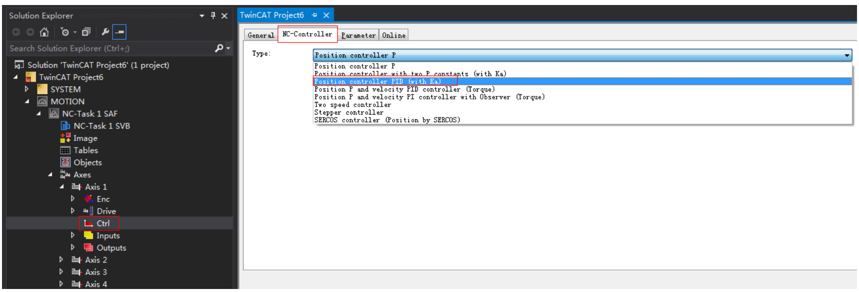
Adjust the speed feedforward coefficient based on actual responses.

9 Jogging of NC axis

a) Click **Set** and a dialog box pops out. Click **All** to enable the servo drive. Perform jogging through F1 to F4.



b) Setting the control type

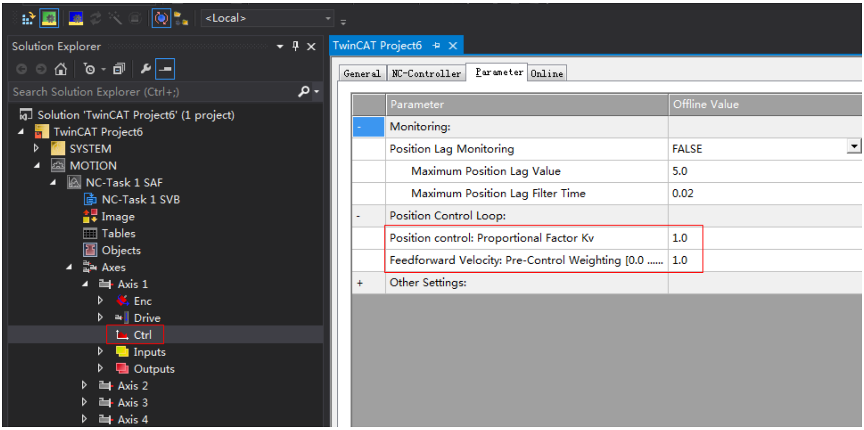


c) PID type of the control loop:

Position loop: servo drive Speed loop: servo drive	Servo drive: position mode	Position Controller P
Position loop: TWinCAT NC Speed loop: servo drive	Servo drive: velocity mode	Position Controller PID (With Ka)

Note: The speed loop can also be performed by TWinCAT NC with the target torque transmitted to the servo drive per cycle. However, such mode is not recommended because of the massive additional load imposed on the CPU and network.

d) Setting control parameters



Adjust the position loop proportion based on actual responses.

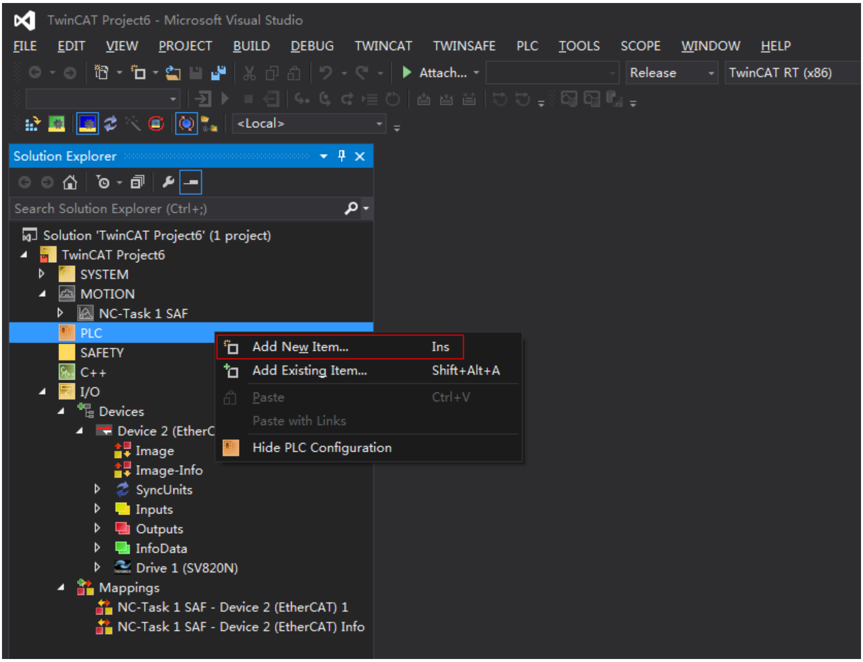
Position control: Proportional Factor Kv	1.0

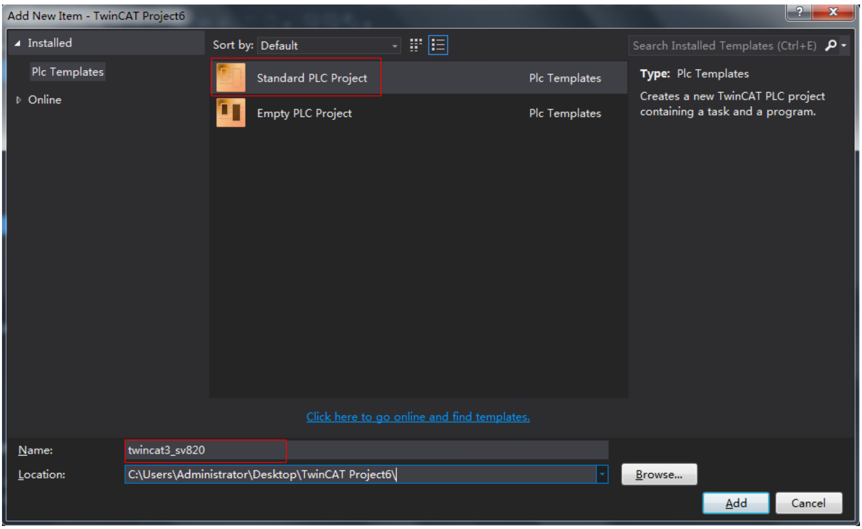
Adjust the speed feedforward coefficient based on actual responses.

Feedforward Velocity: Pre-Control Weighting [0.0 ...	0.0

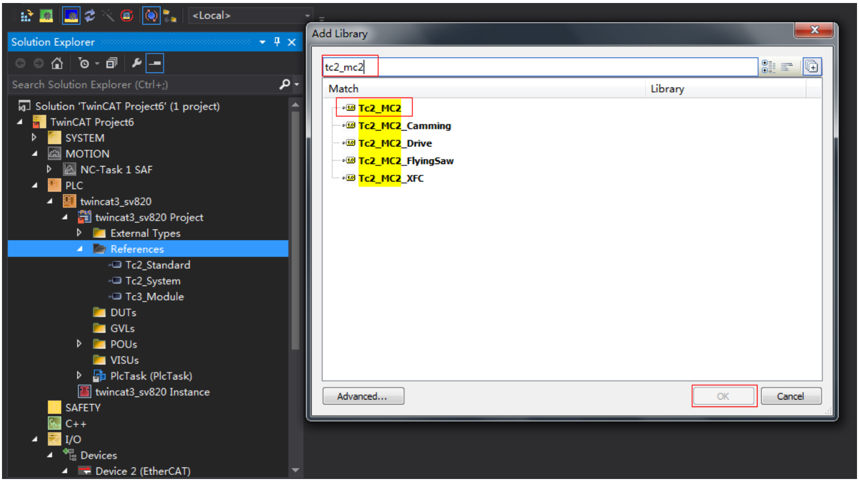
10 PLC program

a) Creating a PLC program

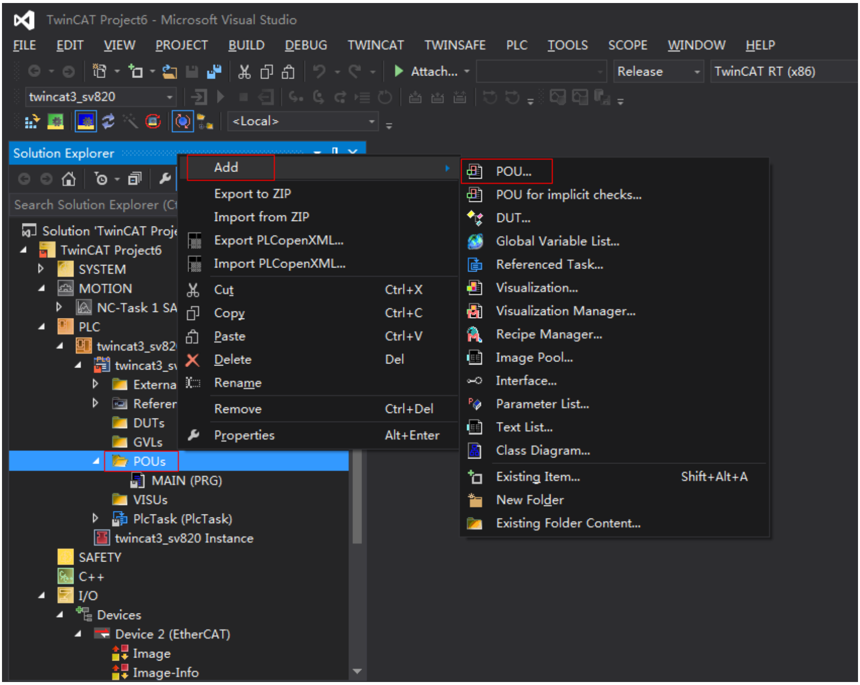


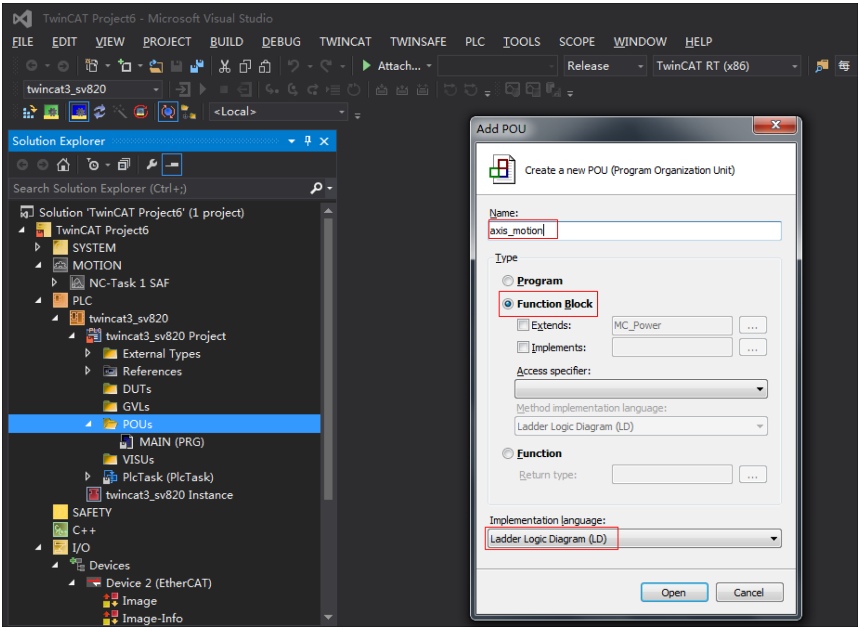


Add a motion control library for easy calling of the motion control function block.

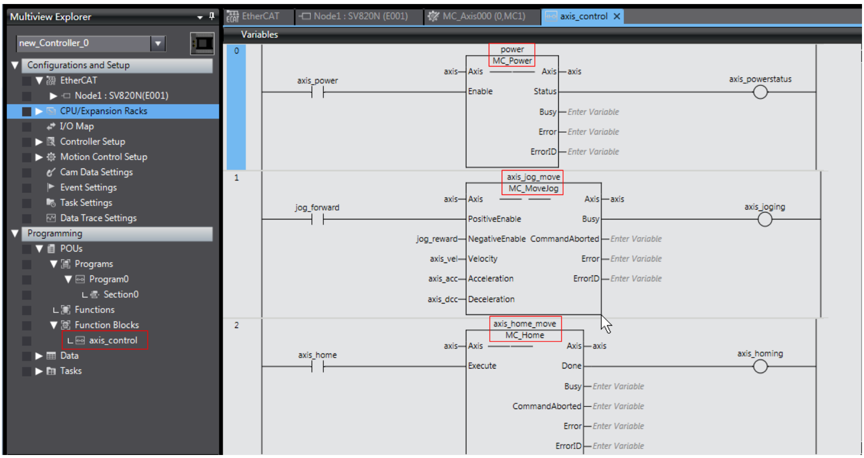


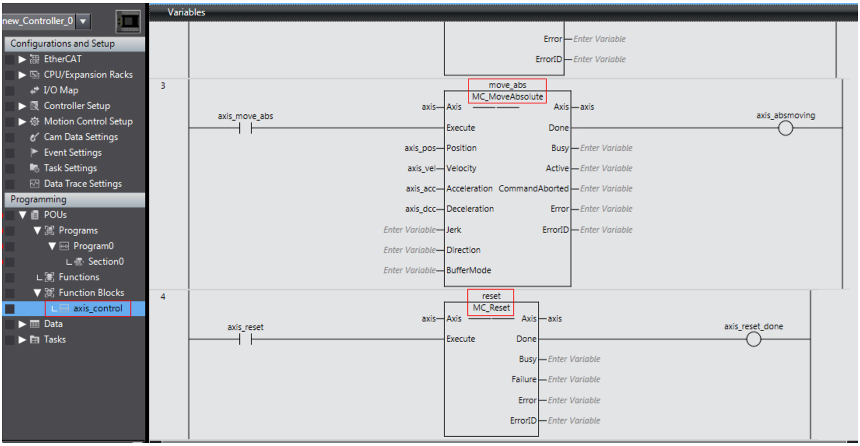
Create a new POU.



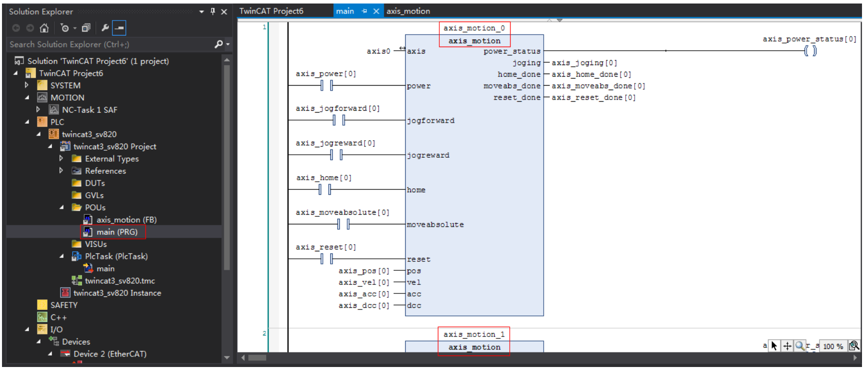


Create a new FB and add **MC_power**, **MC_jog**, **MC_home**, **MC_absolute** and **MC_reset** to FB.

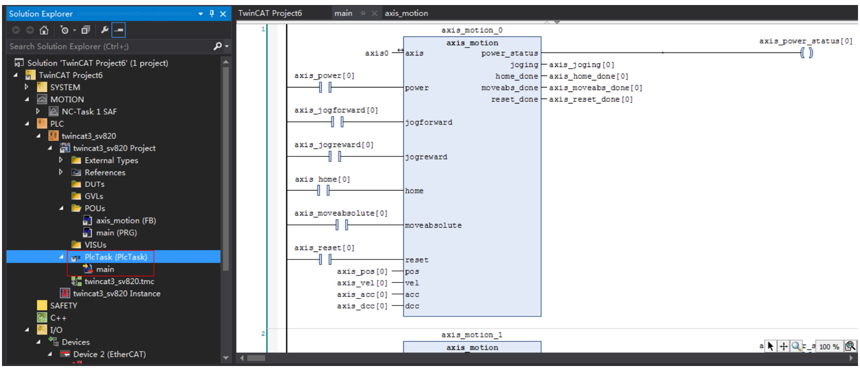




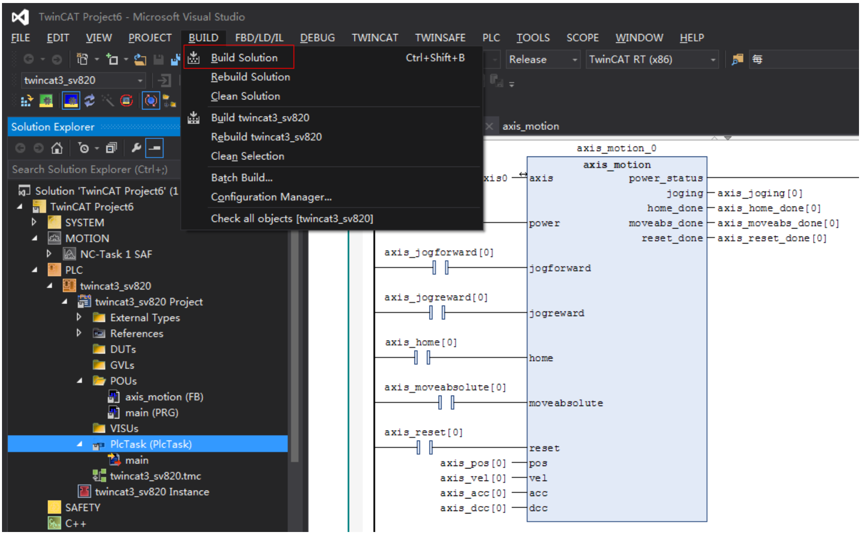
Call **axis_motion** in **main**.

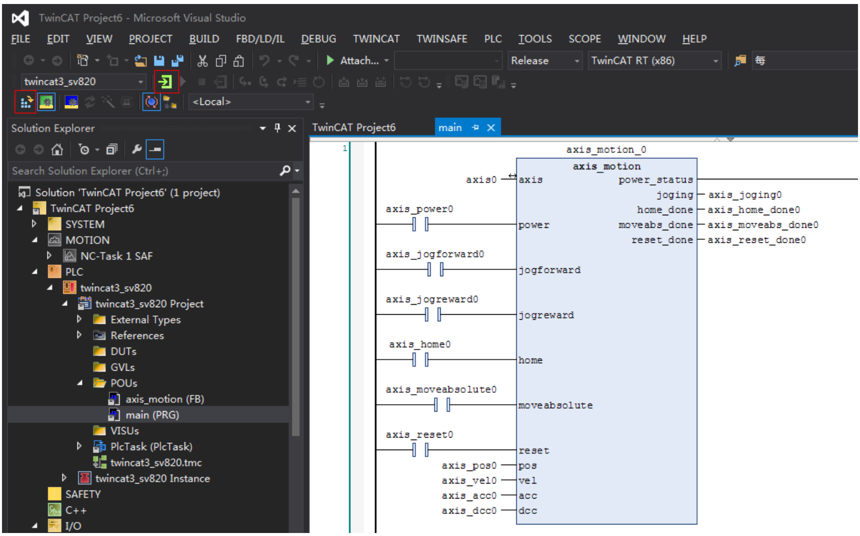


Call the program in **PlcTask**.

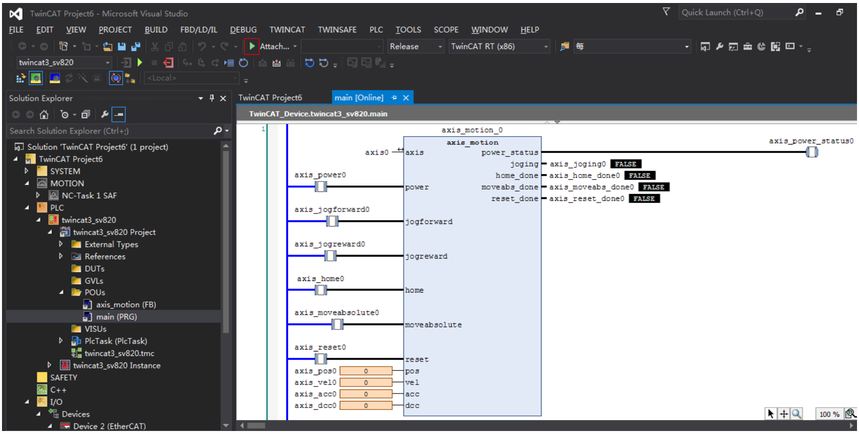


Compile the program. If there is no fault, configuration can be activated, and then log onto the PLC.





Click the arrow indicated by the red box to start the PLC. After the PLC starts running, you can run the servo drive through the bus.



6.8 Servo Stop

The stop modes can be coast to stop, stop at zero speed, ramp to stop, stop at emergency-stop torque, and DB braking. The stop state can be de-energized state or position lock state.

See the following table for details.

Stop Mode	Description	Feature
Coast to stop	The servo motor is de-energized and decelerates to 0 RPM gradually. The deceleration time is affected by the mechanical inertia and friction.	This mode features smooth deceleration and small mechanical impact, but the deceleration duration is long.
Stop at zero speed	The servo motor takes 0 RPM as the target speed and decelerates immediately from the present speed to 0 RPM and stops.	This mode features quick and fast deceleration, but the mechanical impact is large.
Ramp to stop	The servo drive decelerates smoothly to 0 RPM and stops.	This mode features smooth and controllable deceleration with small mechanical impact.
Stop at emergency torque	The servo drive outputs the reverse braking torque to stop the motor.	This mode features quick and fast deceleration, but the mechanical impact is large.
DB braking	The servo motor works in dynamic braking status.	This mode features quick and fast deceleration, but the mechanical impact is large.

Comparison of five stop modes

Table 6-1 Comparison of three stop Status

Stop Status	Description
De-energized state	The motor is not energized after stop, and the motor shaft can be rotated freely.

Stop Status	Description
Position lock state	The motor shaft is locked and cannot be rotated freely after the motor stops.
DB state	The motor keeps DB state after stop.

The servo drive stops due to the following causes:

1 Stop at S-ON signal off:

Switch off the S-ON signal through communication, and the servo drive stops according to the stop mode at S-ON off.

☆ Related parameters:

<table>
<tr><td rowspan="2">605Ch</td><td>Name</td><td colspan="3">Disable operation option code</td><td>Setting Condition & Effective Time</td><td>Any condition & At stop</td><td>Data Structure</td><td>-</td><td>Data Type</td><td>int16</td></tr>
<tr><td>Access</td><td>RW</td><td>Mapping</td><td>No</td><td>Related Mode</td><td>All</td><td>Data Range</td><td>-3 to 1</td><td>Default</td><td>0</td></tr>
<tr><td colspan="11">Used to set the deceleration mode of the servo motor from rotating to stop and the servo motor status after stop when the S-ON signal is OFF. Set a proper stop mode according to the mechanical status and running requirement.
After the brake output is enabled, the stop mode at S-ON off is forcibly set to "Stop at zero speed, keeping DB status".</td></tr>
</table>

2 Stop at fault:

The stop mode varies with the fault type. See *"5 Troubleshooting"* for details.

☆ Related parameters:

<table>
<tr><td>H02-08</td><td>Name</td><td colspan="3">Stop mode at No. 1 fault</td><td>Setting Condition & Effective Time</td><td>At stop & Immedi-ately</td><td>Data Structure</td><td>-</td><td>Data type</td><td>Uint16</td></tr>
<tr><td>2002-09h</td><td>Access</td><td>RW</td><td>Mapping</td><td>RPDO</td><td>Related Mode</td><td>All</td><td>Data Range</td><td>0 to 2</td><td>Default</td><td>0</td></tr>
<tr><td colspan="11">Defines the deceleration mode of the servo motor from rotating to stop and the servo motor status after stop at No. 1 fault.
<table>
<tr><th>Value</th><th>Stop Mode</th></tr>
<tr><td>0</td><td>Coast to stop, keeping de-energized state</td></tr>
<tr><td>1</td><td>DB stop, keeping de-energized state</td></tr>
<tr><td>2</td><td>DB stop, keeping DB state</td></tr>
</table>
After the brake output is enabled, the stop mode at No. 1 fault is forcibly set to "DB stop, keeping DB state".</td></tr>
</table>

605Eh	Name	Fault reaction option code			Setting Condition & Effective Time	Any condition At stop	Data Structure	VAR	Data Type	int16
	Access	RW	Mapping	No	Related Mode	All	Data Range	-5 to 3	Default	2

Defines the deceleration mode of the servo motor from rotating to stop and the servo motor status after stop.

Value	Stop Mode
-5	Stop at zero speed, keeping DB state
-4	Stop at the emergency-stop torque, keeping DB state
-3	Ramp to stop as defined by 6085h, keeping DB state
-2	Ramp to stop as defined by 6084h/609Ah (HM), keeping DB state
-1	DB stop, keeping DB 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

After the brake output is enabled, the stop mode at No. 2 fault is forcibly set to "Stop at zero speed, keeping DB state".

3 Stop at overtravel:

★ Definitions of terms:

"Overtravel": The distance of the mechanical movement exceeds the designed range of safe movement.

"Stop at overtravel": When the moving part moves beyond the range of safe movement, the limit switch outputs level changes, and the servo drive forces the motor to stop.

☆ Related parameters:

H02-07	Name	Stop mode at overtravel			Setting Condition & Effective Time	At stop Immedi-ately	Data Structure	-	Data type	Uint16
2002-08h	Access	RW	Mapping	-	Related Mode	All	Data Range	0 to 2	Default	1

Defines the deceleration mode of the servo motor from rotating to stop and the servo motor status after stop at overtravel.

Value	Stop Mode
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

When the servo motor drives a vertical axis, set 2002-08h to 1 to lock the motor shaft position after overtravel occurs.

After the brake output is enabled, the stop mode at overtravel is forcibly set to "Stop at zero speed, keeping position lock status".

If the servo motor enters overtravel status when driving a vertical axis, the workpiece may fall. To prevent such risk, set 2002-08h (Stop mode at overtravel) to 1 (Stop at zero speed, keeping position lock status). When the workpiece moves linearly, install limit switches to prevent mechanical damage. If the limit switch signal is activated, enter a reverse command to make the motor (workpiece) run in the reverse direction.

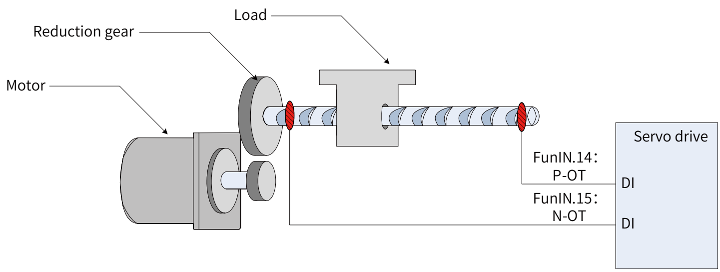


Figure 6-1 Installation of limit switches

To use the limit switch, allocate function 14 (FunIN.14: P-OT, positive limit switch) and function 15 (FunIN.15: N-OT, negative limit switch) to two DI terminals of the servo drive and set the valid logic of the DI terminal. This is to enable the servo drive to receive the level signals input from the limit switch. The servo drive enables or cancels the stop-at-overtravel status based on the DI terminal level status.

☆ Related parameters:

Function No.	Name	Function	Description
FunIN.14	P-OT	Positive limit switch	When the mechanical movement is outside the movable range, the overtravel prevention function will be activated. Invalid: Forward drive permitted Valid: Forward drive inhibited
FunIN.15	N-OT	Negative limit switch	When the mechanical movement is outside the movable range, the overtravel prevention function will be activated. Invalid: Reverse drive permitted Valid: Reverse drive inhibited

4 Emergency stop

Auxiliary function: emergency stop

☆ Related parameters:

H0D-05	Name	Emergency stop			Setting Condition & Effective Time	During running & Immediately	Data Structure	-	Data type	Uint16
200D-06h	Access	RW	Mapping	-	Related Mode	-	Data Range	0 to 1	Default	0
Operations at emergency stop										

Value	Description
0	No operation
1	Emergency stop enabled

When emergency stop is enabled, the servo drive immediately stops according to the stop mode defined by 605Ch.

5 Quick stop

When the bit2 of the control word 6040h (Quick stop) is 0 during servo drive running, the servo drive executes quick stop as defined by 605Ah.

605Ah	Name	Quick stop option code			Setting Condition & Effective Time	Any condition & At stop	Data Structure	VAR	Data Type	int16
	Access	RW	Mapping	No	Related Mode	All	Data Range	0 to 7	Default	2
Defines the deceleration mode of the servo motor from rotating to stop and the servo motor status after quick stop.										

Value	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
4	N/A
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

6 Halt

When the servo drive is in the running status and the bit8 of the control word 6040h is set to 1 (Halt), a halt command is input and the servo drive performs the halt operation in the mode defined by 605Dh.

<table>
<tr><td rowspan="2">605Dh</td><td>Name</td><td colspan="3">Stop option code</td><td>Setting Condition & Effective Time</td><td>Any condition & At stop</td><td>Data Structure</td><td>VAR</td><td>Data Type</td><td>int16</td></tr>
<tr><td>Access</td><td>RW</td><td>Mapping</td><td>No</td><td>Related Mode</td><td>All</td><td>Data Range</td><td>1–3</td><td>Default</td><td>1</td></tr>
<tr><td colspan="11">Defines the deceleration mode of the servo motor from rotating to stop and the servo motor status after halt.
CSP/CST/CST/PP/HM</td></tr>
</table>

Value	Stop 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

Profile torque mode

Value	Stop Mode
1/2/3	Ramp to stop as defined by 6087h, keeping position lock state

6.9 Conversion Factor Setting

6091h: Gear ratio

The gear ratio indicates the motor displacement (in encoder unit) corresponding to the load shaft displacement per 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 (in reference unit) and the motor displacement (in 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 calculated based on such parameters as the mechanical reduction ratio, mechanical dimension, and motor resolution. The calculation formula is as follows.

$$\text{Gear ratio} = \frac{\text{Motor resolution}}{\text{Load shaft resolution}}$$

<table>
<tr><td rowspan="2">Index 6091h</td><td>Name</td><td colspan="3">Gear Ratio</td><td>Setting Condition & Effective Time</td><td>-</td><td>Data Structure</td><td>ARR</td><td>Data Type</td><td>Uint32</td></tr>
<tr><td>Access</td><td>-</td><td>Mapping</td><td>Yes</td><td>Related Mode</td><td>All</td><td>Data Range</td><td>OD data range</td><td>Default</td><td>OD default value</td></tr>
<tr><td colspan="11">Defines the proportional relation between the load shaft displacement designated by the user and the motor shaft displacement.
The electronic gear ratio must be within the following range:
0.001 x Encoder resolution/10000, 4000 x Encoder resolution/10000
If this range is exceeded, Er.B03 (Electronic gear ratio over the limit) will occur.
The relation between the motor position feedback (in encoder unit) and the load shaft position feedback (in 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.
$$\text{Motor speed (rpm)} = \frac{\text{Load shaft speed x Gear ratio 6091h}}{\text{Encoder resolution}} \times 60$$
The relation between the motor acceleration (RPM/ms) and the load shaft speed (reference unit/s^2) is as follows.
$$\text{Motor acceleration} = \frac{\text{Load shaft acceleration x Gear ratio 6091h}}{\text{Encoder resolution}} \times \frac{1000}{60}$$</td></tr>
</table>

<table>
<tr><td rowspan="2">Sub-index 0h</td><td>Name</td><td colspan="3">Number of sub-indexes of the gear ratio</td><td>Setting Condition & Effective Time</td><td>-</td><td>Data Structure</td><td>-</td><td>Data type</td><td>Uint8</td></tr>
<tr><td>Access</td><td>RO</td><td>Mapping</td><td>No</td><td>Related Mode</td><td>-</td><td>Data Range</td><td>-</td><td>Default</td><td>2</td></tr>
</table>

<table>
<tr><td rowspan="2">Sub-index 1h</td><td>Name</td><td colspan="3">Motor resolutions</td><td>Setting Condition & Effective Time</td><td>During running & Immedi-ately</td><td>Data Structure</td><td>-</td><td>Data type</td><td>Uint32</td></tr>
<tr><td>Access</td><td>RW</td><td>Mapping</td><td>RPDO</td><td>Related Mode</td><td>-</td><td>Data Range</td><td>0 to 0xFFFFFFFF</td><td>Default</td><td>1</td></tr>
</table>

<table>
<tr><td rowspan="2">Sub-index 2h</td><td>Name</td><td colspan="3">Shaft resolutions</td><td>Setting Condition & Effective Time</td><td>During running & Immedi-ately</td><td>Data Structure</td><td>-</td><td>Data type</td><td>Uint32</td></tr>
<tr><td>Access</td><td>RW</td><td>Mapping</td><td>RPDO</td><td>Related Mode</td><td>-</td><td>Data Range</td><td>0 to 0xFFFFFFFF</td><td>Default</td><td>1</td></tr>
<tr><td colspan="11">The gear ratio is within the following range: 0.001 x Encoder resolution/10000 to 4000 x Encoder resolution/10000.
If this range is exceeded, Er.B03 (Gear ratio over the limit) will occur.</td></tr>
</table>

Taking the ball screw as an example:

Minimum reference unit fc = 1 mm

Lead pB = 10 mm/r

Reduction ratio n = 5:1

Resolution of Inovance 20-bit serial encoder motor P = 1048576 (PPR)

The position factor is calculated as follows:

Position factor:

$$\text{Position factor} = \frac{\text{Motor resolution P*n}}{\text{PB}} = \frac{1048576 \times 5}{10} = \frac{5242880}{10} = 524288$$

Therefore, 6091-1h = 524288, 6091-2h = 1, which means when the load shaft displacement is 1 mm, the motor displacement is 524288.

Reduce the values of 6091-1h and 6091-2h to a point where there is no common divisor, and take the final value.

Appendix A List of Object Groups

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
0000-0FFF	Data type description
1000-1FFF	CoE communication object
2000-5FFF	Manufacturer-specific object
6000-9FFF	Sub-protocol object
A000-FFFF	Reserved

The SV820N servo drive carries four drive modules on one axis, and each module supports the same parameters. The parameter address of each module is independent of each other except the CoE communication object (common parameter) of 1000h-1FFFh. However, the following relation exists:

Parameter address (HEX) of Module N = Parameter address (HEX) of Module 1 + 0x800 x (N - 1)

For instance:

	Module 1	Module 2	Module 3	Module 4
Manufacturer-specific object: Speed loop gain address	2008-01h	2808-01h	3008-01h	3808-01h
Sub-protocol object: Control word address	6040-00h	6840-00h	7040-00h	7840-00h

Unless otherwise specified, all the parameters descriptions are based on the parameter address description of module 1.

Object Group 1000h

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default
1000	00	Device Type	RO	NO	UINT32	-	-	0x00020192
1008	00	Manufacturer device name	RO	NO	-	-	-	SV820N-ECAT
1009	00	Manufacturer hardware version	RO	NO	-	-	-	Dependent on the software version
100A	00	Manufacturer software version	RO	NO	-	-	-	Dependent on the hardware version

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default
1018		ID object						
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x04
	01	Vendor ID	RO	NO	UINT32	-	-	0x00100000
	02	Product code	RO	NO	UINT32	-	-	0x000C010B
	03	Revision number	RO	NO	UINT32	-	-	0x00010000
1C00		Factory software version						
	00	Number of Sync Manager channels	RO	NO	UINT8	-	-	0x04
	01	Communication type of SM0	RO	NO	UINT8	-	-	0x01
	02	Communication type of SM1	RO	NO	UINT8	-	-	0x02
	03	Communication type of SM2	RO	NO	UINT8	-	-	0x03
	04	Communication type of SM3	RO	NO	UINT8	-	-	0x04
1600		Mapping object of RPDO1						
	00	Number of mapped application objects in RPDO1	RW	NO	UINT8	-	0 to 0x0A	0x05
	01	1st mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60400010
	02	2nd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60600008
	03	3rd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x607A0020
	04	4th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60B80010
	05	5th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60FF0020
	06	6th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	
	07	7th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	08	8th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	09	9th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	0A	10th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
1610		\Mapping object of RPDO11						
	00	Number of mapped objects in RPDO11	RW	NO	UINT8	-	0 to 0x0A	0x05
	01	1st mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68400010
	02	2nd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68600008
	03	3rd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x687A0020
	04	4th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68B80010
	05	5th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68FF0020
	06	6th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	07	7th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	08	8th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	09	9th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	0A	10th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
1620		Mapping object of RPDO21						
	00	Number of mapped objects in RPDO21	RW	NO	UINT8	-	0 to 0x0A	0x05
	01	1st mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70400010
	02	2nd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70600008
	03	3rd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x707A0020

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default
1620	04	4th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70B80010
	05	5th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70FF0020
	06	6th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	
	07	7th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	08	8th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	09	9th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	0A	10th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
1630	Mapping object of RPDO31							
	00	Number of mapped objects in RPDO31	RW	NO	UINT8	-	0 to 0x0A	0x05
	01	1st mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78400010
	02	2nd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78600008
	03	3rd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x787A0020
	04	4th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78B80010
	05	5th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78FF0020
	06	6th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	
	07	7th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	08	8th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	09	9th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
	0A	10th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	-
1A00	Mapping object of TPDO1							
	00	Number of mapped application objects in TPDO1	RW	NO	UINT8	-	0 to 0x0A	0x0A
	01	1st mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x603F0010
	02	2nd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60410010
	03	3rd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60610008
	04	4th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60640020
	05	5th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x606C0020
	06	6th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60B90010
	07	7th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60BA0020
	08	8th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60BC0020
	09	9th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60F40010
	0A	10th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x60FD0010
1A10	Mapping object of TPDO11							
	00	Number of mapped objects in TPDO11	RW	NO	UINT8	-	0 to 0x0A	0x0A
	01	1st mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x683F0010
	02	2nd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68410010
	03	3rd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68610008
	04	4th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68640020
	05	5th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x686C0020
	06	6th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68B90010
	07	7th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68BA0020
	08	8th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68BC0020
	09	9th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68F40010
	0A	10th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x68FD0010
1A20	Mapping object of TPDO21							
	00	Number of mapped objects in TPDO21	RW	NO	UINT8	-	0 to 0x0A	0x0A

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default
1A20	01	1st mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x703F0010
	02	2nd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70410010
	03	3rd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70610008
	04	4th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70640020
	05	5th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x706C0020
	06	6th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70B90010
	07	7th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70BA0020
	08	8th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70BC0020
	09	9th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70F40020
	0A	10th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x70FD0020
1A30	Mapping object of TPDO31							
	00	Number of mapped objects in TPDO31	RW	NO	UINT8	-	0 to 0x0A	0x0A
	01	1st mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x783F0010
	02	2nd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78410010
	03	3rd mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78610008
	04	4th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78640020
	05	5th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x786C0020
	06	6th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78B90010
	07	7th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78BA0020
	08	8th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78BC0020
	09	9th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78F40020
	0A	10th mapping object	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0x78FD0020
1C12	Sync Manager 2_RPDO Assignment							
	00	Number of assigned RPDOs	RW	NO	UINT8	-	0–0x04	0x04
	01	Index of object 1 of assigned RPDO	RW	YES	UINT16	-	0 to 0xFFFF	0x1600
	02	Index of object 2 of assigned RPDO	RW	YES	UINT16	-	0 to 0xFFFF	0x1610
	03	Index of object 3 of assigned RPDO	RW	YES	UINT16	-	0 to 65535	0x1620
	04	Index of object 4 of assigned RPDO	RW	YES	UINT16	-	0 to 65535	0x1630
1C13	Sync Manager 2_TPDO Assignment							
	00	Number of assigned TPDOs	RW	NO	UINT8	-	0–0x4	0x04
	01	Index of object 1 of assigned TPDO	RW	YES	UINT16	-	0 to 0xFFFF	0x1A00
	02	Index of object 2 of assigned TPDO	RW	YES	UINT16	-	0 to 0xFFFF	0x1A10
	03	Index of object 3 of assigned TPDO	RW	YES	UINT16	-	0 to 65535	0x1A20
	04	Index of object 4 of assigned TPDO	RW	YES	UINT16	-	0 to 65535	0x1A30

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default
1C32	Sync Manager 2 Synchronization Output							
	00	Number of synchronization parameters	RO	NO	UINT8	-	-	0x20
	01	Synchronization type	RO	NO	UINT16	-	-	0x0002
	02	Cycle Time	RO	NO	UINT32	ns	-	0
	04	Synchronization types supported	RO	NO	UINT16	-	-	0x0004
	05	Minimum cycle time	RO	NO	UINT32	ns	-	0x000F4240
	06	Calculation and copy time	RO	NO	UINT32	ns	-	-
	09	Delay time	RO	NO	UINT32	ns	-	-
	20	Sync error	RO	NO	BOOL	-	-	-
1C33	Sync Manager 2 Synchronization Input							
	00	Number of synchronization parameters	RO	NO	UINT8	-	-	0x20
	01	Synchronization type	RO	NO	UINT16		-	0x0002
	02	Cycle Time	RO	NO	UINT32	ns	-	0
	04	Synchronization types supported	RO	NO	UINT16	-	-	0x0004
	05	Minimum cycle time	RO	NO	UINT32	ns	-	0x000F4240
	06	Calculation and copy time	RO	NO	UINT32	ns	-	-
	09	Delay time	RO	NO	UINT32	ns	-	-
	20	Sync error	RO	NO	BOOL	-	-	-

Object Group 6000h

Object group 6000h contains DSP402 objects supported.

■ Parameters of axis 1

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
603F	00	Error code	RO	TPDO	UINT16	-	-	-	-	-
6040	00	Control word	RW	RPDO	UINT16	-	0 to 0xFFFF	0	During running	Immedi-ately
6041	00	Status word	RO	TPDO	UINT16	-	-	-	-	-
605A	00	Quick stop option code	RW	NO	INT16	-	0–0x07	0x02	During running	At stop
605C	00	Disable operation option code	RW	NO	INT16	-	0xFFFD to 0x0001	0	During running	At stop
605D	00	Stop option code	RW	NO	INT16	-	0x01 to 0x03	0x01	During running	At stop
605E	00	Fault reaction option code	RW	NO	INT16	-	0xFFFB to 0x02	0x02	During running	At stop
6060	00	Modes of operation	RW	RPDO	INT8	-	0 to 0x0A	0	During running	Immedi-ately
6061	00	Modes of operation display	RO	TPDO	INT8	-	-	-	-	-
6062	00	Position demand value	RO	TPDO	INT32	Position unit	-	-	-	-
6063	00	Position actual value*	RO	TPDO	INT32	Encoder unit	-	-	-	-
6064	00	Position actual value	RO	TPDO	INT32	Position unit	-	-	-	-
6065	00	Following error window	RW	RPDO	UINT32	Position unit	0 to 0xFFFFFFFF	0x00300000	During running	Immedi-ately
6066	00	Following error time out	RW	RPDO	UINT32	ms	0 to 0xFFFF	0	During running	Immedi-ately
6067	00	Position window	RW	RPDO	UINT32	Position unit	0 to 0xFFFFFFFF	0x000002DE	During running	Immedi-ately
6068	00	Position window time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immedi-ately
606C	00	Velocity actual value	RO	TPDO	INT32	Velocity unit/s	-	-	-	-
606D	00	Velocity window	RW	RPDO	UINT16	RPM	0 to 0xFFFF	0x0A	During running	Immedi-ately
606E	00	Velocity window time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immedi-ately
606F	00	Velocity threshold	RW	RPDO	UINT16	RPM	0 to 0xFFFF	0x0A	During running	Immedi-ately
6070	00	Velocity threshold time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immedi-ately
6071	00	Target torque	RW	RPDO	INT16	0.1%	0xF060–0x0FA0	0	During running	Immedi-ately
6072	00	Max. torque	RW	RPDO	UINT16	0.1%	0–0x0FA0	0x0BB8	During running	Immedi-ately

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
6074	00	Torque demand value	RO	TPDO	INT16	0.1%	-	0	-	-
6077	00	Torque actual value	RO	TPDO	INT16	0.1%	-	0	-	-
607A	00	Target position	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
607C	00	Home offset	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
607D	Software position limit									
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x02	-	-
	01	Min. position limit	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0x80000000	During running	Immedi-ately
	02	Max. position limit	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0x7FFFFFFF	During running	Immedi-ately
607E	00	Polarity	RW	RPDO	UINT8	-	0–0xFF	0	During running	Immedi-ately
607F	00	Max. profile velocity	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x06400000	During running	Immedi-ately
6081	00	Profile velocity	RW	RPDO	UINT32	Velocity unit	0 to 0xFFFFFFFF	0	During running	Immedi-ately
6083	00	Profile acceleration	RW	RPDO	UINT32	Acceleration unit/s^2	0 to 0xFFFFFFFF	0x0A6AAAAA	During running	Immedi-ately
6084	00	Profile deceleration	RW	RPDO	UINT32	Acceleration unit/s^2	0 to 0xFFFFFFFF	0x0A6AAAAA	During running	Immedi-ately
6085	00	Quick stop deceleration	RW	RPDO	UINT32	User-defined acceleration unit	0 to 0xFFFFFFFF	0x7FFFFFFF	During running	Immedi-ately
6086	00	Motion profile type	RW	RPDO	INT16	-	0x8000 to 0x7FFF	0	During running	Immedi-ately
6087	00	Torque slope	RW	RPDO	UINT32	0.1%/s	0 to 0xFFFFFFFF	0xFFFFFFFF	During running	Immedi-ately
6091	Gear ratio									
	00	Highest sub-index supported	RO	NO	UINT8	Uint8	-	0x02	-	-
	01	Motor revolutions	RW	RPDO	UINT32	-	0 to 0xFFFFFFFF	1	During running	Immedi-ately
	02	Shaft revolutions	RW	RPDO	UINT32	-	1-0xFFFFFFFF	1	During running	Immedi-ately
6098	00	Homing method	RW	RPDO	INT8	-	0x01 to 0x023	0x01	During running	Immedi-ately
6099	Homing speeds									
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x02	-	-
	01	Speed during search for switch	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x001AAAAB	During running	Immedi-ately
	02	Speed during search for zero	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x0002AAAB	During running	Immedi-ately

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
609A	00	Homing acceleration	RW	RPDO	UINT32	Acceleration unit/s^2	0 to 0xFFFFFFFF	0x0A6AAAAA	During running	Immedi-ately
60B0h	00	Position offset	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
60B1h	00	Velocity offset	RW	RPDO	INT32	Velocity unit/s	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
60B2h	00	Torque offset	RW	RPDO	INT16	0.1%	0xF060–0x0FA0	0	During running	Immedi-ately
60B8h	00	Touch probe function	RW	RPDO	UINT16	-	0 to 0xFFFF	0	During running	Immedi-ately
60B9h	00	Touch probe status	RW	RPDO	UINT16	-	-	0	-	-
60BAh	00	Touch probe 1 positive edge	RW	RPDO	INT32	Position unit	-	0	-	-
60BBh	00	Touch probe 1 negative edge	RW	RPDO	INT32	Position unit	-	0	-	-
60BCh	00	Touch probe 2 positive edge	RW	RPDO	INT32	Position unit	-	0	-	-
60BDh	00	Touch probe 2 negative edge	RW	RPDO	INT32	Position unit	-	0	-	-
60D5h	0x00	Touch probe 1 positive edge counter	RO	RPDO	UINT16	-	-	0	-	-
60D6h	0x00	Touch probe 1 negative edge counter	RO	RPDO	UINT16	-	-	0	-	-
60D7h	0x00	Touch probe 2 positive edge counter	RO	RPDO	UINT16	-	-	0	-	-
60D8h	0x00	Touch probe 2 negative edge counter	RO	RPDO	UINT16	-	-	0	-	-
60E0h	00	Positive torque limit value	RW	RPDO	UINT16	0.1%	0–0x0FA0	0x0BB8	During running	Immedi-ately
60E1h	00	Negative torque limit value	RW	RPDO	UINT16	0.1%	0–0x0FA0	0x0BB8	During running	Immedi-ately
60E3h	Supported homing method									
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x1F	-	-
	01	1st supported homing method	RO	NO	UINT16	-	-	0x0301	-	-
	02	2nd supported homing method	RO	NO	UINT16	-	-	0x0302	-	-
	03	3rd supported homing method	RO	NO	UINT16	-	-	0x0303	-	-
	04	4th supported homing method	RO	NO	UINT16	-	-	0x0304	-	-

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
60E3h	05	5th supported homing method	RO	NO	UINT16	-	-	0x0305	-	-
	06	6th supported homing method	RO	NO	UINT16	-	-	0x0306	-	-
	07	7th supported homing method	RO	NO	UINT16	-	-	0x0307	-	-
	08	8th supported homing method	RO	NO	UINT16	-	-	0x0308	-	-
	09	9th supported homing method	RO	NO	UINT16	-	-	0x0309	-	-
	0A	10th supported homing method	RO	NO	UINT16	-	-	0x030A	-	-
	0B	11th supported homing method	RO	NO	UINT16	-	-	0x030B	-	-
	0C	12th supported homing method	RO	NO	UINT16	-	-	0x030C	-	-
	0D	13th supported homing method	RO	NO	UINT16	-	-	0x030D	-	-
	0E	14th supported homing method	RO	NO	UINT16	-	-	0x030E	-	-
	0F	15th supported homing method	RO	NO	UINT16	-	-	0x030Fh	-	-
	10	16th supported homing method	RO	NO	UINT16	-	-	0x0310	-	-
	11	17th supported homing method	RO	NO	UINT16	-	-	0x0311	-	-
	12	18th supported homing method	RO	NO	UINT16	-	-	0x0312	-	-
	13	19th supported homing method	RO	NO	UINT16	-	-	0x0313	-	-

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
60E3h	14	20th supported homing method	RO	NO	UINT16	-	-	0x0314	-	-
	15	21th supported homing method	RO	NO	UINT16	-	-	0x0315	-	-
	16	22th supported homing method	RO	NO	UINT16	-	-	0x0316	-	-
	17	23th supported homing method	RO	NO	UINT16	-	-	0x0317	-	-
	18	24th supported homing method	RO	NO	UINT16	-	-	0x0318	-	-
	19	25th supported homing method	RO	NO	UINT16	-	-	0x0319	-	-
	1A	26th supported homing method	RO	NO	UINT16	-	-	0x031A	-	-
	1B	27th supported homing method	RO	NO	UINT16	-	-	0x031B	-	-
	1C	28th supported homing method	RO	NO	UINT16	-	-	0x031C	-	-
	1D	29th supported homing method	RO	NO	UINT16	-	-	0x031D	-	-
	1E	30th supported homing method	RO	NO	UINT16	-	-	0x031E	-	-
	1F	31th supported homing method	RO	NO	UINT16	-	-	0x031F	-	-
60E6h	00	Encoder increments for the additional position	RW	NO	UINT16	-	0–1	0	During running	Immediately
60F4h	00	Following error actual value	RO	RPDO	INT32	Position unit	-	-	-	-

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
60FCh	00	Position demand value	RO	TPDO	INT32	Encoder unit	-	-	-	-
60FDh	00	Digital inputs	RO	RPDO	UINT32	-	-	-	-	-
60FEh		Digital outputs								
	00	DO status	RO	NO	UINT8	-	-	0x02	-	-
	01	Physical outputs	RW	RPDO	UINT32	-	0 to 0xFFFFFFFF	0	During running	Immedi-ately
	02	Output mask	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0	During running	Immedi-ately
60FFh	00	Target velocity	RW	RPDO	INT32	Velocity unit/s	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
6502h	00	Supported drive modes	RO	NO	UINT32	-	-	0x000003AD	-	-

■ Parameters of axis 2

Index (hex)	Sub-index (hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
683F	00	Error code	RO	TPDO	UINT16	-	-	-	-	-
6840	00	Control word	RW	RPDO	UINT16	-	0 to 0xFFFF	0	During running	Immedi-ately
6841	00	Status word	RO	TPDO	UINT16	-	-	-	-	-
685A	00	Quick stop option code	RW	NO	INT16	-	0–0x07	0x02	During running	At stop
685C	00	Disable operation option code	RW	NO	INT16	-	0–0x01	0	During running	At stop
685D	00	Stop option code	RW	NO	INT16	-	0x01 to 0x03	0x01	During running	At stop
685E	00	Fault reaction option code	RW	NO	INT16	-	0–0x02	0x02	During running	At stop
6860	00	Modes of operation	RW	RPDO	INT8	-	0 to 0x0A	0	During running	Immedi-ately
6861	00	Modes of operation display	RO	TPDO	INT8	-	-	-	-	-
6862	00	Position demand value	RO	TPDO	INT32	Position unit	-	-	-	-
6863	00	Position actual value	RO	TPDO	INT32	Encoder unit	-	-	-	-
6864	00	Position actual value	RO	TPDO	INT32	Position unit	-	-	-	-
6865	00	Following error window	RW	RPDO	UINT32	Position unit	0 to 0xFFFFFFFF	0x00300000	During running	Immedi-ately
6866	00	Following error time out	RW	RPDO	UINT32	ms	0 to 0xFFFF	0	During running	Immedi-ately
6867	00	Position window	RW	RPDO	UINT32	Reference unit	0 to 0xFFFFFFFF	0x000002DE	During running	Immedi-ately
6868	00	Position window time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immedi-ately
686C	00	Velocity actual value	RO	TPDO	INT32	Velocity unit/s	-	-	-	-

Index (hex)	Sub-index (hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
686D	00	Velocity window	RW	RPDO	UINT16	RPM	0 to 0xFFFF	0x0A	During running	Immedi-ately
686E	00	Velocity window time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immedi-ately
606F	00	Velocity threshold	RW	RPDO	UINT16	RPM	0 to 0xFFFF	0x0A	During running	Immedi-ately
6870	00	Velocity threshold time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immedi-ately
6871	00	Target torque	RW	RPDO	INT16	0.1%	0xF448 to 0x0BB8	0	During running	Immedi-ately
6872	00	Max. torque	RW	RPDO	UINT16	0.1%	0–0x0BB8	0x0BB8	During running	Immedi-ately
6874	00	Torque demand value	RO	TPDO	INT16	0.1%	-	0	-	-
6877	00	Torque actual value	RO	TPDO	INT16	0.1%	-	0	-	-
687A	00	Target position	RW	RPDO	INT32	Reference unit	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
687C	00	Home offset	RW	RPDO	INT32	Reference unit	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
687D	Software position limit									
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x02	-	-
	01	Min. position limit	RW	RPDO	INT32	Reference unit	0x80000000 to 0x7FFFFFFF	0x80000000	During running	Immedi-ately
	02	Max. position limit	RW	RPDO	INT32	Reference unit	0x80000000 to 0x7FFFFFFF	0x7FFFFFFF	During running	Immedi-ately
687E	00	Polarity	RW	RPDO	UINT8	-	0–0xFF	0	During running	Immedi-ately
687F	00	Max. profile velocity	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x06400000	During running	Immedi-ately
6881	00	Profile velocity	RW	RPDO	UINT32	User-defined velocity unit	0 to 0xFFFFFFFF	0	During running	Immedi-ately
6883	00	Profile acceleration	RW	RPDO	UINT32	Acceleration unit/s^2	0 to 0xFFFFFFFF	0x682AAAA6	During running	Immedi-ately
6884	00	Profile deceleration	RW	RPDO	UINT32	Acceleration unit/s^2	0 to 0xFFFFFFFF	0x682AAAA6	During running	Immedi-ately
6885	00	Quick stop deceleration	RW	RPDO	UINT32	User-defined acceleration unit	0 to 0xFFFFFFFF	0xAD9C71C0	During running	Immedi-ately
6886	00	Motion profile type	RW	RPDO	INT16	-	0x8000 to 0x7FFF	0	During running	Immedi-ately
6887	00	Torque slope	RW	RPDO	UINT32	0.1%/s	0 to 0xFFFFFFFF	0xFFFFFFFF	During running	Immedi-ately
6891	Gear ratio									
	00	Highest sub-index supported	RO	NO	UINT8	Uint8	-	0x02	-	-
	01	Motor revolutions	RW	RPDO	UINT32	-	0 to 0xFFFFFFFF	20-bit encoder: 1 23-bit encoder: 8	During running	Immedi-ately

Index (hex)	Sub-index (hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
6891	02	Shaft revolutions	RW	RPDO	UINT32	-	1-0xFFFFFFFF	1	During running	Immedi-ately
6898	00	Homing method	RW	RPDO	INT8	-	0x01 to 0x023	0x01	During running	Immedi-ately
6899	Homing speeds									
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x02	-	-
	01	Speed during search for switch	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x001AAAAB	During running	Immedi-ately
	02	Speed during search for zero	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x0002AAAB	During running	Immedi-ately
689A	00	Homing acceleration	RW	RPDO	UINT32	Acceleration unit/s^2	0 to 0xFFFFFFFF	0x682AAAA6	During running	Immedi-ately
68B0h	00	Position offset	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
68B1h	00	Velocity offset	RW	RPDO	INT32	Velocity unit/s	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
68B2h	00	Torque offset	RW	RPDO	INT16	0.1%	0xF448 to 0x0BB8	0	During running	Immedi-ately
68B8h	00	Touch probe function	RW	RPDO	UINT16	-	0 to 0xFFFF	0	During running	Immedi-ately
68B9h	00	Touch probe status	RW	RPDO	UINT16	-	-	0	-	-
68BAh	00	Touch probe 1 positive edge	RW	RPDO	INT32	Position unit	-	0	-	-
68BBh	00	Touch probe 1 negative edge	RW	RPDO	INT32	Position unit	-	0	-	-
68BCh	00	Touch probe 2 positive edge	RW	RPDO	INT32	Position unit	-	0	-	-
68BDh	00	Touch probe 2 negative edge	RW	RPDO	INT32	Position unit	-	0	-	-
68D5h	0x00	Touch probe 1 positive edge counter	RO	RPDO	UINT16	-	-	0	-	-
68D6h	0x00	Touch probe 1 negative edge counter	RO	RPDO	UINT16	-	-	0	-	-
68D7h	0x00	Touch probe 2 positive edge counter	RO	RPDO	UINT16	-	-	0	-	-
68D8h	0x00	Touch probe 2 negative edge counter	RO	RPDO	UINT16	-	-	0	-	-
68E0h	00	Positive torque limit value	RW	RPDO	UINT16	0.1%	0–0x0BB8	0x0BB8	During running	Immedi-ately
68E1h	00	Negative torque limit value	RW	RPDO	UINT16	0.1%	0–0x0BB8	0x0BB8	During running	Immedi-ately

Index (hex)	Sub-index (hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
68E3h	Supported homing method									
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x1F	-	-
	01	1st supported homing method	RO	NO	UINT16	-	-	0x0301	-	-
	02	2nd supported homing method	RO	NO	UINT16	-	-	0x0302	-	-
	03	3rd supported homing method	RO	NO	UINT16	-	-	0x0303	-	-
	04	4th supported homing method	RO	NO	UINT16	-	-	0x0304	-	-
	05	5th supported homing method	RO	NO	UINT16	-	-	0x0305	-	-
	06	6th supported homing method	RO	NO	UINT16	-	-	0x0306	-	-
	07	7th supported homing method	RO	NO	UINT16	-	-	0x0307	-	-
	08	8th supported homing method	RO	NO	UINT16	-	-	0x0308	-	-
	09	9th supported homing method	RO	NO	UINT16	-	-	0x0309	-	-
	0A	10th supported homing method	RO	NO	UINT16	-	-	0x030A	-	-
	0B	11th supported homing method	RO	NO	UINT16	-	-	0x030B	-	-
	0C	12th supported homing method	RO	NO	UINT16	-	-	0x030C	-	-
	0D	13th supported homing method	RO	NO	UINT16	-	-	0x030D	-	-

Index (hex)	Sub-index (hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
68E3h	0E	14th supported homing method	RO	NO	UINT16	-	-	0x030E	-	-
	0F	15th supported homing method	RO	NO	UINT16	-	-	0x030Fh	-	-
	10	16th supported homing method	RO	NO	UINT16	-	-	0x0310	-	-
	11	17th supported homing method	RO	NO	UINT16	-	-	0x0311	-	-
	12	18th supported homing method	RO	NO	UINT16	-	-	0x0312	-	-
	13	19th supported homing method	RO	NO	UINT16	-	-	0x0313	-	-
	14	20th supported homing method	RO	NO	UINT16	-	-	0x0314	-	-
	15	21th supported homing method	RO	NO	UINT16	-	-	0x0315	-	-
	16	22th supported homing method	RO	NO	UINT16	-	-	0x0316	-	-
	17	23th supported homing method	RO	NO	UINT16	-	-	0x0317	-	-
	18	24th supported homing method	RO	NO	UINT16	-	-	0x0318	-	-
	19	25th supported homing method	RO	NO	UINT16	-	-	0x0319	-	-
	1A	26th supported homing method	RO	NO	UINT16	-	-	0x031A	-	-
	1B	27th supported homing method	RO	NO	UINT16	-	-	0x031B	-	-

Index (hex)	Sub-index (hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
68E3h	1C	28th supported homing method	RO	NO	UINT16	-	-	0x031C	-	-
	1D	29th supported homing method	RO	NO	UINT16	-	-	0x031D	-	-
	1E	30th supported homing method	RO	NO	UINT16	-	-	0x031E	-	-
	1F	31th supported homing method	RO	NO	UINT16	-	-	0x031F	-	-
68E6h	00	Encoder increments for the additional position	RW	NO	UINT16	-	0–1	0	During running	Immedi-ately
68F4h	00	Following error actual value	RO	RPDO	INT32	Position unit	-	-	-	-
68FCh	00	Position demand value	RO	TPDO	INT32	Encoder unit	-	-	-	-
68FDh	00	Digital inputs	RO	RPDO	UINT32	-	-	-	-	-
68FEh	Digital outputs									
	00	DO status	RO	NO	UINT8	-	-	0x02	-	-
	01	Physical outputs	RW	RPDO	UINT32	-	0 to 0xFFFFFFFF	0	During running	Immedi-ately
	02	Output mask	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0	During running	Immedi-ately
68FFh	00	Target velocity	RW	RPDO	INT32	Velocity unit/s	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately

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Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
703F	00	Error code	RO	TPDO	UINT16	-	-	-	-	-
7040	00	Control word	RW	RPDO	UINT16	-	0 to 0xFFFF	0	During running	Immedi-ately
7041	00	Status word	RO	TPDO	UINT16	-	-	-	-	-
705A	00	Quick stop option code	RW	NO	INT16	-	0–0x07	0x02	During running	At stop
705C	00	Disable operation option code	RW	NO	INT16	-	0–0x01	0	During running	At stop
705D	00	Stop option code	RW	NO	INT16	-	0x01 to 0x03	0x01	During running	At stop
705E	00	Fault reaction option code	RW	NO	INT16	-	0–0x02	0x02	During running	At stop
7060	00	Modes of operation	RW	RPDO	INT8	-	0 to 0x0A	0	During running	Immedi-ately

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
7061	00	Modes of operation display	RO	TPDO	INT8	-	-	-	-	-
7062	00	Position demand value	RO	TPDO	INT32	Position unit	-	-	-	-
7063	00	Position actual value*	RO	TPDO	INT32	Encoder unit	-	-	-	-
7064	00	Position actual value	RO	TPDO	INT32	Position unit	-	-	-	-
7065	00	Following error window	RW	RPDO	UINT32	Position unit	0 to 0xFFFFFFFF	0x00300000	During running	Immedi-ately
7066	00	Following error time out	RW	RPDO	UINT32	ms	0 to 0xFFFF	0	During running	Immedi-ately
7067	00	Position window	RW	RPDO	UINT32	Position unit	0 to 0xFFFFFFFF	0x000002DE	During running	Immedi-ately
7068	00	Position window time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immedi-ately
706C	00	Velocity actual value	RO	TPDO	INT32	Velocity unit/s	-	-	-	-
706D	00	Velocity window	RW	RPDO	UINT16	RPM	0 to 0xFFFF	0x0A	During running	Immedi-ately
706E	00	Velocity window time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immedi-ately
706F	00	Velocity threshold	RW	RPDO	UINT16	RPM	0 to 0xFFFF	0x0A	During running	Immedi-ately
7070	00	Velocity threshold time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immedi-ately
7071	00	Target torque	RW	RPDO	INT16	0.1%	0xF448 to 0x0BB8	0	During running	Immedi-ately
7072	00	Max. torque	RW	RPDO	UINT16	0.1%	0–0x0BB8	0x0BB8	During running	Immedi-ately
7074	00	Torque demand value	RO	TPDO	INT16	0.1%	-	0	-	-
7077	00	Torque actual value	RO	TPDO	INT16	0.1%	-	0	-	-
707A	00	Target position	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
707C	00	Home offset	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
707D		Software position limit								
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x02	-	-
	01	Min. position limit	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0x80000000	During running	Immedi-ately
	02	Max. position limit	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0x7FFFFFFF	During running	Immedi-ately
707E	00	Polarity	RW	RPDO	UINT8	-	0–0xFF	0	During running	Immedi-ately

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
707F	00	Max. profile velocity	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x06400000	During running	Immedi-ately
7081	00	Profile velocity	RW	RPDO	UINT32	User -defined velocity unit	0 to 0xFFFFFFFF	0	During running	Immedi-ately
7083	00	Profile acceleration	RW	RPDO	UINT32	Acceleration unit/s^2	0 to 0xFFFFFFFF	0x682AAAA6	During running	Immedi-ately
7084	00	Profile deceleration	RW	RPDO	UINT32	Acceleration unit/s^2	0 to 0xFFFFFFFF	0x682AAAA6	During running	Immedi-ately
6085	00	Quick stop deceleration	RW	RPDO	UINT32	User -defined acceleration unit	0 to 0xFFFFFFFF	0xAD9C71C0	During running	Immedi-ately
7086	00	Motion profile type	RW	RPDO	INT16	-	0x8000 to 0x7FFF	0	During running	Immedi-ately
7087	00	Torque slope	RW	RPDO	UINT32	0.1%/s	0 to 0xFFFFFFFF	0xFFFFFFFF	During running	Immedi-ately
7091	Gear ratio									
	00	Highest sub-index supported	RO	NO	UINT8	Uint8	-	0x02	-	-
	01	Motor revolutions	RW	RPDO	UINT32	-	0 to 0xFFFFFFFF	20-bit encoder: 1 23-bit encoder: 8	During running	Immedi-ately
	02	Shaft revolutions	RW	RPDO	UINT32	-	1–0xFFFFFFFF	1	During running	Immedi-ately
7098	00	Homing method	RW	RPDO	INT8	-	0x01 to 0x023	0x01	During running	Immedi-ately
7099	Homing speeds									
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x02	-	-
	01	Speed during search for switch	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x001AAAAB	During running	Immedi-ately
	02	Speed during search for zero	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x0002AAAB	During running	Immedi-ately
709A	00	Homing acceleration	RW	RPDO	UINT32	Acceleration unit/s2	0 to 0xFFFFFFFF	0x682AAAA6	During running	Immedi-ately
70B0h	00	Position offset	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
70B1h	00	Velocity offset	RW	RPDO	INT32	Velocity unit/s	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
70B2h	00	Torque offset	RW	RPDO	INT16	0.1%	0xF448 to 0x0BB8	0	During running	Immedi-ately
70B8h	00	Touch probe function	RW	RPDO	UINT16	-	0 to 0xFFFF	0	During running	Immedi-ately
70B9h	00	Touch probe status	RW	RPDO	UINT16	-	-	0	-	-
70BAh	00	Touch probe 1 positive edge	RW	RPDO	INT32	Position unit	-	0	-	-

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
70BBh	00	Touch probe 1 negative edge	RW	RPDO	INT32	Position unit	-	0	-	-
70BCh	00	Touch probe 2 positive edge	RW	RPDO	INT32	Position unit	-	0	-	-
70BDh	00	Touch probe 2 negative edge	RW	RPDO	INT32	Position unit	-	0	-	-
70D5h	0x00	Touch probe 1 positive edge counter	RO	RPDO	UINT16	-	-	0	-	-
70D6h	0x00	Touch probe 1 negative edge counter	RO	RPDO	UINT16	-	-	0	-	-
70D7h	0x00	Touch probe 2 positive edge counter	RO	RPDO	UINT16	-	-	0	-	-
70D8h	0x00	Touch probe 2 negative edge counter	RO	RPDO	UINT16	-	-	0	-	-
70E0h	00	Positive torque limit value	RW	RPDO	UINT16	0.1%	0–0x0BB8	0x0BB8	During running	Immedi-ately
70E1h	00	Negative torque limit value	RW	RPDO	UINT16	0.1%	0–0x0BB8	0x0BB8	During running	Immedi-ately
70E3h	Supported homing method									
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x1F	-	-
	01	1st supported homing method	RO	NO	UINT16	-	-	0x0301	-	-
	02	2nd supported homing method	RO	NO	UINT16	-	-	0x0302	-	-
	03	3rd supported homing method	RO	NO	UINT16	-	-	0x0303	-	-
	04	4th supported homing method	RO	NO	UINT16	-	-	0x0304	-	-
	05	5th supported homing method	RO	NO	UINT16	-	-	0x0305	-	-

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
70E3h	06	6th supported homing method	RO	NO	UINT16	-	-	0x0306	-	-
	07	7th supported homing method	RO	NO	UINT16	-	-	0x0307	-	-
	08	8th supported homing method	RO	NO	UINT16	-	-	0x0308	-	-
	09	9th supported homing method	RO	NO	UINT16	-	-	0x0309	-	-
	0A	10th supported homing method	RO	NO	UINT16	-	-	0x030A	-	-
	0B	11th supported homing method	RO	NO	UINT16	-	-	0x030B	-	-
	0C	12th supported homing method	RO	NO	UINT16	-	-	0x030C	-	-
	0D	13th supported homing method	RO	NO	UINT16	-	-	0x030D	-	-
	0E	14th supported homing method	RO	NO	UINT16	-	-	0x030E	-	-
	0F	15th supported homing method	RO	NO	UINT16	-	-	0x030Fh	-	-
	10	16th supported homing method	RO	NO	UINT16	-	-	0x0310	-	-
	11	17th supported homing method	RO	NO	UINT16	-	-	0x0311	-	-
	12	18th supported homing method	RO	NO	UINT16	-	-	0x0312	-	-
	13	19th supported homing method	RO	NO	UINT16	-	-	0x0313	-	-

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
70E3h	14	20th supported homing method	RO	NO	UINT16	-	-	0x0314	-	-
	15	21th supported homing method	RO	NO	UINT16	-	-	0x0315	-	-
	16	22th supported homing method	RO	NO	UINT16	-	-	0x0316	-	-
	17	23th supported homing method	RO	NO	UINT16	-	-	0x0317	-	-
	18	24th supported homing method	RO	NO	UINT16	-	-	0x0318	-	-
	19	25th supported homing method	RO	NO	UINT16	-	-	0x0319	-	-
	1A	26th supported homing method	RO	NO	UINT16	-	-	0x031A	-	-
	1B	27th supported homing method	RO	NO	UINT16	-	-	0x031B	-	-
	1C	28th supported homing method	RO	NO	UINT16	-	-	0x031C	-	-
	1D	29th supported homing method	RO	NO	UINT16	-	-	0x031D	-	-
	1E	30th supported homing method	RO	NO	UINT16	-	-	0x031E	-	-
	1F	31th supported homing method	RO	NO	UINT16	-	-	0x031F	-	-
70E6h	00	Encoder increments for the additional position	RW	NO	UINT16	-	0–1	0	During running	Immediately
70F4h	00	Following error actual value	RO	RPDO	INT32	Position unit	-	-	-	-

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
70FCh	00	Position demand value	RO	TPDO	INT32	Encoder unit	-	-	-	-
70FDh	00	Digital inputs	RO	RPDO	UINT32	-	-	-	-	-
70FEh		Digital outputs								
	00	DO status	RO	NO	UINT8	-	-	0x02	-	-
	01	Physical outputs	RW	RPDO	UINT32	-	0 to 0xFFFFFFFF	0	During running	Immedi-ately
	02	Output mask	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0	During running	Immedi-ately
70FFh	00	Target velocity	RW	RPDO	INT32	Velocity unit/s	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately

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Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
783F	00	Error code	RO	TPDO	UINT16	-	-	-	-	-
7840	00	Control word	RW	RPDO	UINT16	-	0 to 0xFFFF	0	During running	Immedi-ately
7841	00	Status word	RO	TPDO	UINT16	-	-	-	-	-
785A	00	Quick stop option code	RW	NO	INT16	-	0–0x07	0x02	During running	At stop
785C	00	Disable operation option code	RW	NO	INT16	-	0–0x01	0	During running	At stop
785D	00	Stop option code	RW	NO	INT16	-	0x01 to 0x03	0x01	During running	At stop
785E	00	Fault reaction option code	RW	NO	INT16	-	0–0x02	0x02	During running	At stop
7860	00	Modes of operation	RW	RPDO	INT8	-	0 to 0x0A	0	During running	Immedi-ately
7861	00	Modes of operation display	RO	TPDO	INT8	-	-	-	-	-
7862	00	Position demand value	RO	TPDO	INT32	Position unit	-	-	-	-
7863	00	Position actual value*	RO	TPDO	INT32	Encoder unit	-	-	-	-
7864	00	Position actual value	RO	TPDO	INT32	Position unit	-	-	-	-
7865	00	Following error window	RW	RPDO	UINT32	Position unit	0 to 0xFFFFFFFF	0x00300000	During running	Immedi-ately
7866	00	Following error time out	RW	RPDO	UINT32	ms	0 to 0xFFFF	0	During running	Immedi-ately
7867	00	Position window	RW	RPDO	UINT32	Position unit	0 to 0xFFFFFFFF	0x000002DE	During running	Immedi-ately
7868	00	Position window time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immedi-ately

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
786C	00	Velocity actual value	RO	TPDO	INT32	Velocity unit/s	-	-	-	-
786D	00	Velocity window	RW	RPDO	UINT16	RPM	0 to 0xFFFF	0x0A	During running	Immediately
786E	00	Velocity window time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immediately
706F	00	Velocity threshold	RW	RPDO	UINT16	RPM	0 to 0xFFFF	0x0A	During running	Immediately
7870	00	Velocity threshold time	RW	RPDO	UINT16	ms	0 to 0xFFFF	0	During running	Immediately
7871	00	Target torque	RW	RPDO	INT16	0.1%	0xF448 to 0x0BB8	0	During running	Immediately
7872	00	Max. torque	RW	RPDO	UINT16	0.1%	0–0x0BB8	0x0BB8	During running	Immediately
7874	00	Torque demand value	RO	TPDO	INT16	0.1%	-	0	-	-
7877	00	Torque actual value	RO	TPDO	INT16	0.1%	-	0	-	-
787A	00	Target position	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0	During running	Immediately
787C	00	Home offset	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0	During running	Immediately
787D	Software position limit									
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x02	-	-
	01	Min. position limit	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0x80000000	During running	Immediately
	02	Max. position limit	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0x7FFFFFFF	During running	Immediately
787E	00	Polarity	RW	RPDO	UINT8	-	0–0xFF	0	During running	Immediately
787F	00	Max. profile velocity	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x06400000	During running	Immediately
7881	00	Profile velocity	RW	RPDO	UINT32	User-defined velocity unit	0 to 0xFFFFFFFF	0	During running	Immediately
7883	00	Profile acceleration	RW	RPDO	UINT32	Acceleration unit/s^2	0 to 0xFFFFFFFF	0x682AAAA6	During running	Immediately
7884	00	Profile deceleration	RW	RPDO	UINT32	Acceleration unit/s^2	0 to 0xFFFFFFFF	0x682AAAA6	During running	Immediately
7885	00	Quick stop deceleration	RW	RPDO	UINT32	User-defined acceleration unit	0 to 0xFFFFFFFF	0xAD9C71C0	During running	Immediately
7886	00	Motion profile type	RW	RPDO	INT16	-	0x8000 to 0x7FFF	0	During running	Immediately
7887	00	Torque slope	RW	RPDO	UINT32	0.1%/s	0 to 0xFFFFFFFF	0xFFFFFFFF	During running	Immediately
7891	Gear ratio									
	00	Highest sub-index supported	RO	NO	UINT8	Uint8	-	0x02	-	-
	01	Motor revolutions	RW	RPDO	UINT32	-	0 to 0xFFFFFFFF	20-bit encoder: 1 23-bit encoder: 8	During running	Immediately

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
7891	02	Shaft revolutions	RW	RPDO	UINT32	-	1-0xFFFFFFFF	1	During running	Immedi-ately
7898	00	Homing method	RW	RPDO	INT8	-	0x01 to 0x023	0x01	During running	Immedi-ately
7899		Homing speeds								
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x02	-	-
	01	Speed during search for switch	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x001AAAAB	During running	Immedi-ately
	02	Speed during search for zero	RW	RPDO	UINT32	Velocity unit/s	0 to 0xFFFFFFFF	0x0002AAAB	During running	Immedi-ately
789A	00	Homing acceleration	RW	RPDO	UINT32	Acceleration unit/s^2	0 to 0xFFFFFFFF	0x682AAAA6	During running	Immedi-ately
78B0h	00	Position offset	RW	RPDO	INT32	Position unit	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
78B1h	00	Velocity offset	RW	RPDO	INT32	Velocity unit/s	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately
78B2h	00	Torque offset	RW	RPDO	INT16	0.1%	0xF448 to 0x0BB8	0	During running	Immedi-ately
78B8h	00	Touch probe function	RW	RPDO	UINT16	-	0 to 0xFFFF	0	During running	Immedi-ately
78B9h	00	Touch probe status	RW	RPDO	UINT16	-	-	0	-	-
78BAh	00	Touch probe 1 positive edge	RW	RPDO	INT32	Position unit	-	0	-	-
78BBh	00	Touch probe 1 negative edge	RW	RPDO	INT32	Position unit	-	0	-	-
78BCh	00	Touch probe 2 positive edge	RW	RPDO	INT32	Position unit	-	0	-	-
78BDh	00	Touch probe 2 negative edge	RW	RPDO	INT32	Position unit	-	0	-	-
78D5h	0x00	Touch probe 1 positive edge counter	RO	RPDO	UINT16	-	-	0	-	-
78D6h	0x00	Touch probe 1 negative edge counter	RO	RPDO	UINT16	-	-	0	-	-
78D7h	0x00	Touch probe 2 positive edge counter	RO	RPDO	UINT16	-	-	0	-	-
78D8h	0x00	Touch probe 2 negative edge counter	RO	RPDO	UINT16	-	-	0	-	-

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
78E0h	00	Positive torque limit value	RW	RPDO	UINT16	0.1%	0–0x0BB8	0x0BB8	During running	Immediately
78E1h	00	Negative torque limit value	RW	RPDO	UINT16	0.1%	0–0x0BB8	0x0BB8	During running	Immediately
78E3h		Supported homing method								
	00	Highest sub-index supported	RO	NO	UINT8	-	-	0x1F	-	-
	01	1st supported homing method	RO	NO	UINT16	-	-	0x0301	-	-
	02	2nd supported homing method	RO	NO	UINT16	-	-	0x0302	-	-
	03	3rd supported homing method	RO	NO	UINT16	-	-	0x0303	-	-
	04	4th supported homing method	RO	NO	UINT16	-	-	0x0304	-	-
	05	5th supported homing method	RO	NO	UINT16	-	-	0x0305	-	-
	06	6th supported homing method	RO	NO	UINT16	-	-	0x0306	-	-
	07	7th supported homing method	RO	NO	UINT16	-	-	0x0307	-	-
	08	8th supported homing method	RO	NO	UINT16	-	-	0x0308	-	-
	09	9th supported homing method	RO	NO	UINT16	-	-	0x0309	-	-
	0A	10th supported homing method	RO	NO	UINT16	-	-	0x030A	-	-
	0B	11th supported homing method	RO	NO	UINT16	-	-	0x030B	-	-
	0C	12th supported homing method	RO	NO	UINT16	-	-	0x030C	-	-

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
78E3h	0D	13th supported homing method	RO	NO	UINT16	-	-	0x030D	-	-
	0E	14th supported homing method	RO	NO	UINT16	-	-	0x030E	-	-
	0F	15th supported homing method	RO	NO	UINT16	-	-	0x030Fh	-	-
	10	16th supported homing method	RO	NO	UINT16	-	-	0x0310	-	-
	11	17th supported homing method	RO	NO	UINT16	-	-	0x0311	-	-
	12	18th supported homing method	RO	NO	UINT16	-	-	0x0312	-	-
	13	19th supported homing method	RO	NO	UINT16	-	-	0x0313	-	-
	14	20th supported homing method	RO	NO	UINT16	-	-	0x0314	-	-
	15	21th supported homing method	RO	NO	UINT16	-	-	0x0315	-	-
	16	22th supported homing method	RO	NO	UINT16	-	-	0x0316	-	-
	17	23th supported homing method	RO	NO	UINT16	-	-	0x0317	-	-
	18	24th supported homing method	RO	NO	UINT16	-	-	0x0318	-	-
	19	25th supported homing method	RO	NO	UINT16	-	-	0x0319	-	-
	1A	26th supported homing method	RO	NO	UINT16	-	-	0x031A	-	-

Index (Hex)	Sub-index (Hex)	Name	Access	PDO Mapping	Data Type	Unit	Data Range	Default	Change Condition	Effective Time
78E3h	1B	27th supported homing method	RO	NO	UINT16	-	-	0x031B	-	-
	1C	28th supported homing method	RO	NO	UINT16	-	-	0x031C	-	-
	1D	29th supported homing method	RO	NO	UINT16	-	-	0x031D	-	-
	1E	30th supported homing method	RO	NO	UINT16	-	-	0x031E	-	-
	1F	31th supported homing method	RO	NO	UINT16	-	-	0x031F	-	-
78E6h	00	Encoder increments for the additional position	RW	NO	UINT16	-	0–1	0	During running	Immedi-ately
78F4h	00	Following error actual value	RO	RPDO	INT32	Position unit	-	-	-	-
78FCh	00	Position demand value	RO	TPDO	INT32	Encoder unit	-	-	-	-
78FDh	00	Digital inputs	RO	RPDO	UINT32	-	-	-	-	-
78FEh	Digital outputs									
	00	DO status	RO	NO	UINT8	-	-	0x02	-	-
	01	Physical outputs	RW	RPDO	UINT32	-	0 to 0xFFFFFFFF	0	During running	Immedi-ately
	02	Output mask	RW	NO	UINT32	-	0 to 0xFFFFFFFF	0	During running	Immedi-ately
78FFh	00	Target velocity	RW	RPDO	INT32	Velocity unit/s	0x80000000 to 0x7FFFFFFF	0	During running	Immedi-ately

Object Group 2000h

■ Parameters of axis 1

Para. Group Hex. Group	Index Code	Dec. Para. No.	Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
2000h/H00 Servo Motor Parameters										
2000	01h	H00-00	Motor code		0 to 65535	14000	1	16 bits	At stop	Next power-on
	03h	H00-02	Customized motor code		0 to 0xFFFFFFFF	0	1	32 bits	-	-
	05h	H00-04	Encoder version No.		0 to 65535	0	0.1	16 bits	-	-
	06h	H00-05	Serial encoder motor code		0 to 65535	0	1	16 bits	-	-
	09h	H00-08	Serial encoder type		0 to 65535	0	1	16 bits	At stop	Next power-on
	0Ah	H00-09	Rated voltage	0: 220 V 1: 380 V	0 to 1	0	1	16 bits	At stop	Next power-on
	0Bh	H00-10	Rated power		1 to 65535	75	0.01 kW	16 bits	At stop	Next power-on
	0Ch	H00-11	Rated current		1 to 65535	470	0.01 A	16 bits	At stop	Next power-on
	0Dh	H00-12	Rated torque		10 to 65535	239	0.01 N m	16 bits	At stop	Next power-on
	0Eh	H00-13	Maximum torque		10 to 65535	716	0.01 N m	16 bits	At stop	Next power-on
	0Fh	H00-14	Rated speed		100 to 6000	3000	1 RPM	16 bits	At stop	Next power-on
	10h	H00-15	Maximum motor speed		100 to 6000	6000	1 RPM	16 bits	At stop	Next power-on
	11h	H00-16	Moment of inertia		1 to 65535	130	0.01 $kgcm^2$	16 bits	At stop	Next power-on
	12h	H00-17	Number of pole pairs of PMSM		2 to 360	5	1	16 bits	At stop	Next power-on
	13h	H00-18	Stator resistance		1 to 65535	500	0.001 Ω	16 bits	At stop	Next power-on
	14h	H00-19	Stator inductance Lq		1 to 65535	327	0.01 mH	16 bits	At stop	Next power-on
	15h	H00-20	Stator inductance Ld		1 to 65535	387	0.01 mH	16 bits	At stop	Next power-on
	16h	H00-21	Linear back EMF coefficient		1 to 65535	3330	0.01 mV/ RPM	16 bits	At stop	Next power-on
	17h	H00-22	Torque coefficient Kt		1 to 65535	51	0.01 N m/ Arms	16 bits	At stop	Next power-on
	18h	H00-23	Electrical constant Te		1 to 65535	654	0.01 ms	16 bits	At stop	Next power-on
	19h	H00-24	Mechanical constant Tm		1 to 65535	24	0.01 ms	16 bits	At stop	Next power-on
	1Dh	H00-28	Position offset of absolute encoder		0 to 4294967295	8192	1	32 bits	At stop	Next power-on

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2000	1Fh	H00-30	Encoder selection (Hex)	19: Inovance 20-bit serial encoder	0 to 0x0FFF	0x0013	1	16 bits	At stop	Next power-on
2000	20h	H00-31	PPR of encoder		1 to 1073741824	8388608	1 PPR	32 bits	At stop	Next power-on
2000	22h	H00-33	Electrical angle of Z signal		0 to 3600	1800	0.1°	16 bits	At stop	Next power-on
2000	26h	H00-37	Absolute encoder function setting bit		0 to 0xFFFF	0	1	16 bits	At stop	Next power-on
2001h/H01: Servo Drive Parameters										
2001	01h	H01-00	MCU software version		0 to 65535	0	0.1	16 bits	-	-
2001	02h	H01-01	FPGA software version		0 to 65535	0	0.1	16 bits	-	-
2001	03h	H01-02	FPGA customized No.		0 to 65535	0	0.1	16 bits	-	-
2001	04h	H01-03	CPU0 software version No.		0 to 65535	0	0.1	16 bits	-	-
2001	05h	H01-04	CPU1 software version No.		0 to 65535	0	0.1	16 bits	-	-
2001	08h	H01-07	Software test version No.		0 to 65535	0	0.01	16 bits	-	-
2001	0Bh	H01-10	Drive unit series number	3: S2R8 5: S4R8 60002: S1R6 hardware (customized) 60003: S2R8 hardware (customized) 60005: S4R8 hardware (customized)	0 to 65535	3	1	16 bits	At stop	Next power-on
2001	0Ch	H01-11	Voltage class of the drive unit		0 to 65535	220	1 V	16 bits	-	-
2001	0Dh	H01-12	Rated power of the drive unit		0 to 1073741824	40	0.01 kW	32 bits	-	-
2001	0Fh	H01-14	Maximum output power of the drive unit		0 to 1073741824	40	0.01 kW	32 bits	-	-
2001	11h	H01-16	Rated output current of the drive unit		0 to 1073741824	280	0.01 A	32 bits	-	-
2001	13h	H01-18	Maximum output current of the drive unit		0 to 1073741824	1010	0.01 A	32 bits	-	-
2001	15h	H01-20	Carrier frequency		4000 to 20000	8000	1 Hz	16 bits	At stop	Next power-on
2001	16h	H01-21	Dead zone time		1 to 2000	200	0.01 μs	16 bits	At stop	Next power-on

Para. Group Hex. Group	Hex. Index Code	Dec. Para. No.	Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
2001	17h	H01-22	D-axis coupling voltage compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immedi-ately
	18h	H01-23	Q-axis back EMF compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immedi-ately
	19h	H01-24	D-axis current loop gain		0 to 20000	500	1 Hz	16 bits	During running	Immedi-ately
	1Ah	H01-25	D-axis current loop integral compensation factor		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	1Bh	H01-26	Current sampling Sinc3 filter data extraction rate	0: Extraction rate 32 1: Extraction rate 64 2: Extraction rate 128 3: Extraction rate 256	0 to 3	0	1	16 bits	At stop	Next power-on
	1Ch	H01-27	Q-axis current loop gain		0 to 20000	500	1 Hz	16 bits	During running	Immedi-ately
	1Dh	H01-28	Q-axis current loop integral compensation factor		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	1Eh	H01-29	Q-axis coupling voltage compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immedi-ately
	1Fh	H01-30	Bus voltage gain tuning		500 to 1500	1000	0.1%	16 bits	At stop	Next power-on
	20h	H01-31	Minimum turn-on time of bootstrap circuit lower bridge		0 to 200	50	0.1 μs	16 bits	At stop	Next power-on
	21h	H01-32	Relative gain of UV sampling		1 to 65535	32768	1	16 bits	At stop	Next power-on
	23h	H01-34	IGBT over-temperature threshold		0 to 1500	950	0.1°C	16 bits	During running	Immedi-ately
	25h	H01-36	Current sensor range		0 to 999999	2083	0.01 A	32 bits	At stop	Next power-on
	27h	H01-38	FPGA phase current protection threshold		0 to 1000	900	0.1%	16 bits	At stop	Next power-on
	29h	H01-40	DC bus overvoltage protection threshold		0 to 2000	420	1 V	16 bits	-	-
	2Ah	H01-41	DC bus voltage discharge threshold		0 to 2000	380	1 V	16 bits	At stop	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2001	2Bh	H01-42	DC bus undervoltage threshold		0 to 2000	200	1 V	16 bits	At stop	Immedi-ately
	2Ch	H01-43	Power supply unit series No.	1: 1 kW 2: 2 kW	1 to 2	1	1	16 bits	At stop	Next power-on
	2Dh	H01-44	Output power of the power supply unit		0 to 1073741824	100	0.01 kW	32 bits	-	-
	2Fh	H01-46	Maximum output power of the power supply unit		0 to 1073741824	150	0.01 kW	32 bits	-	-
	31h	H01-48	Rated output current of the power supply unit		0 to 1073741824	320	0.01 A	32 bits	-	-
	33h	H01-50	Over-temperature threshold of the power supply module		0 to 1500	800	0.1°C	16 bits	During running	Immedi-ately
	35h	H01-52	D-axis proportional gain in performance priority mode		0 to 20000	2000	1 Hz	16 bits	During running	Immedi-ately
	36h	H01-53	D-axis integral gain in performance priority mode		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	37h	H01-54	Q-axis proportional gain in performance priority mode		0 to 20000	2000	1 Hz	16 bits	During running	Immedi-ately
	38h	H01-55	Q-axis integral gain in performance priority mode		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	39h	H01-56	Current loop low-pass cutoff frequency		0 to 65535	11000	1 Hz	16 bits	At stop	Next power-on
	3Ah	H01-57	Maximum output current of the power supply unit		0 to 1073741824	480	0.01 A	32 bits	-	-
	3Ch	H01-59	Serial encoder data transmission compensation time		0 to 2000	0	0.001 µs	16 bits	At stop	Next power-on
	3Dh	H01-60	FPGA scheduling frequency selection	0: 32 kHz 1: 16 kHz	0 to 1	1	1	16 bits	At stop	Next power-on

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2001	3Eh	H01-61	Command scheduling frequency selection	0: 4 kHz 1: 2 kHz 2: 1 kHz	0 to 2	2	1	16 bits	At stop	Next power-on
	48h	H01-71	Voltage class of the power supply unit		0 to 65535	220	1 V	16 bits	-	-
2002h/H02 Basic Control Parameters										
2002	01h	H02-00	Control mode selection	0: Speed mode 1: Position mode 2: Torque mode 9: EtherCAT mode 255: This axis is not used.	0 to 255	9	1	16 bits	At stop	Immedi-ately
	02h	H02-01	Absolute system selection	0: Incremental mode 1: Absolute position linear mode 2: Absolute position rotation mode	0 to 2	0	1	16 bits	At stop	Next power-on
	03h	H02-02	Rotation direction	0: CCW direction as the forward direction 1: CW direction as the forward direction	0 to 1	0	1	16 bits	At stop	Next power-on
	08h	H02-07	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	0 to 2	1	1	16 bits	At stop	Immedi-ately
	09h	H02-08	Stop mode at No.1 fault	0: Coast to stop, keeping de-energized state 1: DB Stop, keeping de-energized state 2: DB Stop, keeping DB state	0 to 2	0	1	16 bits	At stop	Immedi-ately
	0Ah	H02-09	Delay from brake output ON to command received		0 to 500	250	1 ms	16 bits	During running	Immedi-ately
	0Bh	H02-10	Delay from brake output OFF to motor de-energized		50 to 1000	150	1 ms	16 bits	During running	Immedi-ately
	0Ch	H02-11	Motor speed threshold at brake output OFF in rotation state		20–3000	30	1 RPM	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2002	0Dh	H02-12	Delay from S-ON OFF to brake output OFF in rotation state		1 to 1000	500	1 ms	16 bits	During running	Immedi-ately
	10h	H02-15	Warning display on the keypad	0: Output warning information Immediately 1: Not output warning information	0 to 1	0	1	16 bits	At stop	Immedi-ately
	11h	H02-16	Brake switch	0: OFF 1: ON	0 to 1	0	1	16 bits	At stop	Immedi-ately
	16h	H02-21	Permissible minimum resistance of regenerative resistor		1 to 1000	40	1 Ω	16 bits	-	-
	19h	H02-24	Heat dissipation coefficient of the resistor		10 to 100	30	0.01%	16 bits	At stop	Immedi-ately
	1Ah	H02-25	Regenerative resistor selection	1: External, naturally ventilated 2: External, forced air cooling 3: No regenerative resistor needed	1 to 3	3	1	16 bits	At stop	Immedi-ately
	1Bh	H02-26	Power of external regenerative resistor		1 to 65535	40	1 kW	16 bits	At stop	Immedi-ately
	1Ch	H02-27	Resistance of external regenerative resistor		1 to 1000	50	1 Ω	16 bits	At stop	Immedi-ately
	1Fh	H02-30	User password		0 to 65535	0	1	16 bits	During running	Immedi-ately
	20h	H02-31	System parameter initialization	0: No operation 1: Restore default settings 2: Clear fault records	0 to 2	0	1	16 bits	At stop	Immedi-ately
	21h	H02-32	Selection of parameters in group H0B		0 to 99	50	1	16 bits	During running	Immedi-ately
	24h	H02-35	Keypad data refresh frequency		0 to 20	0	1 Hz	16 bits	During running	Immedi-ately
	2Ah	H02-41	Factory password		0 to 65535	0	1	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2003h/H03 Terminal Input Parameters										
2003	03h	H03-02	DI1 function selection	Consisting of three digits, with the first one (from left to right) indicating the axis number and the last two indicating the function. The last two digits are defined as follows: 0: No definition 01: S-ON 14: Positive limit switch 15: Negative limit switch 31: Home switch 38: Touch probe 1 39: Touch probe 2	0 to 65535	0	1	16 bits	During running	At stop
	04h	H03-03	DI1 logic selection	0: Active low 1: Active high 2: Rising edge-triggered 3: Falling edge-triggered 4: Rising/Falling edge-triggered	0 to 4	0	1	16 bits	During running	At stop
	05h	H03-04	DI2 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	06h	H03-05	DI2 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	07h	H03-06	DI3 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	08h	H03-07	DI3 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	09h	H03-08	DI4 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ah	H03-09	DI4 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	0Bh	H03-10	DI5 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ch	H03-11	DI5 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	0Dh	H03-12	DI6 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Eh	H03-13	DI6 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2003	0Fh	H03-14	DI7 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	10h	H03-15	DI7 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	11h	H03-16	DI8 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	12h	H03-17	DI8 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	13h	H03-18	DI9 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	14h	H03-19	DI9 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	15h	H03-20	DI10 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	16h	H03-21	DI10 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	17h	H03-22	DI11 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	18h	H03-23	DI11 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	19h	H03-24	DI12 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Ah	H03-25	DI12 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	1Bh	H03-26	DI13 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Ch	H03-27	DI13 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	1Dh	H03-28	DI14 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Eh	H03-29	DI14 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	1Fh	H03-30	DI15 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	20h	H03-31	DI15 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	21h	H03-32	DI16 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2003	22h	H03-33	DI16 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	23h	H03-34	DI17 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	24h	H03-35	DI17 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	25h	H03-36	DI18 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	26h	H03-37	DI18 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	27h	H03-38	DI19 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	28h	H03-39	DI19 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	29h	H03-40	DI20 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	2Ah	H03-41	DI20 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Bh	H03-42	DI21 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	2Ch	H03-43	DI21 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Dh	H03-44	DI22 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	2Eh	H03-45	DI22 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Fh	H03-46	DI23 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	30h	H03-47	DI23 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	31h	H03-48	DI24 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	32h	H03-49	DI24 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2004h/H04 Terminal Output Parameters										
2004	01h	H04-00	DO1 function selection	Consisting of three digits, with the first one (from left to right) indicating the axis number and the last two indicating the terminal function. The last two digits are defined as follows: 0: No definition 01: Servo ready 02: Motor rotating 10: Warning 11: Fault	0 to 65535	0	1	16 bits	During running	At stop
2004	02h	H04-01	DO1 logic selection	0: Output low (L) level upon valid logic (optocoupler ON) 1: Output high (H) level upon valid logic (optocoupler OFF)	0 to 1	0	1	16 bits	During running	At stop
2004	03h	H04-02	DO2 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
2004	04h	H04-03	DO2 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
2004	5h	H04-04	DO3 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
2004	6h	H04-05	DO3 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
2004	7h	H04-06	DO4 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
2004	8h	H04-07	DO4 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
2004	9h	H04-08	DO5 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
2004	0Ah	H04-09	DO5 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
2004	0Bh	H04-10	DO6 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
2004	0Ch	H04-11	DO6 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
2005h/H05 Position Control parameters										
2005	05h	H05-04	First-order low-pass filter time constant		0 to 65535	0	0.1 ms	16 bits	At stop	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2005	07h	H05-06	Moving average filter time constant		0 to 1280	0	0.1 ms	16 bits	At stop	Immedi-ately
	14h	H05-19	Speed feedforward control	0: No speed feedforward 1: Internal speed feedforward 2: 60B1 used as speed feedforward	0 to 2	1	1	16 bits	At stop	Immedi-ately
	24h	H05-35	Duration limit of homing		0 to 65535	50000	0.01s	16 bits	During running	Immedi-ately
	2Fh	H05-46	Position offset in absolute position linear mode (low 32 bits)		0 to 4294967295	0	1	32 bits	At stop	Next power-on
	31h	H05-48	Position offset in absolute position linear mode (high 32 bits)		–2147483648 to +2147483647	0	1	32 bits	At stop	Next power-on
	33h	H05-50	Mechanical gear ratio (numerator)		1 to 65535	1	1	16 bits	At stop	Immedi-ately
	34h	H05-51	Mechanical gear ratio (denominator)		1 to 65535	1	1	16 bits	At stop	Immedi-ately
	35h	H05-52	Pulses per load revolution in absolute position rotation mode (low 32 bits)		0 to 4294967295	0	1 p	32 bits	At stop	Immedi-ately
	37h	H05-54	Pulses per load revolution in absolute position rotation mode (high 32 bits)		0 to 128	0	1 p	32 bits	At stop	Immedi-ately
2006h/H06 Speed Control Parameters										
2006	03h	H06-02	Speed reference source	0: Keypad 1: Multi-speed reference	0 to 1	0	1	16 bits	At stop	Immedi-ately
	04h	H06-03	Speed reference		–6000 to +6000	200	1 RPM	16 bits	During running	Immedi-ately
	06h	H06-05	Acceleration ramp time of speed reference		0 to 65535	0	1 RPM	16 bits	During running	Immedi-ately
	07h	H06-06	Deceleration ramp time of speed reference		0 to 65535	0	1 RPM	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2006	09h	H06-08	Forward speed limit		0 to 6000	6000	1 RPM	16 bits	During running	Immedi-ately
	0Ah	H06-09	Reverse speed limit		0 to 6000	6000	1 RPM	16 bits	During running	Immedi-ately
	0Ch	H06-11	Torque feedforward control	0: No torque feedforward 1: Internal torque feedforward 2: 60B2 used as external torque feedforward	0 to 2	1	1	16 bits	During running	Immedi-ately
	0Dh	H06-12	Acceleration ramp time of jog speed		0 to 65535	10	1 ms	16 bits	During running	Immedi-ately
	11h	H06-16	Motor speed threshold		0 to 1000	20	1 RPM	16 bits	During running	Immedi-ately
2007h/H07 Torque Control Parameters										
2007	04h	H07-03	Torque reference set through keypad		–4000 to +4000	0	0.1%	16 bits	During running	Immedi-ately
	06h	H07-05	Torque reference filter time constant		0 to 3000	79	0.01 ms	16 bits	During running	Immedi-ately
	07h	H07-06	2nd torque reference filter time constant		0 to 3000	79	0.01 ms	16 bits	During running	Immedi-ately
	0Ah	H07-09	Internal forward torque limit		0 to 4000	3000	0.1%	16 bits	During running	Immedi-ately
	0Bh	H07-10	Internal reverse torque limit		0 to 4000	3000	0.1%	16 bits	During running	Immedi-ately
	10h	H07-15	Emergency stop torque		0 to 4000	1000	0.1%	16 bits	During running	Immedi-ately
	14h	H07-19	Internal speed limit in torque control		0 to 6000	3000	1 RPM	16 bits	During running	Immedi-ately
	15h	H07-20	Internal reverse speed limit in torque control		0 to 6000	3000	1 RPM	16 bits	During running	Immedi-ately
	16h	H07-21	Reference value for torque reached		0 to 4000	0	0.1%	16 bits	During running	Immedi-ately
	17h	H07-22	Torque output when torque reached DO signal turned on		0 to 4000	200	0.1%	16 bits	During running	Immedi-ately
	18h	H07-23	Torque output when torque reached DO signal turned off		0 to 4000	100	0.1%	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2007	27h	H07-38	Torque reference filter selection	0: First-order low-pass filter 1: Biquad low-pass filter	0 to 1	0	1	16 bits	During running	Immedi-ately
2007	28h	H07-39	Attenuation ratio of biquad low-pass filter		0 to 50	0	1	16 bits	At stop	Immedi-ately
2008h/H08 Gain Parameters										
2008	01h	H08-00	Speed loop gain		1 to 20000	250	0.1 Hz	16 bits	During running	Immedi-ately
2008	02h	H08-01	Speed loop integral time constant		15 to 51200	3183	0.01 ms	16 bits	During running	Immedi-ately
2008	03h	H08-02	Position loop gain		0 to 20000	400	0.1 Hz	16 bits	During running	Immedi-ately
2008	04h	H08-03	2nd speed loop gain		1 to 20000	400	0.1 Hz	16 bits	During running	Immedi-ately
2008	05h	H08-04	2nd speed loop integral time constant		15 to 51200	2000	0.01 ms	16 bits	During running	Immedi-ately
2008	06h	H08-05	2nd position loop gain		0 to 20000	640	0.1 Hz	16 bits	During running	Immedi-ately
2008	09h	H08-08	2nd gain mode	0: Fixed at the 1st gain, P/PI switchover performed through bit26 of 60FE 1: Switchover between the 1st gain and 2nd gain activated based on the condition defined by H08-09	0 to 1	1	1	16 bits	During running	Immedi-ately
2008	0Ah	H08-09	Gain switchover condition	0: Fixed at the 1st gain (PS) 2: Torque reference value too large (PS) 3: Speed reference value too large (PS) 4: Speed reference change rate too large (PS) 5: Threshold of speed reference (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 to 10	0	1	16 bits	During running	Immedi-ately
2008	0Bh	H08-10	Gain switchover delay		0 to 10000	50	0.1 ms	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2008	0Ch	H08-11	Gain switchover level		0 to 20000	50	1	16 bits	During running	Immedi-ately
	0Dh	H08-12	Gain switchover hysteresis		0 to 20000	30	1	16 bits	During running	Immedi-ately
	0Eh	H08-13	Position gain switchover time		0 to 10000	30	0.1 ms	16 bits	During running	Immedi-ately
	10h	H08-15	Load inertia ratio		0 to 12000	100	0.01	16 bits	During running	Immedi-ately
	13h	H08-18	Speed feedforward filter time constant		0 to 6400	50	0.01 ms	16 bits	During running	Immedi-ately
	14h	H08-19	Speed feedforward gain		0 to 1000	0	0.1%	16 bits	During running	Immedi-ately
	15h	H08-20	Torque feedforward filter time constant		0 to 6400	50	0.01 ms	16 bits	During running	Immedi-ately
	16h	H08-21	Torque feedforward gain		0 to 2000	0	0.1%	16 bits	During running	Immedi-ately
	17h	H08-22	Speed feedback filter selection	0: Average filtering of speed feedback inhibited 1: 2 times of average filtering of speed feedback 2: 4 times of average filtering of speed feedback 3: 8 times of average filtering of speed feedback 4: 16 times of average filtering of speed feedback	0 to 4	0	1	16 bits	At stop	Immedi-ately
	18h	H08-23	Cutoff frequency of speed feedback low-pass filter		100 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	19h	H08-24	PDFF control coefficient		0 to 1000	1000	0.1%	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2009h/H09 Gain auto-tuning parameters										
2009	01h	H09-00	Gain auto-tuning mode	0: Disabled, gain parameters adjusted manually 1: Standard gain auto-tuning mode, gain parameters adjusted automatically based on the stiffness level 2: Positioning mode, gain parameters adjusted automatically based on the stiffness level 3: Gain auto-tuning with friction compensation 4: Positioning mode with friction compensation	0 to 4	0	1	16 bits	During running	Immedi-ately
	02h	H09-01	Stiffness level		0 to 31	12	1	16 bits	During running	Immedi-ately
	03h	H09-02	Adaptive notch mode	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, parameters of 3rd and 4th notches restored to default values	0 to 4	0	1	16 bits	During running	Immedi-ately
	04h	H09-03	Online inertia auto-tuning mode	0: Online auto-tuning disabled 1: Online auto-tuning enabled, changing slowly 2: Online auto-tuning enabled, changing normally 3: Online auto-tuning enabled, changing quickly	0 to 3	0	1	16 bits	During running	Immedi-ately
	05h	H09-04	Low-frequency resonance suppression mode	0: Manually set parameters of low-frequency resonance suppression filter 1: Automatically set parameters of low-frequency resonance suppression filter	0 to 1	0	1	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2009	06h	H09-05	Offline inertia auto-tuning mode	0: Positive and negative triangular wave mode 1: JOG mode	0 to 1	0	1	16 bits	At stop	Immediately
	07h	H09-06	Maximum speed of inertia auto-tuning		100 to 1000	500	1 RPM	16 bits	At stop	Immediately
	08h	H09-07	Time constant for accelerating to the maximum speed during inertia auto-tuning		20 to 800	125	1 ms	16 bits	At stop	Immediately
	09h	H09-08	Inertia auto-tuning interval		50 to 10000	800	1 ms	16 bits	At stop	Immediately
	0Ah	H09-09	Number of motor revolutions per inertia auto-tuning		0 to 65535	0	0.01	16 bits	-	-
	0Dh	H09-12	Frequency of the 1st notch		50 to 4000	4000	1 Hz	16 bits	During running	Immediately
	0Eh	H09-13	Width level of the 1st notch		0 to 20	2	1	16 bits	During running	Immediately
	0Fh	H09-14	Depth level of the 1st notch		0 to 99	0	1	16 bits	During running	Immediately
	10h	H09-15	Frequency of the 2nd notch		50 to 4000	4000	1 Hz	16 bits	During running	Immediately
	11h	H09-16	Width level of the 2nd notch		0 to 20	2	1	16 bits	During running	Immediately
	12h	H09-17	Depth level of the 2nd notch		0 to 99	0	1	16 bits	During running	Immediately
	13h	H09-18	Frequency of the 3rd notch		50 to 4000	4000	1 Hz	16 bits	During running	Immediately
	14h	H09-19	Width level of the 3rd notch		0 to 20	2	1	16 bits	During running	Immediately
	15h	H09-20	Depth level of the 3rd notch		0 to 99	0	1	16 bits	During running	Immediately
	16h	H09-21	Frequency of the 4th notch		50 to 4000	4000	1 Hz	16 bits	During running	Immediately
	17h	H09-22	Width level of the 4th notch		0 to 20	2	1	16 bits	During running	Immediately
	18h	H09-23	Depth level of the 4th notch		0 to 99	0	1	16 bits	During running	Immediately
	19h	H09-24	Auto-tuned resonance frequency		0 to 2000	0	1 Hz	16 bits	-	-
	1Fh	H09-30	Torque disturbance compensation gain		–1000 to +1000	0	0.1%	16 bits	During running	Immediately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2009	20h	H09-31	Filter time constant of torque disturbance observer		0 to 2500	50	0.01 ms	16 bits	During running	Immedi-ately
	21h	H09-32	Constant torque compensation value		–1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	22h	H09-33	Forward friction compensation value		–1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	23h	H09-34	Reverse friction compensation value		–1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	27h	H09-38	Frequency of low-frequency resonance		10 to 1000	1000	0.1 Hz	16 bits	During running	Immedi-ately
	28h	H09-39	Low-frequency resonance frequency filter		0 to 10	2	1	16 bits	At stop	Immedi-ately
200Ah/H0A Fault and Protection Parameters										
200A	01h	H0A-00	Power input phase loss protection	0: Enable phase loss fault and inhibit phase loss warning 1: Enable phase loss fault and warning 2: Inhibit phase loss fault and warning	0 to 2	0	1	16 bits	During running	Immedi-ately
	02h	H0A-01	Absolute position limit	0: Disable absolute position limit 1: Enable absolute position limit 2: Enable absolute position limit after homing	0 to 2	0	1	16 bits	At stop	Immedi-ately
	04h	H0A-03	Power-off memory selection	0: Disable power-off memory 1: Enable power-off memory 2: Disable power-off memory and hide control power undervoltage fault	0 to 2	0	1	16 bits	During running	Immedi-ately
	05h	H0A-04	Motor overload protection gain		50 to 300	100	1	16 bits	At stop	Immedi-ately
	07h	H0A-06	Motor overload level		0 to 400	0	1	16 bits	At stop	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
200A	08h	H0A-07	UVW phase sequence auto-tuning selection	0: Not perform UVW phase sequence auto-tuning during angle auto-tuning 1: Perform UVW phase sequence auto-tuning during angle auto-tuning	0 to 1	1	1	16 bits	During running	Immedi-ately
	09h	H0A-08	Overspeed threshold		0 to 10000	0	1 RPM	16 bits	During running	Immedi-ately
	0Dh	H0A-12	Runaway protection	0: Disable 1: Enable	0 to 1	1	1	16 bits	During running	Immedi-ately
	0Eh	H0A-13	Initial angle auto-tuning mode	0: Auto-tuning with Z signal 1: Jog auto-tuning without Z signal 2: Auto-tuning of voltage input 3: Angle auto-tuning of voltage input with Z signal	0 to 3	0	1	16 bits	At stop	Immedi-ately
	10h	H0A-15	Motor rotation threshold		1 to 1000	5	1 RPM	16 bits	During running	Immedi-ately
	11h	H0A-16	Threshold for low-frequency resonance position deviation		1 to 1000	5	1 p	16 bits	During running	Immedi-ately
	14h	H0A-19	Filter time constant of touch probe 1		0 to 630	200	1 μs	16 bits	During running	Immedi-ately
	15h	H0A-20	Filter time constant of touch probe 2		0 to 630	200	1 μs	16 bits	During running	Immedi-ately
	17h	H0A-22	Sigma_Delta filter time		0 to 3	1	1	16 bits	At stop	Next power-on
	18h	H0A-23	TZ signal filter time		0 to 31	15	125 ns	16 bits	At stop	Next power-on
	1Ah	H0A-25	Filter time constant of displayed speed feedback		0 to 5000	50	1 ms	16 bits	At stop	Immedi-ately
	1Bh	H0A-26	Motor overload selection	0: Not hide motor overload warning (Er.909) and fault (Er.620) 1: Hide motor overload warning (Er.909) and fault (Er.620)	0 to 1	0	1	16 bits	At stop	Immedi-ately
	21h	H0A-32	Time window of locked rotor over-temperature protection		10 to 65535	200	1 ms	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
200A	22h	H0A-33	Locked rotor over-temperature protection	0: Shielded 1: Enabled	0 to 1	1	1	16 bits	During running	Immedi-ately
	25h	H0A-36	Encoder multi-turn overflow fault	0: Not hide 1: Hide	0 to 1	0	1	16 bits	At stop	Immedi-ately
	26h	H0A-37	Inverter card model identification	0: Not hide 1: Hide	0 to 1	0	1	16 bits	At stop	Immedi-ately
200Bh/H0B Monitoring Parameters										
200B	01h	H0B-00	Actual motor speed		–9999 to +9999	0	1 RPM	16 bits	-	-
	02h	H0B-01	Speed reference		–9999 to +9999	0	1 RPM	16 bits	-	-
	03h	H0B-02	Internal torque reference		–4000 to +4000	0	0.1%	16 bits	-	-
	04h	H0B-03	Monitored DI status		0 to 0x00FFFFFF	0	1	32 bits	-	-
	06h	H0B-05	Monitored DO status		0 to 0xFFFF	0	1	16 bits	-	-
	08h	H0B-07	Absolute position counter		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	0Ah	H0B-09	Mechanical angle		0 to 3600	0	0.1°	16 bits	-	-
	0Bh	H0B-10	Electrical angle		0 to 3600	0	0.1°	16 bits	-	-
	0Dh	H0B-12	Average load ratio		0 to 65535	0	0.1%	16 bits	-	-
	10h	H0B-15	Position following deviation (encoder unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	12h	H0B-17	Feedback pulse counter		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	14h	H0B-19	Total power-on time		0 to 4294967295	0	0.1s	32 bits	-	-
	19h	H0B-24	RMS value of phase current		0 to 65535	0	0.01 A	32 bits	-	-
	1Bh	H0B-26	Bus voltage		0 to 65535	0	0.1 V	16 bits	-	-
	1Ch	H0B-27	Power module temperature		0 to 65535	0	1°C	16 bits	-	-
	1Dh	H0B-28	Absolute encoder fault information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-
	1Eh	H0B-29	System status information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
200B	1Fh	H0B-30	System fault information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-
	20h	H0B-31	Encoder fault information		0 to 0xFFFF	0	1	16 bits	-	-
	22h	H0B-33	Fault log		0 to 9	0	1	16 bits	During running	Immedi-ately
	23h	H0B-34	Fault code of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	24h	H0B-35	Time stamp upon occurrence of the selected fault		0 to 4294967295	0	0.1s	32 bits	-	-
	26h	H0B-37	Motor speed upon occurrence of the selected fault		–9999 to +9999	0	1 RPM	16 bits	-	-
	27h	H0B-38	Motor phase U current upon occurrence of the selected fault		–32768 to +32767	0	0.01 A	16 bits	-	-
	28h	H0B-39	Motor phase V current upon occurrence of the selected fault		–32768 to +32767	0	0.01 A	16 bits	-	-
	29h	H0B-40	Bus voltage upon occurrence of the selected fault		0 to 65535	0	0.1 V	16 bits	-	-
	2Ah	H0B-41	Input terminal status upon occurrence of the selected fault		0 to 0x00FFFFFF	0	1	32 bits	-	-
	2Ch	H0B-43	Output terminal status upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	2Eh	H0B-45	Internal fault code		0 to 0xFFFF	0	1	16 bits	-	-

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
200B	2Fh	H0B-46	Absolute encoder fault information given by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	30h	H0B-47	System status information given by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	31h	H0B-48	System fault information given by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	32h	H0B-49	Encoder fault information upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	34h	H0B-51	Internal fault code upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	36h	H0B-53	Position following deviation (reference unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	38h	H0B-55	Actual motor speed		–60000 to +60000	0	0.1 RPM	32 bits	-	-
	3Ah	H0B-57	Control power voltage		0 to 65535	0	0.1 V	16 bits	-	-
	3Bh	H0B-58	Mechanical absolute position (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-
	3Dh	H0B-60	Mechanical absolute position (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	47h	H0B-70	Number of absolute encoder revolutions		0 to 65535	0	1	16 bits	-	-

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
200B	48h	H0B-71	Position of the absolute encoder within one turn		0 to 2147483647	0	1 p	32 bits	-	-
	4Eh	H0B-77	Encoder position (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-
	50h	H0B-79	Encoder position (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	52h	H0B-81	Single-turn position of the rotating load (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-
	54h	H0B-83	Single-turn position of the rotating load (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	56h	H0B-85	Single-turn position of the rotating load (reference unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	5Bh	H0B-90	Group No. of the abnormal parameter		0 to 0xFFFF	0	1	16 bits	-	-
	5Ch	H0B-91	Offset of the abnormal parameter within the group		0 to 65535	0	1	16 bits	-	-
200Dh/H0D Auxiliary Function Parameters										
200D	02h	H0D-01	Fault reset	0: No operation 1: Fault reset	0 to 1	0	1	16 bits	During running	Immedi-ately
200D	04h	H0D-03	Encoder initial angle auto-tuning	0: No operation 1: Enable	0 to 1	0	1	16 bits	At stop	Immedi-ately
	05h	H0D-04	Encoder ROM read/write	0: No operation 1: Write ROM 2: Read ROM	0 to 2	0	1	16 bits	At stop	Immedi-ately
	06h	H0D-05	Emergency stop	0: No operation 1: Emergency stop	0 to 1	0	1	16 bits	During running	Immedi-ately
	0Dh	H0D-12	UV phase current balance correction	0: Disabled 1: Enabled	0 to 1	0	1	16 bits	At stop	Immedi-ately
	15h	H0D-20	Absolute encoder reset selection	0: No operation 1: Reset the fault 2: Reset the fault and multi-turn data	0 to 2	0	1	16 bits	At stop	Immedi-ately
	18h	H0D-23	Brake action selection	0: Brake closed 1: Brake released	0 to 1	0	1	16 bits	At stop	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
200Eh/H0E Communication Parameters										
200E	01h	H0E-00	Node address		1 to 127	1	1	16 bits	During running	Immedi-ately
	02h	H0E-01	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 EEPROM	0 to 3	3	1	16 bits	During running	Immedi-ately
	03h	H0E-02	Axis address		1 to 127	1	1	16 bits	-	-
	09h	H0E-08	Servo node address selection	0: Node address determined by H0E-00 1: Node address determined by DIP switch 1	0 to 1	0	1	16 bits	During running	Immedi-ately
	0Bh	H0E-10	CAN communication mode	0: N/A 1: CANopen 2: CANlink	0 to 2	1	1	16 bits	During running	Immedi-ately
	0Ch	H0E-11	CAN baud rate	0: 20 K 1: 50 K 2: 100 K 3: 125 K 4: 250 K 5: 500 K 6: 1 M	0 to 6	5	1	16 bits	During running	Immedi-ately
	0Dh	H0E-12	Number of CAN frames received per unit time		0 to 65535	0	1	16 bits	-	-
	0Eh	H0E-13	Maximum CAN reception errors per unit time		0 to 255	0	1	16 bits	-	-
	0Fh	H0E-14	Maximum CAN transmission errors per unit time		0 to 255	0	1	16 bits	-	-
	10h	H0E-15	CAN bus disconnection times per unit time		0 to 65535	0	1	16 bits	-	-
	11h	H0E-16	CAN configuration mode		0 to 1	0	1	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
200E	15h	H0E-20	EtherCAT slave name		0 to 65535	0	1	16 bits	-	-
	16h	H0E-21	EtherCAT slave alias		0 to 65535	0	1	16 bits	At stop	Immedi-ately
	17h	H0E-22	Number of synchronization interrupts allowed by EtherCAT		1 to 20	9	1	16 bits	During running	Immedi-ately
	18h	H0E-23	EtherCAT synchronization detection mode	0: Standard mode 1: Surplus mode	0 to 1	0	1	16 bits	During running	Immedi-ately
	19h	H0E-24	Synchronization loss count		0 to 65535	0	1	16 bits	-	-
	1Ah	H0E-25	Maximum error value and invalid frames of EtherCAT port 0 per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Bh	H0E-26	Maximum error value and invalid frames of EtherCAT port 1 per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Ch	H0E-27	Maximum transfer error of EtherCAT port per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Dh	H0E-28	Maximum EtherCAT data frame processing unit error per unit time		0 to 0x0255	0	1	16 bits	-	-
	1Eh	H0E-29	Maximum link loss of EtherCAT port 0 per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Fh	H0E-30	EtherCAT master type		0 to 3	2	1	16 bits	At stop	Immedi-ately
	20h	H0E-31	EtherCAT synchronization mode		0 to 2	1	1	16 bits	At stop	Next power-on
	21h	H0E-32	EtherCAT synchronization error threshold		0 to 4000	3000	ns	16 bits	At stop	Immedi-ately
	22h	H0E-33	EtherCAT state machine status		0 to 8	0	1	16 bits	-	-

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
200E	23h	H0E-34	Excessive position reference increment count in CSP mode		1 to 7	3	1	16 bits	During running	Immedi-ately
	24h	H0E-35	EtherCAT status code		0 to 0xFFFF	0	1	16 bits	-	-
	29h	H0E-40	EOE selection	0: Disabled 1: Enabled	0 to 1	0	1	16 bits	During running	Immedi-ately
	2Ah	H0E-41	Most significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Bh	H0E-42	Second most significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Ch	H0E-43	Second least significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Dh	H0E-44	Least significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Eh	H0E-45	Most significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Fh	H0E-46	Second most significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	30h	H0E-47	Second least significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	31h	H0E-48	Least significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	32h	H0E-49	Most significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	33h	H0E-50	Second most significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	34h	H0E-51	Second least significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
200E	35h	H0E-52	Least significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	36h	H0E-53	Most significant byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	37h	H0E-54	2nd byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	38h	H0E-55	3rd byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	39h	H0E-56	4th byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Ah	H0E-57	5th byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Bh	H0E-58	Least significant byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Dh	H0E-60	Automatic Ethernet IP address identification	0: Disabled 1: Enabled	0 to 1	0	1	16 bits	During running	Immedi-ately
	3Eh	H0E-61	Most significant byte of Ethernet IP address		0 to 255	192	1	16 bits	During running	Immedi-ately
	3Fh	H0E-62	Second most significant byte of Ethernet IP address		0 to 255	168	1	16 bits	During running	Immedi-ately
	40h	H0E-63	Second least significant byte of Ethernet IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	41h	H0E-64	Least significant byte of Ethernet IP address		0 to 255	2	1	16 bits	During running	Immedi-ately
	42h	H0E-65	Most significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
200E	43h	H0E-66	Second most significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately
	44h	H0E-67	Second least significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately
	45h	H0E-68	Least significant byte of Ethernet subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	46h	H0E-69	Most significant byte of default Ethernet gateway		0 to 255	192	1	16 bits	During running	Immedi-ately
	47h	H0E-70	Second most significant byte of default Ethernet gateway		0 to 255	168	1	16 bits	During running	Immedi-ately
	48h	H0E-71	Second least significant byte of default Ethernet gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	49h	H0E-72	Least significant byte of default Ethernet gateway		0 to 255	1	1	16 bits	During running	Immedi-ately
	51h	H0E-80	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	0 to 9	9	1	16 bits	During running	Immedi-ately
	52h	H0E-81	Modbus data format	0: No parity, 2 stop bits (8-N-2) 1: Even parity, 1 stop bit (8-E-1) 2: Odd parity, 1 stop bit (8-O-1) 3: No parity, 1 stop bit (8-N-1)	0 to 3	3	1	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
200E	53h	H0E-82	Modbus response delay		0 to 20	0	1	16 bits	During running	Immedi-ately
	54h	H0E-83	Modbus communication timeout		0 to 600	0	1	16 bits	During running	Immedi-ately
	5Bh	H0E-90	Modbus version No.		0 to 65535	0	0.01	16 bits	-	-
	5Ch	H0E-91	CANopen version No.		0 to 65535	0	0.01	16 bits	-	-
	5Dh	H0E-92	CANlink version No.		0 to 65535	0	0.01	16 bits	-	-
	5Eh	H0E-93	EtherCAT COE version No.		0 to 65535	0	0.01	16 bits	-	-
	5Fh	H0E-94	EtherCAT EOE version No.		0 to 65535	0	0.01	16 bits	-	-
	60h	H0E-95	Ethernet version No.		0 to 65535	0	0.01	16 bits	-	-
	61h	H0E-96	XML version No.	-	0 to 65535	0	0.01	16 bits	-	-

■ Parameters of axis 2

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2800h/H00 Servo Motor Parameters										
2800	01h	H00-00	Motor code		0 to 65535	14000	1	16 bits	At stop	Next power-on
	03h	H00-02	Customized motor code		0 to 0xFFFFFFFF	0	1	32 bits	-	-
	05h	H00-04	Encoder version No.		0 to 65535	0	0.1	16 bits	-	-
	06h	H00-05	Serial encoder motor code		0 to 65535	0	1	16 bits	-	-
	09h	H00-08	Serial encoder type		0 to 65535	0	1	16 bits	At stop	Next power-on
	0Ah	H00-09	Rated voltage	0: 220 V 1: 380 V	0 to 1	0	1	16 bits	At stop	Next power-on
	0Bh	H00-10	Rated power		1 to 65535	75	0.01 kW	16 bits	At stop	Next power-on
	0Ch	H00-11	Rated current		1 to 65535	470	0.01 A	16 bits	At stop	Next power-on
	0Dh	H00-12	Rated torque		10 to 65535	239	0.01 N m	16 bits	At stop	Next power-on
	0Eh	H00-13	Maximum torque		10 to 65535	716	0.01 N m	16 bits	At stop	Next power-on

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2800	0Fh	H00-14	Rated speed		100 to 6000	3000	1 RPM	16 bits	At stop	Next power-on
	10h	H00-15	Maximum motor speed		100 to 6000	6000	1 RPM	16 bits	At stop	Next power-on
	11h	H00-16	Moment of inertia		1 to 65535	130	0.01 $kgcm^2$	16 bits	At stop	Next power-on
	12h	H00-17	Number of pole pairs of PMSM		2 to 360	5	1	16 bits	At stop	Next power-on
	13h	H00-18	Stator resistance		1 to 65535	500	0.001 Ω	16 bits	At stop	Next power-on
	14h	H00-19	Stator inductance Lq		1 to 65535	327	0.01 mH	16 bits	At stop	Next power-on
	15h	H00-20	Stator inductance Ld		1 to 65535	387	0.01 mH	16 bits	At stop	Next power-on
	16h	H00-21	Linear back EMF coefficient		1 to 65535	3330	0.01 mV/RPM	16 bits	At stop	Next power-on
	17h	H00-22	Torque coefficient Kt		1 to 65535	51	0.01 N m/Arms	16 bits	At stop	Next power-on
	18h	H00-23	Electrical constant Te		1 to 65535	654	0.01 ms	16 bits	At stop	Next power-on
	19h	H00-24	Mechanical constant Tm		1 to 65535	24	0.01 ms	16 bits	At stop	Next power-on
	1Dh	H00-28	Position offset of absolute encoder		0 to 4294967295	8192	1	32 bits	At stop	Next power-on
	1Fh	H00-30	Encoder selection (Hex)	19: Inovance 20-bit serial encoder	0 to 0x0FFF	0x0013	1	16 bits	At stop	Next power-on
	20h	H00-31	PPR of encoder		1 to 1073741824	8388608	1 PPR	32 bits	At stop	Next power-on
	22h	H00-33	Electrical angle of Z signal		0 to 3600	1800	0.1°	16 bits	At stop	Next power-on
	26h	H00-37	Absolute encoder function setting bit		0 to 0xFFFF	0	1	16 bits	At stop	Next power-on
2801h/H01: Servo Drive Parameters										
2801	01h	H01-00	MCU software version		0 to 65535	0	0.1	16 bits	-	-
	02h	H01-01	FPGA software version		0 to 65535	0	0.1	16 bits	-	-

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2801	03h	H01-02	FPGA customized No.		0 to 65535	0	0.1	16 bits	-	-
	04h	H01-03	CPU0 software version No.		0 to 65535	0	0.1	16 bits	-	-
	05h	H01-04	CPU1 software version No.		0 to 65535	0	0.1	16 bits	-	-
	08h	H01-07	Software test version No.		0 to 65535	0	0.01	16 bits	-	-
	0Bh	H01-10	Drive unit series number	3: S2R8 5: S5R5	0 to 65535	3	1	16 bits	At stop	Next power-on
	0Ch	H01-11	Voltage class of the drive unit		0 to 65535	220	1 V	16 bits	-	-
	0Dh	H01-12	Rated power of the drive unit		0 to 1073741824	40	0.01 kW	32 bits	-	-
	0Fh	H01-14	Maximum output power of the drive unit		0 to 1073741824	40	0.01 kW	32 bits	-	-
	11h	H01-16	Rated output current of the drive unit		0 to 1073741824	280	0.01 A	32 bits	-	-
	13h	H01-18	Maximum output current of the drive unit		0 to 1073741824	1010	0.01 A	32 bits	-	-
	15h	H01-20	Carrier frequency		4000 to 20000	8000	1 Hz	16 bits	At stop	Next power-on
	16h	H01-21	Dead zone time		1 to 2000	200	0.01 μs	16 bits	At stop	Next power-on
	17h	H01-22	D-axis coupling voltage compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immedi-ately
	18h	H01-23	Q-axis back EMF compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immedi-ately
	19h	H01-24	D-axis current loop gain		0 to 20000	500	1 Hz	16 bits	During running	Immedi-ately
	1Ah	H01-25	D-axis current loop integral compensation factor		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	1Bh	H01-26	Current sampling Sinc3 filter data extraction rate	0: Extraction rate 32 1: Extraction rate 64 2: Extraction rate 128 3: Extraction rate 256	0 to 3	0	1	16 bits	At stop	Next power-on

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2801	1Ch	H01-27	Q-axis current loop gain		0 to 20000	500	1 Hz	16 bits	During running	Immedi-ately
	1Dh	H01-28	Q-axis current loop integral compensation factor		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	1Eh	H01-29	Q-axis coupling voltage compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immedi-ately
	1Fh	H01-30	Bus voltage gain tuning		500 to 1500	1000	0.1%	16 bits	At stop	Next power-on
	20h	H01-31	Minimum turn-on time of bootstrap circuit lower bridge		0 to 200	50	0.1 μs	16 bits	At stop	Next power-on
	21h	H01-32	Relative gain of UV sampling		1 to 65535	32768	1	16 bits	At stop	Next power-on
	23h	H01-34	IGBT over-temperature threshold		0 to 1500	950	0.1°C	16 bits	During running	Immedi-ately
	25h	H01-36	Current sensor range		0 to 999999	2083	0.01 A	32 bits	At stop	Next power-on
	27h	H01-38	FPGA phase current protection threshold		0 to 1000	900	0.1%	16 bits	At stop	Next power-on
	29h	H01-40	DC bus overvoltage protection threshold		0 to 2000	420	1 V	16 bits	-	-
	2Ah	H01-41	DC bus voltage discharge threshold		0 to 2000	380	1 V	16 bits	At stop	Immedi-ately
	2Bh	H01-42	DC bus undervoltage threshold		0 to 2000	200	1 V	16 bits	At stop	Immedi-ately
	2Ch	H01-43	Power supply unit series No.	1: 1 kW 2: 2 kW	1 to 2	1	1	16 bits	At stop	Next power-on
	2Dh	H01-44	Output power of the power supply unit		0 to 1073741824	100	0.01 kW	32 bits	-	-
	2Fh	H01-46	Maximum output power of the power supply unit		0 to 1073741824	150	0.01 kW	32 bits	-	-
	31h	H01-48	Rated output current of the power supply unit		0 to 1073741824	320	0.01 A	32 bits	-	-

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2801	33h	H01-50	Over-temperature threshold of the power supply module		0 to 1500	800	0.1°C	16 bits	During running	Immedi-ately
	35h	H01-52	D-axis proportional gain in performance priority mode		0 to 20000	2000	1 Hz	16 bits	During running	Immedi-ately
	36h	H01-53	D-axis integral gain in performance priority mode		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	37h	H01-54	Q-axis proportional gain in performance priority mode		0 to 20000	2000	1 Hz	16 bits	During running	Immedi-ately
	38h	H01-55	Q-axis integral gain in performance priority mode		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	39h	H01-56	Current loop low-pass cutoff frequency		0 to 65535	11000	1 Hz	16 bits	At stop	Next power-on
	3Ah	H01-57	Maximum output current of the power supply unit		0 to 1073741824	480	0.01 A	32 bits	-	-
	3Ch	H01-59	Serial encoder data transmission compensation time		0 to 2000	0	0.001 μs	16 bits	At stop	Next power-on
	3Dh	H01-60	FPGA scheduling frequency selection	0: 32 kHz 1: 16 kHz	0 to 1	1	1	16 bits	At stop	Next power-on
	3Eh	H01-61	Command scheduling frequency selection	0: 4 kHz 1: 2 kHz 2: 1 kHz	0 to 2	2	1	16 bits	At stop	Next power-on
	48h	H01-71	Voltage class of the power supply unit		0 to 65535	220	1 V	16 bits	-	-
2802h/H02 Basic Control Parameters										
2802	01h	H02-00	Control mode selection	0: Speed mode 1: Position mode 2: Torque mode 9: EtherCAT mode 255: This axis is not used.	0 to 255	9	1	16 bits	At stop	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2802	02h	H02-01	Absolute system selection	0: Incremental mode 1: Absolute position linear mode 2: Absolute position rotation mode	0 to 2	0	1	16 bits	At stop	Next power-on
	03h	H02-02	Rotation direction	0: CCW direction as the forward direction 1: CW direction as the forward direction	0 to 1	0	1	16 bits	At stop	Next power-on
	08h	H02-07	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	0 to 2	1	1	16 bits	At stop	Immedi-ately
	09h	H02-08	Stop mode at No. 1 fault	0: Coast to stop, keeping de-energized state 1: DB Stop, keeping de-energized state 2: DB Stop, keeping DB state	0 to 2	0	1	16 bits	At stop	Immedi-ately
	0Ah	H02-09	Delay from brake output ON to command received		0 to 500	250	1 ms	16 bits	During running	Immedi-ately
	0Bh	H02-10	Delay from brake output OFF to motor de-energized		50 to 1000	150	1 ms	16 bits	During running	Immedi-ately
	0Ch	H02-11	Motor speed threshold at brake output OFF in rotation state		20 to 3000	30	1 RPM	16 bits	During running	Immedi-ately
	0Dh	H02-12	Delay from S-ON OFF to brake output OFF in rotation state		1 to 1000	500	1 ms	16 bits	During running	Immedi-ately
	10h	H02-15	Warning display on the keypad	0: Output warning information Immediately 1: Not output warning information	0 to 1	0	1	16 bits	At stop	Immedi-ately
	11h	H02-16	Brake switch	0: OFF 1: ON	0 to 1	0	1	16 bits	At stop	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2802	16h	H02-21	Permissible minimum resistance of the regenerative resistor		1 to 1000	40	1 Ω	16 bits	-	-
	19h	H02-24	Heat dissipation coefficient of the resistor		10 to 100	30	0.01%	16 bits	At stop	Immedi-ately
	1Ah	H02-25	Regenerative resistor selection	1: External, naturally ventilated 2: External, forced air cooling 3: No regenerative resistor needed	1 to 3	3	1	16 bits	At stop	Immedi-ately
	1Bh	H02-26	Power of external regenerative resistor		1 to 65535	40	1 kW	16 bits	At stop	Immedi-ately
	1Ch	H02-27	Resistance of external regenerative resistor		1 to 1000	50	1 Ω	16 bits	At stop	Immedi-ately
	1Fh	H02-30	User password		0 to 65535	0	1	16 bits	During running	Immedi-ately
	20h	H02-31	System parameter initialization	0: No operation 1: Restore default settings 2: Clear fault records	0 to 2	0	1	16 bits	At stop	Immedi-ately
	21h	H02-32	Selection of parameters in group H0B		0 to 99	50	1	16 bits	During running	Immedi-ately
	24h	H02-35	Keypad data refresh frequency		0 to 20	0	1 Hz	16 bits	During running	Immedi-ately
	2Ah	H02-41	Factory password		0 to 65535	0	1	16 bits	During running	Immedi-ately
2803h/H03 Terminal Input Parameters										
2803	03h	H03-02	DI1 function selection	Consisting of three digits, with the first one (from left to right) indicating the axis number and the last two indicating the terminal function. The last two digits are defined as follows: 0: No definition 01: S-ON 14: Positive limit switch 15: Negative limit switch 31: Home switch 38: Touch probe 1 39: Touch probe 2	0 to 65535	0	1	16 bits	During running	At stop

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2803	04h	H03-03	DI1 logic selection	0: Active low 1: Active high 2: Rising edge-triggered 3: Falling edge-triggered 4: Rising/Falling edge-triggered	0 to 4	0	1	16 bits	During running	At stop
	05h	H03-04	DI2 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	06h	H03-05	DI2 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	07h	H03-06	DI3 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	08h	H03-07	DI3 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	09h	H03-08	DI4 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ah	H03-09	DI4 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	0Bh	H03-10	DI5 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ch	H03-11	DI5 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	0Dh	H03-12	DI6 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Eh	H03-13	DI6 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	0Fh	H03-14	DI7 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	10h	H03-15	DI7 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	11h	H03-16	DI8 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	12h	H03-17	DI8 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	13h	H03-18	DI9 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	14h	H03-19	DI9 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2803	15h	H03-20	DI10 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	16h	H03-21	DI10 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	17h	H03-22	DI11 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	18h	H03-23	DI11 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	19h	H03-24	DI12 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Ah	H03-25	DI12 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	1Bh	H03-26	DI13 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Ch	H03-27	DI13 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	1Dh	H03-28	DI14 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Eh	H03-29	DI14 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	1Fh	H03-30	DI15 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	20h	H03-31	DI15 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	21h	H03-32	DI16 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	22h	H03-33	DI16 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	23h	H03-34	DI17 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	24h	H03-35	DI17 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	25h	H03-36	DI18 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	26h	H03-37	DI18 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	27h	H03-38	DI19 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2803	28h	H03-39	DI19 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	29h	H03-40	DI20 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	2Ah	H03-41	DI20 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Bh	H03-42	DI21 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	2Ch	H03-43	DI21 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Dh	H03-44	DI22 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	2Eh	H03-45	DI22 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Fh	H03-46	DI23 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	30h	H03-47	DI23 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	31h	H03-48	DI24 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	32h	H03-49	DI24 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
2804h/H04 Terminal Output Parameters										
2804	01h	H04-00	DO1 function selection	Consisting of three digits, with the first one (from left to right) indicating the axis number and the last two indicating the terminal function. The last two digits are defined as follows: 0: No definition 01: Servo ready 02: Motor rotating 10: Warning 11: Fault	0 to 65535	0	1	16 bits	During running	At stop
	02h	H04-01	DO1 logic selection	0: Output low (L) level upon valid logic (optocoupler ON) 1: Output high (H) level upon valid logic (optocoupler OFF)	0 to 1	0	1	16 bits	During running	At stop

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2804	03h	H04-02	DO2 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	04h	H04-03	DO2 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
	5h	H04-04	DO3 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	6h	H04-05	DO3 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
	7h	H04-06	DO4 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	8h	H04-07	DO4 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
	9h	H04-08	DO5 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ah	H04-09	DO5 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
	0Bh	H04-10	DO6 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ch	H04-11	DO6 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
2805h/H05 Position Control Parameters										
2805	05h	H05-04	First-order low-pass filter time constant		0 to 65535	0	0.1 ms	16 bits	At stop	Immediately
	07h	H05-06	Moving average filter time constant		0 to 1280	0	0.1 ms	16 bits	At stop	Immediately
	14h	H05-19	Speed feedforward control	0: No speed feedforward 1: Internal speed feedforward 2: 60B1 used as speed feedforward	0 to 2	1	1	16 bits	At stop	Immediately
	24h	H05-35	Duration limit of homing		0 to 65535	50000	0.01s	16 bits	During running	Immediately
	2Fh	H05-46	Position offset in absolute position linear mode (low 32 bits)		0 to 4294967295	0	1	32 bits	At stop	Next power-on
	31h	H05-48	Position offset in absolute position linear mode (high 32 bits)		–2147483648 to +2147483647	0	1	32 bits	At stop	Next power-on

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2805	33h	H05-50	Mechanical gear ratio (numerator)		1 to 65535	1	1	16 bits	At stop	Immedi-ately
	34h	H05-51	Mechanical gear ratio (denominator)		1 to 65535	1	1	16 bits	At stop	Immedi-ately
	35h	H05-52	Pulses per load revolution in absolute position rotation mode (low 32 bits)		0 to 4294967295	0	1 p	32 bits	At stop	Immedi-ately
	37h	H05-54	Pulses per load revolution in absolute position rotation mode (high 32 bits)		0 to 128	0	1 p	32 bits	At stop	Immedi-ately
2806h/H06 Speed Control Parameters										
2806	03h	H06-02	Speed reference source	0: Keypad 1: Multi-speed reference	0 to 1	0	1	16 bits	At stop	Immedi-ately
	04h	H06-03	Speed reference		–6000 to +6000	200	1 RPM	16 bits	During running	Immedi-ately
	06h	H06-05	Acceleration ramp time of speed reference		0 to 65535	0	1 RPM	16 bits	During running	Immedi-ately
	07h	H06-06	Deceleration ramp time of speed reference		0 to 65535	0	1 RPM	16 bits	During running	Immedi-ately
	09h	H06-08	Forward speed limit		0 to 6000	6000	1 RPM	16 bits	During running	Immedi-ately
	0Ah	H06-09	Reverse speed limit		0 to 6000	6000	1 RPM	16 bits	During running	Immedi-ately
	0Ch	H06-11	Torque feedforward control	0: No torque feedforward 1: Internal torque feedforward 2: 60B2 used as external torque feedforward	0 to 2	1	1	16 bits	During running	Immedi-ately
	0Dh	H06-12	Acceleration ramp time of jog speed		0 to 65535	10	1 ms	16 bits	During running	Immedi-ately
	11h	H06-16	Motor speed threshold		0 to 1000	20	1 RPM	16 bits	During running	Immedi-ately
2807h/H07 Torque Control Parameters										
2807	04h	H07-03	Torque reference set through keypad		–3000 to +3000	0	0.1%	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2807	06h	H07-05	Torque reference filter time constant		0 to 3000	79	0.01 ms	16 bits	During running	Immedi-ately
	07h	H07-06	2nd torque reference filter time constant		0 to 3000	79	0.01 ms	16 bits	During running	Immedi-ately
	0Ah	H07-09	Internal forward torque limit		0 to 3000	3000	0.1%	16 bits	During running	Immedi-ately
	0Bh	H07-10	Internal reverse torque limit		0 to 3000	3000	0.1%	16 bits	During running	Immedi-ately
	10h	H07-15	Emergency stop torque		0 to 3000	1000	0.1%	16 bits	During running	Immedi-ately
	14h	H07-19	Internal speed limit in torque control		0 to 6000	3000	1 RPM	16 bits	During running	Immedi-ately
	15h	H07-20	Internal reverse speed limit in torque control		0 to 6000	3000	1 RPM	16 bits	During running	Immedi-ately
	16h	H07-21	Reference value for torque reached		0 to 3000	0	0.1%	16 bits	During running	Immedi-ately
	17h	H07-22	Torque output when torque reached DO signal turned on		0 to 3000	200	0.1%	16 bits	During running	Immedi-ately
	18h	H07-23	Torque output when torque reached DO signal turned off		0 to 3000	100	0.1%	16 bits	During running	Immedi-ately
2808h/H08 Gain Parameters										
2808	01h	H08-00	Speed loop gain		1 to 20000	250	0.1 Hz	16 bits	During running	Immedi-ately
	02h	H08-01	Speed loop integral time constant		15 to 51200	3183	0.01 ms	16 bits	During running	Immedi-ately
	03h	H08-02	Position loop gain		0 to 20000	400	0.1 Hz	16 bits	During running	Immedi-ately
	04h	H08-03	2nd speed loop gain		1 to 20000	400	0.1 Hz	16 bits	During running	Immedi-ately
	05h	H08-04	2nd speed loop integral time constant		15 to 51200	2000	0.01 ms	16 bits	During running	Immedi-ately
	06h	H08-05	2nd position loop gain		0 to 20000	640	0.1 Hz	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2808	09h	H08-08	2nd gain mode	0: Fixed at the 1st gain, P/PI switchover performed through bit26 of 60FE 1: Switchover between the 1st gain and 2nd gain activated based on the condition defined by H08-09	0 to 1	1	1	16 bits	During running	Immediately
	0Ah	H08-09	Gain switchover condition	0: Fixed at the 1st gain (PS) 2: Torque reference value too large (PS) 3: Speed reference value too large (PS) 4: Speed reference change rate too large (PS) 5: Threshold of speed reference (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 to 10	0	1	16 bits	During running	Immediately
	0Bh	H08-10	Gain switchover delay		0 to 10000	50	0.1 ms	16 bits	During running	Immediately
	0Ch	H08-11	Gain switchover level		0 to 20000	50	1	16 bits	During running	Immediately
	0Dh	H08-12	Gain switchover hysteresis		0 to 20000	30	1	16 bits	During running	Immediately
	0Eh	H08-13	Position gain switchover time		0 to 10000	30	0.1 ms	16 bits	During running	Immediately
	10h	H08-15	Load inertia ratio		0 to 12000	100	0.01	16 bits	During running	Immediately
	13h	H08-18	Speed feedforward filter time constant		0 to 6400	50	0.01 ms	16 bits	During running	Immediately
	14h	H08-19	Speed feedforward gain		0 to 1000	0	0.1%	16 bits	During running	Immediately
	15h	H08-20	Torque feedforward filter time constant		0 to 6400	50	0.01 ms	16 bits	During running	Immediately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2808	16h	H08-21	Torque feedforward gain		0 to 2000	0	0.1%	16 bits	During running	Immedi-ately
	17h	H08-22	Speed feedback filter selection	0: Average filtering of speed feedback inhibited 1: 2 times of average filtering of speed feedback 2: 4 times of average filtering of speed feedback 3: 8 times of average filtering of speed feedback 4: 16 times of average filtering of speed feedback	0 to 4	0	1	16 bits	At stop	Immedi-ately
	18h	H08-23	Cutoff frequency of speed feedback low-pass filter		100 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	19h	H08-24	PDFF control coefficient		0 to 1000	1000	0.1%	16 bits	During running	Immedi-ately
2809h/H09 Gain auto-tuning Parameters										
2809	01h	H09-00	Gain auto-tuning mode	0: Disabled, gain parameters adjusted manually 1: Standard gain auto-tuning mode, gain parameters adjusted automatically based on the stiffness level 2: Positioning mode, gain parameters adjusted automatically based on set stiffness level	0 to 2	0	1	16 bits	During running	Immedi-ately
	02h	H09-01	Stiffness level		0 to 31	12	1	16 bits	During running	Immedi-ately
	03h	H09-02	Adaptive notch mode	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, parameters of 3rd and 4th notches restored to default values	0 to 4	0	1	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2809	04h	H09-03	Online inertia auto-tuning mode	0: Online auto-tuning disabled 1: Online auto-tuning enabled, changing slowly 2: Online auto-tuning enabled, changing normally 3: Online auto-tuning enabled, changing quickly	0 to 3	0	1	16 bits	During running	Immedi-ately
	05h	H09-04	Low-frequency resonance suppression mode	0: Manually set parameters of low-frequency resonance suppression filter 1: Automatically set parameters of low-frequency resonance suppression filter	0 to 1	0	1	16 bits	During running	Immedi-ately
	06h	H09-05	Offline inertia auto-tuning mode	0: Positive and negative triangular wave mode 1: JOG mode	0 to 1	0	1	16 bits	At stop	Immedi-ately
	07h	H09-06	Maximum speed of inertia auto-tuning		100 to 1000	500	1 RPM	16 bits	At stop	Immedi-ately
	08h	H09-07	Time constant for accelerating to the maximum speed during inertia auto-tuning		20 to 800	125	1 ms	16 bits	At stop	Immedi-ately
	09h	H09-08	Inertia auto-tuning interval		50 to 10000	800	1 ms	16 bits	At stop	Immedi-ately
	0Ah	H09-09	Number of motor revolutions per inertia auto-tuning		0 to 65535	0	0.01	16 bits	-	-
	0Dh	H09-12	Frequency of the 1st notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	0Eh	H09-13	Width level of the 1st notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	0Fh	H09-14	Depth level of the 1st notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	10h	H09-15	Frequency of the 2nd notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	11h	H09-16	Width level of the 2nd notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	12h	H09-17	Depth level of the 2nd notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	13h	H09-18	Frequency of the 3rd notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
2809	14h	H09-19	Width level of the 3rd notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	15h	H09-20	Depth level of the 3rd notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	16h	H09-21	Frequency of the 4th notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	17h	H09-22	Width level of the 4th notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	18h	H09-23	Depth level of the 4th notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	19h	H09-24	Auto-tuned resonance frequency		0 to 2000	0	1 Hz	16 bits	-	-
	1Fh	H09-30	Torque disturbance compensation gain		−1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	20h	H09-31	Filter time constant of torque disturbance observer		0 to 2500	50	0.01 ms	16 bits	During running	Immedi-ately
	21h	H09-32	Constant torque compensation value		−1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	22h	H09-33	Forward friction compensation value		−1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	23h	H09-34	Reverse friction compensation value		−1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	27h	H09-38	Frequency of low-frequency resonance		10 to 1000	1000	0.1 Hz	16 bits	During running	Immedi-ately
	28h	H09-39	Low-frequency resonance frequency filter		0 to 10	2	1	16 bits	At stop	Immedi-ately
280Ah/H0A Fault and Protection Parameters										
280A	01h	H0A-00	Power input phase loss protection	0: Enable phase loss fault and inhibit phase loss warning 1: Enable phase loss fault and warning 2: Inhibit phase loss fault and warning	0 to 2	0	1	16 bits	During running	Immedi-ately
	02h	H0A-01	Absolute position limit	0: Disable absolute position limit 1: Enable absolute position limit 2: Enable absolute position limit after homing	0 to 2	0	1	16 bits	At stop	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
280A	04h	H0A-03	Power-off memory selection	0: Disable power-off memory 1: Enable power-off memory 2: Disable power-off memory and hide control power undervoltage fault	0 to 2	0	1	16 bits	During running	Immedi-ately
	05h	H0A-04	Motor overload protection gain		50 to 300	100	1	16 bits	At stop	Immedi-ately
	07h	H0A-06	Motor overload level		0 to 400	0	1	16 bits	At stop	Immedi-ately
	08h	H0A-07	UVW phase sequence auto-tuning selection	0: Not perform UVW phase sequence auto-tuning during angle auto-tuning 1: Perform UVW phase sequence auto-tuning during angle auto-tuning	0 to 1	1	1	16 bits	During running	Immedi-ately
	09h	H0A-08	Overspeed threshold		0 to 10000	0	1 RPM	16 bits	During running	Immedi-ately
	0Dh	H0A-12	Runaway protection selection	0: Disable 1: Enable	0 to 1	1	1	16 bits	During running	Immedi-ately
	0Eh	H0A-13	Initial angle auto-tuning mode	0: Auto-tuning with Z signal 1: Jog auto-tuning without Z signal 2: Auto-tuning of voltage input 3: Angle auto-tuning of voltage input with Z signal	0 to 3	0	1	16 bits	At stop	Immedi-ately
	10h	H0A-15	Motor rotation threshold		1 to 1000	5	1 RPM	16 bits	During running	Immedi-ately
	11h	H0A-16	Threshold for low-frequency resonance position deviation		1 to 1000	5	1 p	16 bits	During running	Immedi-ately
	14h	H0A-19	Filter time constant of touch probe 1		0 to 630	200	1 μs	16 bits	During running	Immedi-ately
	15h	H0A-20	Filter time constant of touch probe 2		0 to 630	200	1 μs	16 bits	During running	Immedi-ately
	16h	H0A-21	STO function switch	0: Enable STO function 1: Hide STO function	0 to 1	0	1	16 bits	At stop	Next power-on
	17h	H0A-22	Sigma_Delta filter time		0 to 3	1	1	16 bits	At stop	Next power-on

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
280A	18h	H0A-23	TZ signal filter time		0 to 31	15	125 ns	16 bits	At stop	Next power-on
	1Ah	H0A-25	Filter time constant of displayed speed feedback		0 to 5000	50	1 ms	16 bits	At stop	Immediately
	1Bh	H0A-26	Motor overload selection	0: Not hide motor overload warning (Er.909) and fault (Er.620) 1: Hide motor overload warning (Er.909) and fault (Er.620)	0 to 1	0	1	16 bits	At stop	Immediately
	21h	H0A-32	Time window of locked rotor over-temperature protection		10 to 65535	200	1 ms	16 bits	During running	Immediately
	22h	H0A-33	Locked rotor over-temperature protection	0: Shielded 1: Enabled	0 to 1	1	1	16 bits	During running	Immediately
	25h	H0A-36	Encoder multi-turn overflow fault	0: Not hide 1: Hide	0 to 1	0	1	16 bits	At stop	Immediately
280Bh/H0B Monitor Parameters										
280B	01h	H0B-00	Actual motor speed		–9999 to +9999	0	1 RPM	16 bits	-	-
	02h	H0B-01	Speed reference		–9999 to +9999	0	1 RPM	16 bits	-	-
	03h	H0B-02	Internal torque reference		–3000 to +3000	0	0.1%	16 bits	-	-
	04h	H0B-03	Monitored DI status		0 to 0x00FFFFFF	0	1	32 bits	-	-
	06h	H0B-05	Monitored DO status		0 to 0xFFFF	0	1	16 bits	-	-
	08h	H0B-07	Absolute position counter		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	0Ah	H0B-09	Mechanical angle		0 to 3600	0	0.1°	16 bits	-	-
	0Bh	H0B-10	Electrical angle		0 to 3600	0	0.1°	16 bits	-	-
	0Dh	H0B-12	Average load ratio		0 to 65535	0	0.1%	16 bits	-	-
	10h	H0B-15	Position following deviation (encoder unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	12h	H0B-17	Feedback pulse counter		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	14h	H0B-19	Total power-on time		0 to 4294967295	0	0.1s	32 bits	-	-

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
280B	19h	H0B-24	RMS value of phase current		0 to 65535	0	0.01 A	32 bits	-	-
	1Bh	H0B-26	Bus voltage		0 to 65535	0	0.1 V	16 bits	-	-
	1Ch	H0B-27	Power module temperature		0 to 65535	0	1°C	16 bits	-	-
	1Dh	H0B-28	Absolute encoder fault information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-
	1Eh	H0B-29	System status information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-
	1Fh	H0B-30	System fault information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-
	20h	H0B-31	Encoder fault information		0 to 0xFFFF	0	1	16 bits	-	-
	22h	H0B-33	Fault log		0 to 9	0	1	16 bits	During running	Immedi-ately
	23h	H0B-34	Fault code of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	24h	H0B-35	Time stamp upon occurrence of the selected fault		0 to 4294967295	0	0.1s	32 bits	-	-
	26h	H0B-37	Motor speed upon occurrence of the selected fault		–9999 to +9999	0	1 RPM	16 bits	-	-
	27h	H0B-38	Motor phase U current upon occurrence of the selected fault		–32768 to +32767	0	0.01 A	16 bits	-	-
	28h	H0B-39	Motor phase V current upon occurrence of the selected fault		–32768 to +32767	0	0.01 A	16 bits	-	-
	29h	H0B-40	Bus voltage upon occurrence of the selected fault		0 to 65535	0	0.1 V	16 bits	-	-
	2Ah	H0B-41	Input terminal status upon occurrence of the selected fault		0 to 0x00FFFFFF	0	1	32 bits	-	-

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
280B	2Ch	H0B-43	Output terminal status upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	2Eh	H0B-45	Internal fault code		0 to 0xFFFF	0	1	16 bits	-	-
	2Fh	H0B-46	Absolute encoder fault information given by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	30h	H0B-47	System status information given by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	31h	H0B-48	System fault information given by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	32h	H0B-49	Encoder fault information upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	34h	H0B-51	Internal fault code upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	36h	H0B-53	Position following deviation (reference unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	38h	H0B-55	Actual motor speed		–60000 to +60000	0	0.1 RPM	32 bits	-	-
	3Ah	H0B-57	Bus voltage of the control power		0 to 65535	0	0.1 V	16 bits	-	-
	3Bh	H0B-58	Mechanical absolute position (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
280B	3Dh	H0B-60	Mechanical absolute position (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	47h	H0B-70	Number of absolute encoder revolutions		0 to 65535	0	1	16 bits	-	-
	48h	H0B-71	Position of the absolute encoder within one turn		0 to 2147483647	0	1 p	32 bits	-	-
	4Eh	H0B-77	Encoder position (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-
	50h	H0B-79	Encoder position (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	52h	H0B-81	Single-turn position of the rotating load (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-
	54h	H0B-83	Single-turn position of the rotating load (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	56h	H0B-85	Single-turn position of the rotating load (reference unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	5Bh	H0B-90	Group No. of the abnormal parameter		0 to 0xFFFF	0	1	16 bits	-	-
	5Ch	H0B-91	Offset of the abnormal parameter within the group		0 to 65535	0	1	16 bits	-	-
280Dh/H0D Auxiliary Function Parameters										
280D	02h	H0D-01	Fault reset	0: No operation 1: Fault reset	0 to 1	0	1	16 bits	During running	Immedi-ately
	04h	H0D-03	Encoder initial angle auto-tuning	0: No operation 1: Enabled	0 to 1	0	1	16 bits	At stop	Immedi-ately
	05h	H0D-04	Encoder ROM read/write	0: No operation 1: Write ROM 2: Read ROM	0 to 2	0	1	16 bits	At stop	Immedi-ately
	06h	H0D-05	Emergency stop	0: No operation 1: Emergency stop	0 to 1	0	1	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
280D	0Dh	H0D-12	UV phase current balance correction	0: Disable 1: Enable	0 to 1	0	1	16 bits	At stop	Immedi-ately
	15h	H0D-20	Absolute encoder reset selection	0: No operation 1: Reset the fault 2: Reset the fault and multi-turn data	0 to 2	0	1	16 bits	At stop	Immedi-ately
280Eh/H0E Communication Function Parameters										
280E	01h	H0E-00	Node address		1 to 127	1	1	16 bits	During running	Immedi-ately
	02h	H0E-01	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 EEPROM	0 to 3	3	1	16 bits	During running	Immedi-ately
	03h	H0E-02	Axis address		1 to 127	1	1	16 bits	-	-
	09h	H0E-08	Servo node address selection	0: Node address determined by H0E-00 1: Node address determined by DIP switch 1	0 to 1	0	1	16 bits	During running	Immedi-ately
	0Bh	H0E-10	CAN communication mode	0: N/A 1: CANopen 2: CANlink	0 to 2	1	1	16 bits	During running	Immedi-ately
	0Ch	H0E-11	CAN baud rate	0: 20 K 1: 50 K 2: 100 K 3: 125 K 4: 250 K 5: 500 K 6: 1 M	0 to 6	5	1	16 bits	During running	Immedi-ately
	0Dh	H0E-12	Number of CAN frames received per unit time		0 to 65535	0	1	16 bits	-	-
	0Eh	H0E-13	Maximum CAN reception errors per unit time		0 to 255	0	1	16 bits	-	-

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
280E	0Fh	H0E-14	Maximum CAN transmission errors per unit time		0 to 255	0	1	16 bits	-	-
	10h	H0E-15	CAN bus disconnection times per unit time		0 to 65535	0	1	16 bits	-	-
	11h	H0E-16	CAN configuration mode		0 to 1	0	1	16 bits	During running	Immedi-ately
	15h	H0E-20	EtherCAT slave name		0 to 65535	0	1	16 bits	-	-
	16h	H0E-21	EtherCAT slave alias		0 to 65535	0	1	16 bits	At stop	Immedi-ately
	17h	H0E-22	Number of synchronization interrupts allowed by EtherCAT		1 to 20	9	1	16 bits	During running	Immedi-ately
	18h	H0E-23	EtherCAT synchronization detection mode	0: Standard mode 1: Surplus mode	0 to 1	0	1	16 bits	During running	Immedi-ately
	19h	H0E-24	Synchronization loss count		0 to 65535	0	1	16 bits	-	-
	1Ah	H0E-25	Maximum error value and invalid frames of EtherCAT port 0 per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Bh	H0E-26	Maximum error value and invalid frames of EtherCAT port 1 per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Ch	H0E-27	Maximum transfer error of EtherCAT port per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Dh	H0E-28	Maximum EtherCAT data frame processing unit error per unit time		0 to 0x0255	0	1	16 bits	-	-
	1Eh	H0E-29	Maximum link loss of EtherCAT port 0 per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Fh	H0E-30	EtherCAT master type		0 to 3	2	1	16 bits	At stop	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
280E	20h	H0E-31	EtherCAT synchronization mode		0 to 2	1	1	16 bits	At stop	Next power-on
	21h	H0E-32	EtherCAT synchronization error threshold		0 to 2000	500	1	16 bits	At stop	Immedi-ately
	22h	H0E-33	EtherCAT state machine status		0 to 8	0	1	16 bits	-	-
	23h	H0E-34	Excessive position reference increment count in CSP mode		0 to 7	1	1	16 bits	During running	Immedi-ately
	29h	H0E-40	EOE selection	0: Disable EOE 1: Enable EOE	0 to 1	0	1	16 bits	During running	Immedi-ately
	2Ah	H0E-41	Most significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Bh	H0E-42	Second most significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Ch	H0E-43	Second least significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Dh	H0E-44	Least significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Eh	H0E-45	Most significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Fh	H0E-46	Second most significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	30h	H0E-47	Second least significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	31h	H0E-48	Least significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	32h	H0E-49	Most significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
280E	33h	H0E-50	Second most significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	34h	H0E-51	Second least significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	35h	H0E-52	Least significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	36h	H0E-53	Most significant byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	37h	H0E-54	2nd byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	38h	H0E-55	3rd byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	39h	H0E-56	4th byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Ah	H0E-57	5th byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Bh	H0E-58	Least significant byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Dh	H0E-60	Automatic Ethernet IP address identification	0: Disabled 1: Enabled	0 to 1	0	1	16 bits	During running	Immedi-ately
	3Eh	H0E-61	Most significant byte of Ethernet IP address		0 to 255	192	1	16 bits	During running	Immedi-ately
	3Fh	H0E-62	Second most significant byte of Ethernet IP address		0 to 255	168	1	16 bits	During running	Immedi-ately
	40h	H0E-63	Second least significant byte of Ethernet IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	41h	H0E-64	Least significant byte of Ethernet IP address		0 to 255	2	1	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
280E	42h	H0E-65	Most significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately
	43h	H0E-66	Second most significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately
	44h	H0E-67	Second least significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately
	45h	H0E-68	Least significant byte of Ethernet subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	46h	H0E-69	Most significant byte of default Ethernet gateway		0 to 255	192	1	16 bits	During running	Immedi-ately
	47h	H0E-70	Second most significant byte of default Ethernet gateway		0 to 255	168	1	16 bits	During running	Immedi-ately
	48h	H0E-71	Second least significant byte of default Ethernet gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	49h	H0E-72	Least significant byte of default Ethernet gateway		0 to 255	1	1	16 bits	During running	Immedi-ately
	51h	H0E-80	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	0 to 9	9	1	16 bits	During running	Immedi-ately

Para. Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
280E	52h	H0E-81	Modbus data format	0: No parity, 2 stop bits (8-N-2) 1: Even parity, 1 stop bit (8-E-1) 2: Odd parity, 1 stop bit (8-O-1) 3: No parity, 1 stop bit (8-N-1)	0 to 3	3	1	16 bits	During running	Immediately
	53h	H0E-82	Modbus response delay		0 to 20	0	1	16 bits	During running	Immediately
	54h	H0E-83	Modbus communication timeout		0 to 600	0	1	16 bits	During running	Immediately
	5Bh	H0E-90	Modbus version No.		0 to 65535	0	0.01	16 bits	-	-
	5Ch	H0E-91	CANopen version No.		0 to 65535	0	0.01	16 bits	-	-
	5Dh	H0E-92	CANlink version No.		0 to 65535	0	0.01	16 bits	-	-
	5Eh	H0E-93	EtherCAT COE version No.		0 to 65535	0	0.01	16 bits	-	-
	5Fh	H0E-94	EtherCAT EOE version No.		0 to 65535	0	0.01	16 bits	-	-
	60h	H0E-95	Ethernet version No.		0 to 65535	0	0.01	16 bits	-	-

■ Parameters of axis 3

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3000h/H00 Servo Motor Parameters										
3000	01h	H00-00	Motor code		0 to 65535	14000	1	16 bits	At stop	Next power-on
	03h	H00-02	Customized motor code		0 to 0xFFFFFFFF	0	1	32 bits	-	-
	05h	H00-04	Encoder version No.		0 to 65535	0	0.1	16 bits	-	-
	06h	H00-05	Serial encoder motor code		0 to 65535	0	1	16 bits	-	-
	09h	H00-08	Serial encoder type		0 to 65535	0	1	16 bits	At stop	Next power-on
	0Ah	H00-09	Rated voltage	0: 220 V 1: 380 V	0 to 1	0	1	16 bits	At stop	Next power-on
	0Bh	H00-10	Rated power		1 to 65535	75	0.01 kW	16 bits	At stop	Next power-on
	0Ch	H00-11	Rated current		1 to 65535	470	0.01 A	16 bits	At stop	Next power-on

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3000	0Dh	H00-12	Rated torque		10 to 65535	239	0.01 N m	16 bits	At stop	Next power-on
	0Eh	H00-13	Maximum torque		10 to 65535	716	0.01 N m	16 bits	At stop	Next power-on
	0Fh	H00-14	Rated speed		100 to 6000	3000	1 RPM	16 bits	At stop	Next power-on
	10h	H00-15	Maximum motor speed		100 to 6000	6000	1 RPM	16 bits	At stop	Next power-on
	11h	H00-16	Moment of inertia		1 to 65535	130	0.01 $kgcm^2$	16 bits	At stop	Next power-on
	12h	H00-17	Number of pole pairs of PMSM		2 to 360	5	1	16 bits	At stop	Next power-on
	13h	H00-18	Stator resistance		1 to 65535	500	0.001 Ω	16 bits	At stop	Next power-on
	14h	H00-19	Stator inductance Lq		1 to 65535	327	0.01 mH	16 bits	At stop	Next power-on
	15h	H00-20	Stator inductance Ld		1 to 65535	387	0.01 mH	16 bits	At stop	Next power-on
	16h	H00-21	Linear back EMF coefficient		1 to 65535	3330	0.01 mV/ RPM	16 bits	At stop	Next power-on
	17h	H00-22	Torque coefficient Kt		1 to 65535	51	0.01 N m/ Arms	16 bits	At stop	Next power-on
	18h	H00-23	Electrical constant Te		1 to 65535	654	0.01 ms	16 bits	At stop	Next power-on
	19h	H00-24	Mechanical constant Tm		1 to 65535	24	0.01 ms	16 bits	At stop	Next power-on
	1Dh	H00-28	Position offset of absolute encoder		0 to 4294967295	8192	1	32 bits	At stop	Next power-on
	1Fh	H00-30	Encoder selection (Hex)	19: Inovance 20-bit serial encoder	0 to 0x0FFF	0x0013	1	16 bits	At stop	Next power-on
	20h	H00-31	PPR of encoder		1 to 1073741824	8388608	1 PPR	32 bits	At stop	Next power-on
	22h	H00-33	Electrical angle of Z signal		0 to 3600	1800	0.1°	16 bits	At stop	Next power-on
	26h	H00-37	Absolute encoder function setting bit		0 to 0xFFFF	0	1	16 bits	At stop	Next power-on

Parameter Group Hex. Group	Hex. Index Code	Dec. Para. No.	Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
3001h/H01: Servo Drive Parameters										
3001	01h	H01-00	MCU software version		0 to 65535	0	0.1	16 bits	-	-
	02h	H01-01	FPGA software version		0 to 65535	0	0.1	16 bits	-	-
	03h	H01-02	FPGA customized No.		0 to 65535	0	0.1	16 bits	-	-
	04h	H01-03	CPU0 software version No.		0 to 65535	0	0.1	16 bits	-	-
	05h	H01-04	CPU1 software version No.		0 to 65535	0	0.1	16 bits	-	-
	08h	H01-07	Software test version No.		0 to 65535	0	0.01	16 bits	-	-
	0Bh	H01-10	Drive unit series number	3: S2R8 5: S5R5	0 to 65535	3	1	16 bits	At stop	Next power-on
	0Ch	H01-11	Voltage class of the drive unit		0 to 65535	220	1 V	16 bits	-	-
	0Dh	H01-12	Rated power of the drive unit		0 to 1073741824	40	0.01 kW	32 bits	-	-
	0Fh	H01-14	Maximum output power of the drive unit		0 to 1073741824	40	0.01 kW	32 bits	-	-
	11h	H01-16	Rated output current of the drive unit		0 to 1073741824	280	0.01 A	32 bits	-	-
	13h	H01-18	Maximum output current of the drive unit		0 to 1073741824	1010	0.01 A	32 bits	-	-
	15h	H01-20	Carrier frequency		4000 to 20000	8000	1 Hz	16 bits	At stop	Next power-on
	16h	H01-21	Dead zone time		1 to 2000	200	0.01 μs	16 bits	At stop	Next power-on
	17h	H01-22	D-axis coupling voltage compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immediately
	18h	H01-23	Q-axis back EMF compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immediately
	19h	H01-24	D-axis current loop gain		0 to 20000	500	1 Hz	16 bits	During running	Immediately
	1Ah	H01-25	D-axis current loop integral compensation factor		1 to 10000	100	0.01	16 bits	During running	Immediately
	1Bh	H01-26	Current sampling Sinc3 filter data extraction rate	0: Extraction rate 32 1: Extraction rate 64 2: Extraction rate 128 3: Extraction rate 256	0 to 3	0	1	16 bits	At stop	Next power-on

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3001	1Ch	H01-27	Q-axis current loop gain		0 to 20000	500	1 Hz	16 bits	During running	Immedi-ately
	1Dh	H01-28	Q-axis current loop integral compensation factor		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	1Eh	H01-29	Q-axis coupling voltage compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immedi-ately
	1Fh	H01-30	Bus voltage gain tuning		500 to 1500	1000	0.1%	16 bits	At stop	Next power-on
	20h	H01-31	Minimum turn-on time of bootstrap circuit lower bridge		0 to 200	50	0.1 μs	16 bits	At stop	Next power-on
	21h	H01-32	Relative gain of UV sampling		1 to 65535	32768	1	16 bits	At stop	Next power-on
	23h	H01-34	IGBT over-temperature threshold		0 to 1500	950	0.1°C	16 bits	During running	Immedi-ately
	25h	H01-36	Current sensor range		0 to 999999	2083	0.01 A	32 bits	At stop	Next power-on
	27h	H01-38	FPGA phase current protection threshold		0 to 1000	900	0.1%	16 bits	At stop	Next power-on
	29h	H01-40	DC bus overvoltage protection threshold		0 to 2000	420	1 V	16 bits	-	-
	2Ah	H01-41	DC bus voltage discharge threshold		0 to 2000	380	1 V	16 bits	At stop	Immedi-ately
	2Bh	H01-42	DC bus undervoltage threshold		0 to 2000	200	1 V	16 bits	At stop	Immedi-ately
	2Ch	H01-43	Power supply unit series No.	1: 1 kW 2: 2 kW	1 to 2	1	1	16 bits	At stop	Next power-on
	2Dh	H01-44	Output power of the power supply unit		0 to 1073741824	100	0.01 kW	32 bits	-	-
	2Fh	H01-46	Maximum output power of the power supply unit		0 to 1073741824	150	0.01 kW	32 bits	-	-
	31h	H01-48	Rated output current of the power supply unit		0 to 1073741824	320	0.01 A	32 bits	-	-
	33h	H01-50	Over-temperature threshold of the power module		0 to 1500	800	0.1°C	16 bits	During running	Immedi-ately
	35h	H01-52	D-axis proportional gain in performance priority mode		0 to 20000	2000	1 Hz	16 bits	During running	Immedi-ately
	36h	H01-53	D-axis integral gain in performance priority mode		1 to 10000	100	0.01	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3001	37h	H01-54	Q-axis proportional gain in performance priority mode		0 to 20000	2000	1 Hz	16 bits	During running	Immedi-ately
	38h	H01-55	Q-axis integral gain in performance priority mode		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	39h	H01-56	Current loop low-pass cutoff frequency		0 to 65535	11000	1 Hz	16 bits	At stop	Next power-on
	3Ah	H01-57	Maximum output current of the power supply unit		0 to 1073741824	480	0.01 A	32 bits	-	-
	3Ch	H01-59	Serial encoder data transmission compensation time		0 to 2000	0	0.001 μs	16 bits	At stop	Next power-on
	3Dh	H01-60	FPGA scheduling frequency selection	0: 32 kHz 1: 16 kHz	0 to 1	1	1	16 bits	At stop	Next power-on
	3Eh	H01-61	Command scheduling frequency selection	0: 4 kHz 1: 2 kHz 2: 1 kHz	0 to 2	2	1	16 bits	At stop	Next power-on
	48h	H01-71	Voltage class of the power supply unit		0 to 65535	220	1 V	16 bits	-	-
3002h/H02 Basic Control Parameters										
3002	01h	H02-00	Control mode selection	0: Speed mode 1: Position mode 2: Torque mode 9: EtherCAT mode 255: This axis is not used.	0 to 255	9	1	16 bits	At stop	Immedi-ately
	02h	H02-01	Absolute system selection	0: Incremental mode 1: Absolute position linear mode 2: Absolute position rotation mode	0 to 2	0	1	16 bits	At stop	Next power-on
	03h	H02-02	Rotation direction	0: CCW direction as the forward direction 1: CW direction as the forward direction	0 to 1	0	1	16 bits	At stop	Next power-on
	08h	H02-07	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	0 to 2	1	1	16 bits	At stop	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3002	09h	H02-08	Stop mode at No.1 fault	0: Coast to stop, keeping de-energized state 1: DB Stop, keeping de-energized state 2: DB Stop, keeping DB state	0 to 2	0	1	16 bits	At stop	Immedi-ately
	0Ah	H02-09	Delay from brake output ON to command received		0 to 500	250	1 ms	16 bits	During running	Immedi-ately
	0Bh	H02-10	Delay from brake output OFF to motor de-energized		50 to 1000	150	1 ms	16 bits	During running	Immedi-ately
	0Ch	H02-11	Motor speed threshold at brake output OFF in rotational state		20 to 3000	30	1 RPM	16 bits	During running	Immedi-ately
	0Dh	H02-12	Delay from S-ON OFF to brake output OFF in rotational state		1 to 1000	500	1 ms	16 bits	During running	Immedi-ately
	10h	H02-15	Warning display on the keypad	0: Output warning information Immediately 1: Not output warning information	0 to 1	0	1	16 bits	At stop	Immedi-ately
	11h	H02-16	Brake switch	0: OFF 1: ON	0 to 1	0	1	16 bits	At stop	Immedi-ately
	16h	H02-21	Permissible minimum resistance of the regenerative resistor		1 to 1000	40	1 Ω	16 bits	-	-
	19h	H02-24	Heat dissipation coefficient of the resistor		10 to 100	30	0.01%	16 bits	At stop	Immedi-ately
	1Ah	H02-25	Regenerative resistor selection	1: External resistor, naturally ventilated 2: External resistor, forced air cooling 3: Capacitor, no regenerative resistor needed	1 to 3	3	1	16 bits	At stop	Immedi-ately
	1Bh	H02-26	Power of external regenerative resistor		1 to 65535	40	1 kW	16 bits	At stop	Immedi-ately
	1Ch	H02-27	Resistance of external regenerative resistor		1 to 1000	50	1 Ω	16 bits	At stop	Immedi-ately
	1Fh	H02-30	User password		0 to 65535	0	1	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3002	20h	H02-31	System parameter initialization	0: No operation 1: Restore default settings 2: Clear fault records	0 to 2	0	1	16 bits	At stop	Immedi-ately
	21h	H02-32	Selection of parameters in group H0B		0 to 99	50	1	16 bits	During running	Immedi-ately
	24h	H02-35	Keypad data refresh frequency		0 to 20	0	1 Hz	16 bits	During running	Immedi-ately
	2Ah	H02-41	Factory password		0 to 65535	0	1	16 bits	During running	Immedi-ately
3003h/H03 Terminal Input Parameters										
3003	03h	H03-02	DI1 function selection	Consisting of three digits, with the first one (from left to right) indicating the axis number and the last two indicating the terminal function. The last two digits are defined as follows: 0: No definition 01: S-ON 14: Positive limit switch 15: Negative limit switch 31: Home switch 38: Touch probe 1 39: Touch probe 2	0 to 65535	0	1	16 bits	During running	At stop
	04h	H03-03	DI1 logic selection	0: Active low 1: Active high 2: Rising edge-triggered 3: Falling edge-triggered 4: Rising/Falling edge-triggered	0 to 4	0	1	16 bits	During running	At stop
	05h	H03-04	DI2 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	06h	H03-05	DI2 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	07h	H03-06	DI3 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3003	08h	H03-07	DI3 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	09h	H03-08	DI4 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ah	H03-09	DI4 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	0Bh	H03-10	DI5 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ch	H03-11	DI5 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	0Dh	H03-12	DI6 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Eh	H03-13	DI6 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	0Fh	H03-14	DI7 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	10h	H03-15	DI7 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	11h	H03-16	DI8 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	12h	H03-17	DI8 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	13h	H03-18	DI9 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	14h	H03-19	DI9 terminal logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	15h	H03-20	DI10 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3003	16h	H03-21	DI10 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	17h	H03-22	DI11 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	18h	H03-23	DI11 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	19h	H03-24	DI12 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Ah	H03-25	DI12 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	1Bh	H03-26	DI13 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Ch	H03-27	DI13 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	1Dh	H03-28	DI14 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Eh	H03-29	DI14 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	1Fh	H03-30	DI15 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	20h	H03-31	DI15 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	21h	H03-32	DI16 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	22h	H03-33	DI16 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	23h	H03-34	DI17 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3003	24h	H03-35	DI17 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	25h	H03-36	DI18 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	26h	H03-37	DI18 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	27h	H03-38	DI19 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	28h	H03-39	DI19 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	29h	H03-40	DI20 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	2Ah	H03-41	DI20 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Bh	H03-42	DI21 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	2Ch	H03-43	DI21 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Dh	H03-44	DI22 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	2Eh	H03-45	DI22 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Fh	H03-46	DI23 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	30h	H03-47	DI23 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	31h	H03-48	DI24 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3003	32h	H03-49	DI24 terminal logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
3004h/H04 Terminal Output Parameters										
3004	01h	H04-00	DO1 function selection	Consisting of three digits, with the first one (from left to right) indicating the axis number and the last two indicating the terminal function. The last two digits are defined as follows: 0: No definition 01: Servo ready 02: Motor rotating 10: Warning 11: Fault	0 to 65535	0	1	16 bits	During running	At stop
	02h	H04-01	DO1 logic selection	0: Output low (L) level upon valid logic (optocoupler ON) 1: Output high (H) level upon valid logic (optocoupler OFF)	0 to 1	0	1	16 bits	During running	At stop
	03h	H04-02	DO2 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	04h	H04-03	DO2 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
	5h	H04-04	DO3 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	6h	H04-05	DO3 terminal logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
	7h	H04-06	DO4 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	8h	H04-07	DO4 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3004	9h	H04-08	DO5 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ah	H04-09	DO5 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
	0Bh	H04-10	DO6 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ch	H04-11	DO6 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
3005h/H05 Position Control Parameters										
3005	05h	H05-04	First-order low-pass filter time constant		0 to 65535	0	0.1 ms	16 bits	At stop	Immediately
	07h	H05-06	Moving average filter time constant		0 to 1280	0	0.1 ms	16 bits	At stop	Immediately
	14h	H05-19	Speed feedforward control	0: No speed feedforward 1: Internal speed feedforward 2: 60B1 used as speed feedforward	0 to 2	1	1	16 bits	At stop	Immediately
	24h	H05-35	Duration limit of homing		0 to 65535	50000	0.01s	16 bits	During running	Immediately
	2Fh	H05-46	Position offset in absolute position linear mode (low 32 bits)		0 to 4294967295	0	1	32 bits	At stop	Next power-on
	31h	H05-48	Position offset in absolute position linear mode (high 32 bits)		–2147483648 to +2147483647	0	1	32 bits	At stop	Next power-on
	33h	H05-50	Mechanical gear ratio (numerator)		1 to 65535	1	1	16 bits	At stop	Immediately
	34h	H05-51	Mechanical gear ratio (denominator)		1 to 65535	1	1	16 bits	At stop	Immediately
	35h	H05-52	Pulses per load revolution in absolute position rotation mode (low 32 bits)		0 to 4294967295	0	1 p	32 bits	At stop	Immediately
	37h	H05-54	Pulses per load revolution in absolute position rotation mode (high 32 bits)		0 to 128	0	1 p	32 bits	At stop	Immediately

Parameter Group Hex. Group	Hex. Index Code	Dec. Para. No.	Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
3006h/H06 Speed Control Parameters										
3006	03h	H06-02	Speed reference source	0: Keypad 1: Multi-speed reference	0 to 1	0	1	16 bits	At stop	Immedi-ately
	04h	H06-03	Speed reference		–6000 to +6000	200	1 RPM	16 bits	During running	Immedi-ately
3006	06h	H06-05	Acceleration ramp time of speed reference		0 to 65535	0	1 RPM	16 bits	During running	Immedi-ately
	07h	H06-06	Deceleration ramp time of speed reference		0 to 65535	0	1 RPM	16 bits	During running	Immedi-ately
	09h	H06-08	Forward speed limit		0 to 6000	6000	1 RPM	16 bits	During running	Immedi-ately
	0Ah	H06-09	Reverse speed limit		0 to 6000	6000	1 RPM	16 bits	During running	Immedi-ately
	0Ch	H06-11	Torque feedforward control	0: No torque feedforward 1: Internal torque feedforward 2: 60B2 used as external torque feedforward	0 to 2	1	1	16 bits	During running	Immedi-ately
	0Dh	H06-12	Acceleration ramp time of jog speed		0 to 65535	10	1 ms	16 bits	During running	Immedi-ately
	11h	H06-16	Motor speed threshold		0 to 1000	20	1 RPM	16 bits	During running	Immedi-ately
3007h/H07 Torque Control Parameters										
3007	04h	H07-03	Torque reference set through keypad		–3000 to +3000	0	0.1%	16 bits	During running	Immedi-ately
	06h	H07-05	Torque reference filter time constant		0 to 3000	79	0.01 ms	16 bits	During running	Immedi-ately
	07h	H07-06	2nd torque reference filter time constant		0 to 3000	79	0.01 ms	16 bits	During running	Immedi-ately
	0Ah	H07-09	Internal forward torque limit		0 to 3000	3000	0.1%	16 bits	During running	Immedi-ately
	0Bh	H07-10	Internal reverse torque limit		0 to 3000	3000	0.1%	16 bits	During running	Immedi-ately
	10h	H07-15	Emergency stop torque		0 to 3000	1000	0.1%	16 bits	During running	Immedi-ately
	14h	H07-19	Internal speed limit in torque control		0 to 6000	3000	1 RPM	16 bits	During running	Immedi-ately
	15h	H07-20	Internal reverse speed limit in torque control		0 to 6000	3000	1 RPM	16 bits	During running	Immedi-ately
3007	16h	H07-21	Reference value for torque reached		0 to 3000	0	0.1%	16 bits	During running	Immedi-ately
	17h	H07-22	Torque output when torque reached DO signal turned on		0 to 3000	200	0.1%	16 bits	During running	Immedi-ately
	18h	H07-23	Torque output when torque reached DO signal turned off		0 to 3000	100	0.1%	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3008h/H08 Gain Parameters										
3008	01h	H08-00	Speed loop gain		1 to 20000	250	0.1 Hz	16 bits	During running	Immedi-ately
	02h	H08-01	Speed loop integral time constant		15 to 51200	3183	0.01 ms	16 bits	During running	Immedi-ately
	03h	H08-02	Position loop gain		0 to 20000	400	0.1 Hz	16 bits	During running	Immedi-ately
	04h	H08-03	2nd speed loop gain		1 to 20000	400	0.1 Hz	16 bits	During running	Immedi-ately
	05h	H08-04	2nd speed loop integral time constant		15 to 51200	2000	0.01 ms	16 bits	During running	Immedi-ately
	06h	H08-05	2nd position loop gain		0 to 20000	640	0.1 Hz	16 bits	During running	Immedi-ately
	09h	H08-08	2nd gain mode	0: Fixed at the 1st gain, P/ PI switchover performed through bit26 of 60FE 1: Switchover between the 1st gain and 2nd gain activated based on the condition defined by H08-09	0 to 1	1	1	16 bits	During running	Immedi-ately
	0Ah	H08-09	Gain switchover condition	0: Fixed at the 1st gain (PS) 2: Torque reference value too large (PS) 3: Speed reference value too large (PS) 4: Speed reference change rate too large (PS) 5: Threshold of speed reference (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 to 10	0	1	16 bits	During running	Immedi-ately
	0Bh	H08-10	Gain switchover delay		0 to 10000	50	0.1 ms	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3008	0Ch	H08-11	Gain switchover level		0 to 20000	50	1	16 bits	During running	Immedi-ately
	0Dh	H08-12	Gain switchover hysteresis		0 to 20000	30	1	16 bits	During running	Immedi-ately
	0Eh	H08-13	Position gain switchover time		0 to 10000	30	0.1 ms	16 bits	During running	Immedi-ately
	10h	H08-15	Load inertia ratio		0 to 12000	100	0.01	16 bits	During running	Immedi-ately
	13h	H08-18	Speed feedforward filter time constant		0 to 6400	50	0.01 ms	16 bits	During running	Immedi-ately
	14h	H08-19	Speed feedforward gain		0 to 1000	0	0.1%	16 bits	During running	Immedi-ately
	15h	H08-20	Torque feedforward filter time constant		0 to 6400	50	0.01 ms	16 bits	During running	Immedi-ately
	16h	H08-21	Torque feedforward gain		0 to 2000	0	0.1%	16 bits	During running	Immedi-ately
	17h	H08-22	Speed feedback filter selection	0: Average filtering of speed feedback inhibited 1: 2 times of average filtering of speed feedback 2: 4 times of average filtering of speed feedback 3: 8 times of average filtering of speed feedback 4: 16 times of average filtering of speed feedback	0 to 4	0	1	16 bits	At stop	Immedi-ately
	18h	H08-23	Cutoff frequency of speed feedback low-pass filter		100 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	19h	H08-24	PDFF control coefficient		0 to 1000	1000	0.1%	16 bits	During running	Immedi-ately
3009h/H09 Gain Auto-tuning Parameters										
3009	01h	H09-00	Gain auto-tuning mode	0: Disabled, gain parameters adjusted manually 1: Standard gain auto-tuning mode, gain parameters adjusted automatically based on the stiffness level 2: Positioning mode, gain parameters adjusted automatically based on the stiffness level	0 to 2	0	1	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3009	02h	H09-01	Stiffness level		0 to 31	12	1	16 bits	During running	Immedi-ately
	03h	H09-02	Adaptive notch mode	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, parameters of 3rd and 4th notches restored to default values	0 to 4	0	1	16 bits	During running	Immedi-ately
	04h	H09-03	Online inertia auto-tuning mode	0: Online auto-tuning disabled 1: Online auto-tuning enabled, changing slowly 2: Online auto-tuning enabled, changing normally 3: Online auto-tuning enabled, changing quickly	0 to 3	0	1	16 bits	During running	Immedi-ately
	05h	H09-04	Low-frequency resonance suppression mode	0: Manually set parameters of low-frequency resonance suppression filter 1: Automatically set parameters of low-frequency resonance suppression filter	0 to 1	0	1	16 bits	During running	Immedi-ately
	06h	H09-05	Offline inertia auto-tuning mode	0: Positive and negative triangular wave mode 1: JOG mode	0 to 1	0	1	16 bits	At stop	Immedi-ately
	07h	H09-06	Maximum speed of inertia auto-tuning		100 to 1000	500	1 RPM	16 bits	At stop	Immedi-ately
	08h	H09-07	Time constant for accelerating to the maximum speed during inertia auto-tuning		20 to 800	125	1 ms	16 bits	At stop	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3009	09h	H09-08	Inertia auto-tuning interval		50 to 10000	800	1 ms	16 bits	At stop	Immedi-ately
	0Ah	H09-09	Number of motor revolutions per inertia auto-tuning		0 to 65535	0	0.01	16 bits	-	-
	0Dh	H09-12	Frequency of the 1st notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	0Eh	H09-13	Width level of the 1st notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	0Fh	H09-14	Depth level of the 1st notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	10h	H09-15	Frequency of the 2nd notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	11h	H09-16	Width level of the 2nd notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	12h	H09-17	Depth level of the 2nd notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	13h	H09-18	Frequency of the 3rd notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	14h	H09-19	Width level of the 3rd notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	15h	H09-20	Depth level of the 3rd notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	16h	H09-21	Frequency of the 4th notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	17h	H09-22	Width level of the 4th notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	18h	H09-23	Depth level of the 4th notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	19h	H09-24	Auto-tuned resonance frequency		0 to 2000	0	1 Hz	16 bits	-	-
	1Fh	H09-30	Torque disturbance compensation gain		–1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	20h	H09-31	Filter time constant of torque disturbance observer		0 to 2500	50	0.01 ms	16 bits	During running	Immedi-ately
	21h	H09-32	Constant torque compensation value		–1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	22h	H09-33	Forward friction compensation value		–1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	23h	H09-34	Reverse friction compensation value		–1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	27h	H09-38	Frequency of low-frequency resonance		10 to 1000	1000	0.1 Hz	16 bits	During running	Immedi-ately
	28h	H09-39	Low-frequency resonance frequency filter		0 to 10	2	1	16 bits	At stop	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
300Ah/H0A Fault and Protection Parameters										
300A	01h	H0A-00	Power input phase loss protection	0: Enable phase loss fault and inhibit phase loss warning 1: Enable phase loss fault and warning 2: Inhibit phase loss fault and warning	0 to 2	0	1	16 bits	During running	Immedi-ately
	02h	H0A-01	Absolute position limit	0: Disable absolute position limit 1: Enable absolute position limit 2: Enable absolute position limit after homing	0 to 2	0	1	16 bits	At stop	Immedi-ately
	04h	H0A-03	Power-off memory selection	0: Disable power-off memory 1: Enable power-off memory 2: Disable power-off memory and hide control power undervoltage fault	0 to 2	0	1	16 bits	During running	Immedi-ately
	05h	H0A-04	Motor overload protection gain		50 to 300	100	1	16 bits	At stop	Immedi-ately
	07h	H0A-06	Motor overload level		0 to 400	0	1	16 bits	At stop	Immedi-ately
	08h	H0A-07	UVW phase sequence auto-tuning selection	0: Not perform UVW phase sequence auto-tuning during angle auto-tuning 1: Perform UVW phase sequence auto-tuning during angle auto-tuning	0 to 1	1	1	16 bits	During running	Immedi-ately
	09h	H0A-08	Overspeed threshold		0 to 10000	0	1 RPM	16 bits	During running	Immedi-ately
	0Dh	H0A-12	Runaway protection selection	0: Disable 1: Enable	0 to 1	1	1	16 bits	During running	Immedi-ately
	0Eh	H0A-13	Initial angle auto-tuning mode	0: Auto-tuning with Z signal 1: Jog auto-tuning without Z signal 2: Auto-tuning of voltage input 3: Angle auto-tuning of voltage input with Z signal	0 to 3	0	1	16 bits	At stop	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
300A	10h	H0A-15	Motor rotation threshold		1 to 1000	5	1 RPM	16 bits	During running	Immedi-ately
	11h	H0A-16	Threshold for low-frequency resonance position deviation		1 to 1000	5	1 p	16 bits	During running	Immedi-ately
	14h	H0A-19	Filter time constant of touch probe 1		0 to 630	200	1 μs	16 bits	During running	Immedi-ately
	15h	H0A-20	Filter time constant of touch probe 2		0 to 630	200	1 μs	16 bits	During running	Immedi-ately
	16h	H0A-21	STO function switch	0: Enable STO function 1: Hide STO function	0 to 1	0	1	16 bits	At stop	Next power-on
	17h	H0A-22	Sigma_Delta filter time		0 to 3	1	1	16 bits	At stop	Next power-on
	18h	H0A-23	TZ signal filter time		0 to 31	15	125 ns	16 bits	At stop	Next power-on
	1Ah	H0A-25	Filter time constant of displayed speed feedback		0 to 5000	50	1 ms	16 bits	At stop	Immedi-ately
	1Bh	H0A-26	Motor overload selection	0: Show motor overload warning (Er.909) and fault (Er.620) 1: Hide motor overload warning (Er.909) and fault (Er.620)	0 to 1	0	1	16 bits	At stop	Immedi-ately
	21h	H0A-32	Time window of locked rotor over-temperature protection		10 to 65535	200	1 ms	16 bits	During running	Immedi-ately
	22h	H0A-33	Locked rotor over-temperature protection	0: Shielded 1: Enabled	0 to 1	1	1	16 bits	During running	Immedi-ately
	25h	H0A-36	Encoder multi-turn overflow fault	0: Not hide 1: Hide	0 to 1	0	1	16 bits	At stop	Immedi-ately
300Bh/H0B Monitor Parameters										
300B	01h	H0B-00	Actual motor speed		–9999 to +9999	0	1 RPM	16 bits	-	-
	02h	H0B-01	Speed reference		–9999 to +9999	0	1 RPM	16 bits	-	-
	03h	H0B-02	Internal torque reference		–3000 to +3000	0	0.1%	16 bits	-	-
	04h	H0B-03	Monitored DI status		0 to 0x00FFFFFF	0	1	32 bits	-	-
	06h	H0B-05	Monitored DO status		0 to 0xFFFF	0	1	16 bits	-	-
	08h	H0B-07	Absolute position counter		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	0Ah	H0B-09	Mechanical angle		0 to 3600	0	0.1°	16 bits	-	-
	0Bh	H0B-10	Electrical angle		0 to 3600	0	0.1°	16 bits	-	-
	0Dh	H0B-12	Average load ratio		0 to 65535	0	0.1%	16 bits	-	-

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
300B	10h	H0B-15	Position following deviation (encoder unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	12h	H0B-17	Feedback pulse counter		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	14h	H0B-19	Total power-on time		0 to 4294967295	0	0.1s	32 bits	-	-
	19h	H0B-24	RMS value of phase current		0 to 65535	0	0.01 A	32 bits	-	-
	1Bh	H0B-26	Bus voltage		0 to 65535	0	0.1 V	16 bits	-	-
	1Ch	H0B-27	Power module temperature		0 to 65535	0	1°C	16 bits	-	-
	1Dh	H0B-28	Absolute encoder fault information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-
	1Eh	H0B-29	System status information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-
	1Fh	H0B-30	System fault information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-
	20h	H0B-31	Encoder fault information		0 to 0xFFFF	0	1	16 bits	-	-
	22h	H0B-33	Fault log		0 to 9	0	1	16 bits	During running	Immedi-ately
	23h	H0B-34	Fault code of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	24h	H0B-35	Time stamp upon occurrence of the selected fault		0 to 4294967295	0	0.1s	32 bits	-	-
	26h	H0B-37	Motor speed upon occurrence of the selected fault		–9999 to +9999	0	1 RPM	16 bits	-	-
	27h	H0B-38	Motor phase U current upon occurrence of the selected fault		–32768 to +32767	0	0.01 A	16 bits	-	-
	28h	H0B-39	Motor phase V current upon occurrence of the selected fault		–32768 to +32767	0	0.01 A	16 bits	-	-
	29h	H0B-40	Bus voltage upon occurrence of the selected fault		0 to 65535	0	0.1 V	16 bits	-	-
	2Ah	H0B-41	Input terminal status upon occurrence of the selected fault		0 to 0x00FFFFFF	0	1	32 bits	-	-
	2Ch	H0B-43	Output terminal status upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	2Eh	H0B-45	Internal fault code		0 to 0xFFFF	0	1	16 bits	-	-
	2Fh	H0B-46	Absolute encoder fault information given by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
300B	30h	H0B-47	System status information given by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	31h	H0B-48	System fault information given by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	32h	H0B-49	Encoder fault information upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	34h	H0B-51	Internal fault code upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	36h	H0B-53	Position following deviation (reference unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	38h	H0B-55	Actual motor speed		–60000 to +60000	0	0.1 RPM	32 bits	-	-
	3Ah	H0B-57	Bus voltage of the control power		0 to 65535	0	0.1 V	16 bits	-	-
	3Bh	H0B-58	Mechanical absolute position (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-
	3Dh	H0B-60	Mechanical absolute position (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	47h	H0B-70	Number of absolute encoder revolutions		0 to 65535	0	1	16 bits	-	-
	48h	H0B-71	Position of the absolute encoder within one turn		0 to 2147483647	0	1 p	32 bits	-	-
	4Eh	H0B-77	Encoder position (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-
	50h	H0B-79	Encoder position (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	52h	H0B-81	Single-turn position of the rotating load (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-
	54h	H0B-83	Single-turn position of the rotating load (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	56h	H0B-85	Single-turn position of the rotating load (reference unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	5Bh	H0B-90	Group No. of the abnormal parameter		0 to 0xFFFF	0	1	16 bits	-	-
	5Ch	H0B-91	Offset of the abnormal parameter within the group		0 to 65535	0	1	16 bits	-	-

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
300Dh/H0D Auxiliary Function Parameters										
300D	02h	H0D-01	Fault reset	0: No operation 1: Fault reset	0 to 1	0	1	16 bits	During running	Immedi-ately
300D	04h	H0D-03	Encoder initial angle auto-tuning	0: No operation 1: Enable	0 to 1	0	1	16 bits	At stop	Immedi-ately
300D	05h	H0D-04	Encoder ROM read/ write	0: No operation 1: Write ROM 2: Read ROM	0 to 2	0	1	16 bits	At stop	Immedi-ately
300D	06h	H0D-05	Emergency stop	0: No operation 1: Emergency stop	0 to 1	0	1	16 bits	During running	Immedi-ately
300D	0Dh	H0D-12	UV phase current balance correction	0: Disable 1: Enable	0 to 1	0	1	16 bits	At stop	Immedi-ately
300D	15h	H0D-20	Absolute encoder reset selection	0: No operation 1: Reset the fault 2: Reset the fault and multi-turn data	0 to 2	0	1	16 bits	At stop	Immedi-ately
300Eh/H0E Communication Function Parameters										
300E	01h	H0E-00	Node address		1 to 127	1	1	16 bits	During running	Immedi-ately
300E	02h	H0E-01	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 EEPROM	0 to 3	3	1	16 bits	During running	Immedi-ately
300E	03h	H0E-02	Axis address		1 to 127	1	1	16 bits	-	-
300E	09h	H0E-08	Servo node address selection	0: Node address determined by H0E-00 1: Node address determined by DIP switch 1	0 to 1	0	1	16 bits	During running	Immedi-ately
300E	0Bh	H0E-10	CAN communication mode	0: N/A 1: CANopen 2: CANlink	0 to 2	1	1	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
300E	0Ch	H0E-11	CAN baud rate	0: 20 K 1: 50 K 2: 100 K 3: 125 K 4: 250 K 5: 500 K 6: 1 M	0 to 6	5	1	16 bits	During running	Immedi-ately
	0Dh	H0E-12	Number of CAN frames received per unit time		0 to 65535	0	1	16 bits	-	-
	0Eh	H0E-13	Maximum CAN reception errors per unit time		0 to 255	0	1	16 bits	-	-
	0Fh	H0E-14	Maximum CAN transmission errors per unit time		0 to 255	0	1	16 bits	-	-
	10h	H0E-15	CAN bus disconnection times per unit time		0 to 65535	0	1	16 bits	-	-
	11h	H0E-16	CAN configuration mode		0 to 1	0	1	16 bits	During running	Immedi-ately
	15h	H0E-20	EtherCAT slave name		0 to 65535	0	1	16 bits	-	-
	16h	H0E-21	EtherCAT slave alias		0 to 65535	0	1	16 bits	At stop	Immedi-ately
	17h	H0E-22	Number of synchronization interrupts allowed by EtherCAT		1 to 20	9	1	16 bits	During running	Immedi-ately
	18h	H0E-23	EtherCAT synchronization detection mode	0: Standard mode 1: Surplus mode	0 to 1	0	1	16 bits	During running	Immedi-ately
	19h	H0E-24	Synchronization loss count		0 to 65535	0	1	16 bits	-	-
	1Ah	H0E-25	Maximum error value and invalid frames of EtherCAT port 0 per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Bh	H0E-26	Maximum error value and invalid frames of EtherCAT port 1 per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Ch	H0E-27	Maximum transfer error of EtherCAT port per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Dh	H0E-28	Maximum EtherCAT data frame processing unit error per unit time		0 to 0x0255	0	1	16 bits	-	-
	1Eh	H0E-29	Maximum link loss of EtherCAT port 0 per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Fh	H0E-30	EtherCAT master type		0 to 3	2	1	16 bits	At stop	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
300E	20h	H0E-31	EtherCAT synchronization mode		0 to 2	1	1	16 bits	At stop	Next power-on
	21h	H0E-32	EtherCAT synchronization error threshold		0 to 2000	500	1	16 bits	At stop	Immediately
	22h	H0E-33	EtherCAT state machine status		0 to 8	0	1	16 bits	-	-
	23h	H0E-34	Excessive position reference increment count in CSP mode		0 to 7	1	1	16 bits	During running	Immediately
	29h	H0E-40	EOE selection	0: Disable EOE 1: Enable EOE	0 to 1	0	1	16 bits	During running	Immediately
	2Ah	H0E-41	Most significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immediately
	2Bh	H0E-42	Second most significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immediately
	2Ch	H0E-43	Second least significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immediately
	2Dh	H0E-44	Least significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immediately
	2Eh	H0E-45	Most significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immediately
	2Fh	H0E-46	Second most significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immediately
	30h	H0E-47	Second least significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immediately
	31h	H0E-48	Least significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immediately
	32h	H0E-49	Most significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immediately
	33h	H0E-50	Second most significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immediately
	34h	H0E-51	Second least significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immediately
	35h	H0E-52	Least significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immediately
	36h	H0E-53	Most significant byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	37h	H0E-54	2nd byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
300E	38h	H0E-55	3rd byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	39h	H0E-56	4th byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Ah	H0E-57	5th byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Bh	H0E-58	Least significant byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Dh	H0E-60	Automatic Ethernet IP address identification	0: Disabled 1: Enabled	0 to 1	0	1	16 bits	During running	Immedi-ately
	3Eh	H0E-61	Most significant byte of Ethernet IP address		0 to 255	192	1	16 bits	During running	Immedi-ately
	3Fh	H0E-62	Second most significant byte of Ethernet IP address		0 to 255	168	1	16 bits	During running	Immedi-ately
	40h	H0E-63	Second least significant byte of Ethernet IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	41h	H0E-64	Least significant byte of Ethernet IP address		0 to 255	2	1	16 bits	During running	Immedi-ately
	42h	H0E-65	Most significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately
	43h	H0E-66	Second most significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately
	44h	H0E-67	Second least significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately
	45h	H0E-68	Least significant byte of Ethernet subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	46h	H0E-69	Most significant byte of default Ethernet gateway		0 to 255	192	1	16 bits	During running	Immedi-ately
	47h	H0E-70	Second most significant byte of default Ethernet gateway		0 to 255	168	1	16 bits	During running	Immedi-ately
	48h	H0E-71	Second least significant byte of default Ethernet gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	49h	H0E-72	Least significant byte of default Ethernet gateway		0 to 255	1	1	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
300E	51h	H0E-80	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	0 to 9	9	1	16 bits	During running	Immedi-ately
	52h	H0E-81	Modbus data format	0: No parity, 2 stop bits (8-N-2) 1: Even parity, 1 stop bit (8-E-1) 2: Odd parity, 1 stop bit (8-O-1) 3: No parity, 1 stop bit (8-N-1)	0 to 3	3	1	16 bits	During running	Immedi-ately
	53h	H0E-82	Modbus response delay		0 to 20	0	1	16 bits	During running	Immedi-ately
	54h	H0E-83	Modbus communication timeout		0 to 600	0	1	16 bits	During running	Immedi-ately
	5Bh	H0E-90	Modbus version No.		0 to 65535	0	0.01	16 bits	-	-
	5Ch	H0E-91	CANopen version No.		0 to 65535	0	0.01	16 bits	-	-
	5Dh	H0E-92	CANlink version No.		0 to 65535	0	0.01	16 bits	-	-
	5Eh	H0E-93	EtherCAT COE version No.		0 to 65535	0	0.01	16 bits	-	-
	5Fh	H0E-94	EtherCAT EOE version No.		0 to 65535	0	0.01	16 bits	-	-
	60h	H0E-95	Ethernet version No.		0 to 65535	0	0.01	16 bits	-	-

■ Parameters of axis 4

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3800h/H00 Servo Motor Parameters										
3800	01h	H00-00	Motor code		0 to 65535	14000	1	16 bits	At stop	Next power-on
	03h	H00-02	Customized motor code		0 to 0xFFFFFFFF	0	1	32 bits	-	-
	05h	H00-04	Encoder version No.		0 to 65535	0	0.1	16 bits	-	-
	06h	H00-05	Serial encoder motor code		0 to 65535	0	1	16 bits	-	-
	09h	H00-08	Serial encoder type		0 to 65535	0	1	16 bits	At stop	Next power-on
	0Ah	H00-09	Rated voltage	0: 220 V 1: 380 V	0 to 1	0	1	16 bits	At stop	Next power-on

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3800	0Bh	H00-10	Rated power		1 to 65535	75	0.01 kW	16 bits	At stop	Next power-on
	0Ch	H00-11	Rated current		1 to 65535	470	0.01 A	16 bits	At stop	Next power-on
	0Dh	H00-12	Rated torque		10 to 65535	239	0.01 N m	16 bits	At stop	Next power-on
	0Eh	H00-13	Maximum torque		10 to 65535	716	0.01 N m	16 bits	At stop	Next power-on
	0Fh	H00-14	Rated speed		100 to 6000	3000	1 RPM	16 bits	At stop	Next power-on
	10h	H00-15	Maximum motor speed		100 to 6000	6000	1 RPM	16 bits	At stop	Next power-on
	11h	H00-16	Moment of inertia		1 to 65535	130	0.01 $kgcm^2$	16 bits	At stop	Next power-on
	12h	H00-17	Number of pole pairs of PMSM		2 to 360	5	1	16 bits	At stop	Next power-on
	13h	H00-18	Stator resistance		1 to 65535	500	0.001 Ω	16 bits	At stop	Next power-on
	14h	H00-19	Stator inductance Lq		1 to 65535	327	0.01 mH	16 bits	At stop	Next power-on
	15h	H00-20	Stator inductance Ld		1 to 65535	387	0.01 mH	16 bits	At stop	Next power-on
	16h	H00-21	Linear back EMF coefficient		1 to 65535	3330	0.01 mV/ RPM	16 bits	At stop	Next power-on
	17h	H00-22	Torque coefficient Kt		1 to 65535	51	0.01 N m/Arms	16 bits	At stop	Next power-on
	18h	H00-23	Electrical constant Te		1 to 65535	654	0.01 ms	16 bits	At stop	Next power-on
	19h	H00-24	Mechanical constant Tm		1 to 65535	24	0.01 ms	16 bits	At stop	Next power-on
	1Dh	H00-28	Position offset of absolute encoder		0 to 4294967295	8192	1	32 bits	At stop	Next power-on
	1Fh	H00-30	Encoder selection (Hex)	19: Inovance 20-bit serial encoder	0 to 0x0FFF	0x0013	1	16 bits	At stop	Next power-on
	20h	H00-31	PPR of encoder		1 to 1073741824	8388608	1 PPR	32 bits	At stop	Next power-on
	22h	H00-33	Electrical angle of Z signal		0 to 3600	1800	0.1°	16 bits	At stop	Next power-on
	26h	H00-37	Absolute encoder function setting bit		0 to 0xFFFF	0	1	16 bits	At stop	Next power-on
3801h/H01: Servo Drive Parameters										
3801	01h	H01-00	MCU software version		0 to 65535	0	0.1	16 bits	-	-
	02h	H01-01	FPGA software version		0 to 65535	0	0.1	16 bits	-	-
	03h	H01-02	FPGA customized No.		0 to 65535	0	0.1	16 bits	-	-
	04h	H01-03	CPU0 software version No.		0 to 65535	0	0.1	16 bits	-	-
	05h	H01-04	CPU1 software version No.		0 to 65535	0	0.1	16 bits	-	-
	08h	H01-07	Software test version No.		0 to 65535	0	0.01	16 bits	-	-

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3801	0Bh	H01-10	Drive unit series number	3: S2R8 5: S5R5	0 to 65535	3	1	16 bits	At stop	Next power-on
	0Ch	H01-11	Voltage class of the drive unit		0 to 65535	220	1 V	16 bits	-	-
	0Dh	H01-12	Rated power of the drive unit		0 to 1073741824	40	0.01 kW	32 bits	-	-
	0Fh	H01-14	Maximum output power of the drive unit		0 to 1073741824	40	0.01 kW	32 bits	-	-
	11h	H01-16	Rated output current of the drive unit		0 to 1073741824	280	0.01 A	32 bits	-	-
	13h	H01-18	Maximum output current of the drive unit		0 to 1073741824	1010	0.01 A	32 bits	-	-
	15h	H01-20	Carrier frequency		4000 to 20000	8000	1 Hz	16 bits	At stop	Next power-on
	16h	H01-21	Dead zone time		1 to 2000	200	0.01 μs	16 bits	At stop	Next power-on
	17h	H01-22	D-axis coupling voltage compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immedi-ately
	18h	H01-23	Q-axis back EMF compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immedi-ately
	19h	H01-24	D-axis current loop gain		0 to 20000	500	1 Hz	16 bits	During running	Immedi-ately
	1Ah	H01-25	D-axis current loop integral compensation factor		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	1Bh	H01-26	Current sampling Sinc3 filter data extraction rate	0: Extraction rate 32 1: Extraction rate 64 2: Extraction rate 128 3: Extraction rate 256	0 to 3	0	1	16 bits	At stop	Next power-on
	1Ch	H01-27	Q-axis current loop gain		0 to 20000	500	1 Hz	16 bits	During running	Immedi-ately
	1Dh	H01-28	Q-axis current loop integral compensation factor		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	1Eh	H01-29	Q-axis coupling voltage compensation coefficient		0 to 60000	500	0.1%	16 bits	During running	Immedi-ately
	1Fh	H01-30	Bus voltage gain tuning		500 to 1500	1000	0.1%	16 bits	At stop	Next power-on
	20h	H01-31	Minimum turn-on time of bootstrap circuit lower bridge		0 to 200	50	0.1 μs	16 bits	At stop	Next power-on
	21h	H01-32	Relative gain of UV sampling		1 to 65535	32768	1	16 bits	At stop	Next power-on
	23h	H01-34	IGBT over-temperature threshold		0 to 1500	950	0.1°C	16 bits	During running	Immedi-ately
	25h	H01-36	Current sensor range		0 to 999999	2083	0.01 A	32 bits	At stop	Next power-on

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3801	27h	H01-38	FPGA phase current protection threshold		0 to 1000	900	0.1%	16 bits	At stop	Next power-on
	29h	H01-40	DC bus overvoltage protection threshold		0 to 2000	420	1 V	16 bits	-	-
	2Ah	H01-41	DC bus voltage discharge threshold		0 to 2000	380	1 V	16 bits	At stop	Immedi-ately
	2Bh	H01-42	DC bus undervoltage threshold		0 to 2000	200	1 V	16 bits	At stop	Immedi-ately
	2Ch	H01-43	Power supply unit series No.	1: 1 kW 2: 2 kW	1 to 2	1	1	16 bits	At stop	Next power-on
	2Dh	H01-44	Output power of the power supply unit		0 to 1073741824	100	0.01 kW	32 bits	-	-
	2Fh	H01-46	Maximum output power of the power supply unit		0 to 1073741824	150	0.01 kW	32 bits	-	-
	31h	H01-48	Rated output current of the power supply unit		0 to 1073741824	320	0.01 A	32 bits	-	-
	33h	H01-50	Over-temperature threshold of the power module		0 to 1500	800	0.1°C	16 bits	During running	Immedi-ately
	35h	H01-52	D-axis proportional gain in performance priority mode		0 to 20000	2000	1 Hz	16 bits	During running	Immedi-ately
	36h	H01-53	D-axis integral gain in performance priority mode		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	37h	H01-54	Q-axis proportional gain in performance priority mode		0 to 20000	2000	1 Hz	16 bits	During running	Immedi-ately
	38h	H01-55	Q-axis integral gain in performance priority mode		1 to 10000	100	0.01	16 bits	During running	Immedi-ately
	39h	H01-56	Current loop low-pass cutoff frequency		0 to 65535	11000	1 Hz	16 bits	At stop	Next power-on
	3Ah	H01-57	Maximum output current of the power supply unit		0 to 1073741824	480	0.01 A	32 bits	-	-
	3Ch	H01-59	Serial encoder data transmission compensation time		0 to 2000	0	0.001 μs	16 bits	At stop	Next power-on
	3Dh	H01-60	FPGA scheduling frequency selection	0: 32 kHz 1: 16 kHz	0 to 1	1	1	16 bits	At stop	Next power-on
	3Eh	H01-61	Command scheduling frequency selection	0: 4 kHz 1: 2 kHz 2: 1 kHz	0 to 2	2	1	16 bits	At stop	Next power-on
	48h	H01-71	Voltage class of the power supply unit		0 to 65535	220	1 V	16 bits	-	-

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3802h/H02 Basic Control Parameters										
3802	01h	H02-00	Control mode selection	0: Speed mode 1: Position mode 2: Torque mode 9: EtherCAT mode 255: This axis is not used.	0 to 255	9	1	16 bits	At stop	Immediately
	02h	H02-01	Absolute system selection	0: Incremental mode 1: Absolute position linear mode 2: Absolute position rotation mode	0 to 2	0	1	16 bits	At stop	Next power-on
	03h	H02-02	Rotation direction	0: CCW direction as the forward direction 1: CW direction as the forward direction	0 to 1	0	1	16 bits	At stop	Next power-on
	08h	H02-07	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	0 to 2	1	1	16 bits	At stop	Immediately
	09h	H02-08	Stop mode at No.1 fault	0: Coast to stop, keeping de-energized state 1: DB Stop, keeping de-energized state 2: DB Stop, keeping DB state	0 to 2	0	1	16 bits	At stop	Immediately
	0Ah	H02-09	Delay from brake output ON to command received		0 to 500	250	1 ms	16 bits	During running	Immediately
	0Bh	H02-10	Delay from brake output OFF to motor de-energized		50 to 1000	150	1 ms	16 bits	During running	Immediately
	0Ch	H02-11	Motor speed threshold at brake output OFF in rotational state		20 to 3000	30	1 RPM	16 bits	During running	Immediately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3802	0Dh	H02-12	Delay from S-ON OFF to brake output OFF in rotational state		1 to 1000	500	1 ms	16 bits	During running	Immedi-ately
	10h	H02-15	Warning display on the keypad	0: Output warning information Immediately 1: Not output warning information	0 to 1	0	1	16 bits	At stop	Immedi-ately
	11h	H02-16	Brake switch	0: OFF 1: ON	0 to 1	0	1	16 bits	At stop	Immedi-ately
	16h	H02-21	Permissible minimum resistance of the regenerative resistor		1 to 1000	40	1 Ω	16 bits	-	-
	19h	H02-24	Heat dissipation coefficient of the resistor		10 to 100	30	0.01%	16 bits	At stop	Immedi-ately
	1Ah	H02-25	Regenerative resistor selection	1: External resistor, naturally ventilated 2: External resistor, forced air cooling 3: Capacitor, no regenerative resistor needed	1 to 3	3	1	16 bits	At stop	Immedi-ately
	1Bh	H02-26	Power of external regenerative resistor		1 to 65535	40	1 kW	16 bits	At stop	Immedi-ately
	1Ch	H02-27	Resistance of external regenerative resistor		1 to 1000	50	1 Ω	16 bits	At stop	Immedi-ately
	1Fh	H02-30	User password		0 to 65535	0	1	16 bits	During running	Immedi-ately
	20h	H02-31	System parameter initialization	0: No operation 1: Restore default settings 2: Clear fault records	0 to 2	0	1	16 bits	At stop	Immedi-ately
	21h	H02-32	Selection of parameters in group H0B		0 to 99	50	1	16 bits	During running	Immedi-ately
	24h	H02-35	Keypad data refresh frequency		0 to 20	0	1 Hz	16 bits	During running	Immedi-ately
	2Ah	H02-41	Factory password		0 to 65535	0	1	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3803h/H03 Terminal Input Parameters										
3803	03h	H03-02	DI1 function selection	Consisting of three digits, with the first one (from left to right) indicating the axis number and the last two indicating the terminal function. The last two digits are defined as follows: 0: No definition 01: S-ON 14: Positive limit switch 15: Negative limit switch 31: Home switch 38: Touch probe 1 39: Touch probe 2	0 to 65535	0	1	16 bits	During running	At stop
	04h	H03-03	DI1 logic selection	0: Active low 1: Active high 2: Rising edge-triggered 3: Falling edge-triggered 4: Rising/Falling edge-triggered	0 to 4	0	1	16 bits	During running	At stop
	05h	H03-04	DI2 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	06h	H03-05	DI2 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	07h	H03-06	DI3 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	08h	H03-07	DI3 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3803	09h	H03-08	DI4 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ah	H03-09	DI4 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	0Bh	H03-10	DI5 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ch	H03-11	DI5 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	0Dh	H03-12	DI6 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Eh	H03-13	DI6 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	0Fh	H03-14	DI7 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	10h	H03-15	DI7 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	11h	H03-16	DI8 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	12h	H03-17	DI8 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	13h	H03-18	DI9 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3803	14h	H03-19	DI9 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	15h	H03-20	DI10 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	16h	H03-21	DI10 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	17h	H03-22	DI11 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	18h	H03-23	DI11 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	19h	H03-24	DI12 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Ah	H03-25	DI12 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	1Bh	H03-26	DI13 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Ch	H03-27	DI13 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	1Dh	H03-28	DI14 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	1Eh	H03-29	DI14 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3803	1Fh	H03-30	DI15 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	20h	H03-31	DI15 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	21h	H03-32	DI16 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	22h	H03-33	DI16 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	23h	H03-34	DI17 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	24h	H03-35	DI17 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	25h	H03-36	DI18 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	26h	H03-37	DI18 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	27h	H03-38	DI19 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	28h	H03-39	DI19 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	29h	H03-40	DI20 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3803	2Ah	H03-41	DI20 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Bh	H03-42	DI21 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	2Ch	H03-43	DI21 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Dh	H03-44	DI22 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	2Eh	H03-45	DI22 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	2Fh	H03-46	DI23 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	30h	H03-47	DI23 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop
	31h	H03-48	DI24 function selection	0 to 39 See the description of H03-02 for details.	0 to 65535	0	1	16 bits	During running	At stop
	32h	H03-49	DI24 logic selection	0 to 4 See the description of H03-03 for details.	0 to 4	0	1	16 bits	During running	At stop

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3804h/H04 Terminal Output Parameters										
3804	01h	H04-00	DO1 function selection	Consisting of three digits, with the first one (from left to right) indicating the axis number and the last two indicating the terminal function. The last two digits are defined as follows: 0: No definition 01: Servo ready 02: Motor rotating 10: Warning 11: Fault	0 to 65535	0	1	16 bits	During running	At stop
	02h	H04-01	DO1 logic selection	0: Output low (L) level upon valid logic (optocoupler ON) 1: Output high (H) level upon valid logic (optocoupler OFF)	0 to 1	0	1	16 bits	During running	At stop
	03h	H04-02	DO2 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	04h	H04-03	DO2 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
	5h	H04-04	DO3 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	6h	H04-05	DO3 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3804	7h	H04-06	DO4 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	8h	H04-07	DO4 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
	9h	H04-08	DO5 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ah	H04-09	DO5 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
	0Bh	H04-10	DO6 function selection	0 to 11 See the description of H04-00 for details.	0 to 65535	0	1	16 bits	During running	At stop
	0Ch	H04-11	DO6 logic selection	0 to 1 See the description of H04-01 for details.	0 to 1	0	1	16 bits	During running	At stop
3805h/H05 Position Control Parameters										
3805	05h	H05-04	First-order low-pass filter time constant		0 to 65535	0	0.1 ms	16 bits	At stop	Immedi-ately
	07h	H05-06	Moving average filter time constant		0 to 1280	0	0.1 ms	16 bits	At stop	Immedi-ately
	14h	H05-19	Speed feedforward control	0: No speed feedforward 1: Internal speed feedforward 2: 60B1 used as speed feedforward	0 to 2	1	1	16 bits	At stop	Immedi-ately
	24h	H05-35	Duration limit of homing		0 to 65535	50000	0.01s	16 bits	During running	Immedi-ately
	2Fh	H05-46	Position offset in absolute position linear mode (low 32 bits)		0 to 4294967295	0	1	32 bits	At stop	Next power-on
	31h	H05-48	Position offset in absolute position linear mode (high 32 bits)		–2147483648 to +2147483647	0	1	32 bits	At stop	Next power-on
	33h	H05-50	Mechanical gear ratio (numerator)		1 to 65535	1	1	16 bits	At stop	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3805	34h	H05-51	Mechanical gear ratio (denominator)		1 to 65535	1	1	16 bits	At stop	Immediately
	35h	H05-52	Pulses per load revolution in absolute position rotation mode (low 32 bits)		0 to 4294967295	0	1 p	32 bits	At stop	Immediately
	37h	H05-54	Pulses per load revolution in absolute position rotation mode (high 32 bits)		0 to 128	0	1 p	32 bits	At stop	Immediately
3806h/H06 Speed Control Parameters										
3806	03h	H06-02	Speed reference source	0: Keypad 1: Multi-speed reference	0 to 1	0	1	16 bits	At stop	Immediately
	04h	H06-03	Speed reference		–6000 to +6000	200	1 RPM	16 bits	During running	Immediately
	06h	H06-05	Acceleration ramp time of speed reference		0 to 65535	0	1 RPM	16 bits	During running	Immediately
	07h	H06-06	Deceleration ramp time of speed reference		0 to 65535	0	1 RPM	16 bits	During running	Immediately
	09h	H06-08	Forward speed limit		0 to 6000	6000	1 RPM	16 bits	During running	Immediately
	0Ah	H06-09	Reverse speed limit		0 to 6000	6000	1 RPM	16 bits	During running	Immediately
	0Ch	H06-11	Torque feedforward control	0: No torque feedforward 1: Internal torque feedforward 2: 60B2 used as external torque feedforward	0 to 2	1	1	16 bits	During running	Immediately
	0Dh	H06-12	Acceleration ramp time of jog speed		0 to 65535	10	1 ms	16 bits	During running	Immediately
	11h	H06-16	Motor speed threshold		0 to 1000	20	1 RPM	16 bits	During running	Immediately
3807h/H07 Torque Control Parameters										
3807	04h	H07-03	Torque reference set through the keypad		–3000 to +3000	0	0.1%	16 bits	During running	Immediately
	06h	H07-05	Torque reference filter time constant		0 to 3000	79	0.01 ms	16 bits	During running	Immediately
	07h	H07-06	2nd torque reference filter time constant		0 to 3000	79	0.01 ms	16 bits	During running	Immediately
	0Ah	H07-09	Internal forward torque limit		0 to 3000	3000	0.1%	16 bits	During running	Immediately
	0Bh	H07-10	Internal reverse torque limit		0 to 3000	3000	0.1%	16 bits	During running	Immediately
	10h	H07-15	Emergency stop torque		0 to 3000	1000	0.1%	16 bits	During running	Immediately
	14h	H07-19	Internal speed limit in torque control		0 to 6000	3000	1 RPM	16 bits	During running	Immediately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3807	15h	H07-20	Internal reverse speed limit in torque control		0 to 6000	3000	1 RPM	16 bits	During running	Immedi-ately
	16h	H07-21	Reference value for torque reached		0 to 3000	0	0.1%	16 bits	During running	Immedi-ately
	17h	H07-22	Torque output when torque reached DO signal turned on		0 to 3000	200	0.1%	16 bits	During running	Immedi-ately
	18h	H07-23	Torque output when torque reached DO signal turned off		0 to 3000	100	0.1%	16 bits	During running	Immedi-ately
3808h/H08 Gain Parameters										
3808	01h	H08-00	Speed loop gain		1 to 20000	250	0.1 Hz	16 bits	During running	Immedi-ately
	02h	H08-01	Speed loop integral time constant		15 to 51200	3183	0.01 ms	16 bits	During running	Immedi-ately
	03h	H08-02	Position loop gain		0 to 20000	400	0.1 Hz	16 bits	During running	Immedi-ately
	04h	H08-03	2nd speed loop gain		1 to 20000	400	0.1 Hz	16 bits	During running	Immedi-ately
	05h	H08-04	2nd speed loop integral time constant		15 to 51200	2000	0.01 ms	16 bits	During running	Immedi-ately
	06h	H08-05	2nd position loop gain		0 to 20000	640	0.1 Hz	16 bits	During running	Immedi-ately
	09h	H08-08	2nd gain mode	0: Fixed at the 1st gain, P/PI switchover performed through bit26 of 60FE 1: Switchover between the 1st gain and 2nd gain activated based on the condition defined by H08-09	0 to 1	1	1	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3808	0Ah	H08-09	Gain switchover condition	0: Fixed at the 1st gain (PS) 2: Torque reference value too large (PS) 3: Speed reference value too large (PS) 4: Speed reference change rate too large (PS) 5: Threshold of speed reference (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 to 10	0	1	16 bits	During running	Immediately
	0Bh	H08-10	Gain switchover delay		0 to 10000	50	0.1 ms	16 bits	During running	Immediately
	0Ch	H08-11	Gain switchover level		0 to 20000	50	1	16 bits	During running	Immediately
	0Dh	H08-12	Gain switchover hysteresis		0 to 20000	30	1	16 bits	During running	Immediately
	0Eh	H08-13	Position gain switchover time		0 to 10000	30	0.1 ms	16 bits	During running	Immediately
	10h	H08-15	Load inertia ratio		0 to 12000	100	0.01	16 bits	During running	Immediately
	13h	H08-18	Speed feedforward filter time constant		0 to 6400	50	0.01 ms	16 bits	During running	Immediately
	14h	H08-19	Speed feedforward gain		0 to 1000	0	0.1%	16 bits	During running	Immediately
	15h	H08-20	Torque feedforward filter time constant		0 to 6400	50	0.01 ms	16 bits	During running	Immediately
	16h	H08-21	Torque feedforward gain		0 to 2000	0	0.1%	16 bits	During running	Immediately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3808	17h	H08-22	Speed feedback filter selection	0: Average filtering of speed feedback inhibited 1: 2 times of average filtering of speed feedback 2: 4 times of average filtering of speed feedback 3: 8 times of average filtering of speed feedback 4: 16 times of average filtering of speed feedback	0 to 4	0	1	16 bits	At stop	Immedi-ately
	18h	H08-23	Cutoff frequency of speed feedback low-pass filter		100 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	19h	H08-24	PDFF control coefficient		0 to 1000	1000	0.1%	16 bits	During running	Immedi-ately
3809h/H09 Gain Auto-tuning Parameters										
3809	01h	H09-00	Gain auto-tuning mode	0: Disabled, gain parameters adjusted manually 1: Standard gain auto-tuning mode, gain parameters adjusted automatically based on the stiffness level 2: Positioning mode, gain parameters adjusted automatically based on the stiffness level	0 to 2	0	1	16 bits	During running	Immedi-ately
	02h	H09-01	Stiffness level		0 to 31	12	1	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3809	03h	H09-02	Adaptive notch mode	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, parameters of 3rd and 4th notches restored to default values	0 to 4	0	1	16 bits	During running	Immedi-ately
	04h	H09-03	Online inertia auto-tuning mode	0: Online auto-tuning disabled 1: Online auto-tuning enabled, changing slowly 2: Online auto-tuning enabled, changing normally 3: Online auto-tuning enabled, changing quickly	0 to 3	0	1	16 bits	During running	Immedi-ately
	05h	H09-04	Low-frequency resonance suppression mode	0: Manually set parameters of low-frequency resonance suppression filter 1: Automatically set parameters of low-frequency resonance suppression filter	0 to 1	0	1	16 bits	During running	Immedi-ately
	06h	H09-05	Offline inertia auto-tuning mode	0: Positive and negative triangular wave mode 1: JOG mode	0 to 1	0	1	16 bits	At stop	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
3809	07h	H09-06	Maximum speed of inertia auto-tuning		100 to 1000	500	1 RPM	16 bits	At stop	Immedi-ately
	08h	H09-07	Time constant for accelerating to the maximum speed during inertia auto-tuning		20 to 800	125	1 ms	16 bits	At stop	Immedi-ately
	09h	H09-08	Inertia auto-tuning interval		50 to 10000	800	1 ms	16 bits	At stop	Immedi-ately
	0Ah	H09-09	Number of motor revolutions per inertia auto-tuning		0 to 65535	0	0.01	16 bits	-	-
	0Dh	H09-12	Frequency of the 1st notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	0Eh	H09-13	Width level of the 1st notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	0Fh	H09-14	Depth level of the 1st notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	10h	H09-15	Frequency of the 2nd notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	11h	H09-16	Width level of the 2nd notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	12h	H09-17	Depth level of the 2nd notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	13h	H09-18	Frequency of the 3rd notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	14h	H09-19	Width level of the 3rd notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	15h	H09-20	Depth level of the 3rd notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	16h	H09-21	Frequency of the 4th notch		50 to 4000	4000	1 Hz	16 bits	During running	Immedi-ately
	17h	H09-22	Width level of the 4th notch		0 to 20	2	1	16 bits	During running	Immedi-ately
	18h	H09-23	Depth level of the 4th notch		0 to 99	0	1	16 bits	During running	Immedi-ately
	19h	H09-24	Auto-tuned resonance frequency		0 to 2000	0	1 Hz	16 bits	-	-
	1Fh	H09-30	Torque disturbance compensation gain		–1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	20h	H09-31	Filter time constant of torque disturbance observer		0 to 2500	50	0.01 ms	16 bits	During running	Immedi-ately
	21h	H09-32	Constant torque compensation value		–1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	22h	H09-33	Forward friction compensation value		–1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	23h	H09-34	Reverse friction compensation value		–1000 to +1000	0	0.1%	16 bits	During running	Immedi-ately
	27h	H09-38	Frequency of low-frequency resonance		10 to 1000	1000	0.1 Hz	16 bits	During running	Immedi-ately
	28h	H09-39	Low-frequency resonance frequency filter		0 to 10	2	1	16 bits	At stop	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
380Ah/H0A Fault and Protection Parameters										
380A	01h	H0A-00	Power input phase loss protection	0: Enable phase loss fault and inhibit phase loss warning 1: Enable phase loss fault and warning 2: Inhibit phase loss fault and warning	0 to 2	0	1	16 bits	During running	Immedi-ately
	02h	H0A-01	Absolute position limit	0: Disable absolute position limit 1: Enable absolute position limit 2: Enable absolute position limit after homing	0 to 2	0	1	16 bits	At stop	Immedi-ately
	04h	H0A-03	Power-off memory selection	0: Disable power-off memory 1: Enable power-off memory 2: Disable power-off memory and hide control power undervoltage fault	0 to 2	0	1	16 bits	During running	Immedi-ately
	05h	H0A-04	Motor overload protection gain		50 to 300	100	1	16 bits	At stop	Immedi-ately
	07h	H0A-06	Motor overload level		0 to 400	0	1	16 bits	At stop	Immedi-ately
	08h	H0A-07	UVW phase sequence auto-tuning selection	0: Not perform UVW phase sequence auto-tuning during angle auto-tuning 1: Perform UVW phase sequence auto-tuning during angle auto-tuning	0 to 1	1	1	16 bits	During running	Immedi-ately
	09h	H0A-08	Overspeed threshold		0 to 10000	0	1 RPM	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
380A	0Dh	H0A-12	Runaway protection selection	0: Disabled 1: Enabled	0 to 1	1	1	16 bits	During running	Immedi-ately
	0Eh	H0A-13	Initial angle auto-tuning mode	0: Auto-tuning with Z signal 1: Jog auto-tuning without Z signal 2: Auto-tuning of voltage input 3: Angle auto-tuning of voltage input with Z signal	0 to 3	0	1	16 bits	At stop	Immedi-ately
	10h	H0A-15	Motor rotation threshold		1 to 1000	5	1 RPM	16 bits	During running	Immedi-ately
	11h	H0A-16	Threshold for low-frequency resonance position deviation		1 to 1000	5	1 p	16 bits	During running	Immedi-ately
	14h	H0A-19	Filter time constant of touch probe 1		0 to 630	200	1 μs	16 bits	During running	Immedi-ately
	15h	H0A-20	Filter time constant of touch probe 2		0 to 630	200	1 μs	16 bits	During running	Immedi-ately
	16h	H0A-21	STO function switch	0: Enable STO function 1: Hide STO function	0 to 1	0	1	16 bits	At stop	Next power-on
	17h	H0A-22	Sigma_Delta filter time		0 to 3	1	1	16 bits	At stop	Next power-on
	18h	H0A-23	TZ signal filter time		0 to 31	15	125 ns	16 bits	At stop	Next power-on
	1Ah	H0A-25	Filter time constant of displayed speed feedback		0 to 5000	50	1 ms	16 bits	At stop	Immedi-ately
	1Bh	H0A-26	Motor overload selection	0: Show motor overload warning (Er.909) and fault (Er.620) 1: Hide motor overload warning (Er.909) and fault (Er.620)	0 to 1	0	1	16 bits	At stop	Immedi-ately
	21h	H0A-32	Time window of locked rotor over-temperature protection		10 to 65535	200	1 ms	16 bits	During running	Immedi-ately
	22h	H0A-33	Locked rotor over-temperature protection	0: Shielded 1: Enabled	0 to 1	1	1	16 bits	During running	Immedi-ately
	25h	H0A-36	Encoder multi-turn overflow fault	0: Not hide 1: Hide	0 to 1	0	1	16 bits	At stop	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
380Bh/H0B Monitor Parameters										
380B	01h	H0B-00	Actual motor speed		–9999 to +9999	0	1 RPM	16 bits	-	-
	02h	H0B-01	Speed reference		–9999 to +9999	0	1 RPM	16 bits	-	-
	03h	H0B-02	Internal torque reference		–3000 to +3000	0	0.1%	16 bits	-	-
	04h	H0B-03	Monitored DI status		0 to 0x00FFFFFF	0	1	32 bits	-	-
	06h	H0B-05	Monitored DO status		0 to 0xFFFF	0	1	16 bits	-	-
	08h	H0B-07	Absolute position counter		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	0Ah	H0B-09	Mechanical angle		0 to 3600	0	0.1°	16 bits	-	-
	0Bh	H0B-10	Electrical angle		0 to 3600	0	0.1°	16 bits	-	-
	0Dh	H0B-12	Average load ratio		0 to 65535	0	0.1%	16 bits	-	-
	10h	H0B-15	Position following deviation (encoder unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	12h	H0B-17	Feedback pulse counter		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	14h	H0B-19	Total power-on time		0 to 4294967295	0	0.1s	32 bits	-	-
	19h	H0B-24	RMS value of phase current		0 to 65535	0	0.01 A	32 bits	-	-
	1Bh	H0B-26	Bus voltage		0 to 65535	0	0.1 V	16 bits	-	-
	1Ch	H0B-27	Power module temperature		0 to 65535	0	1°C	16 bits	-	-
	1Dh	H0B-28	Absolute encoder fault information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-
	1Eh	H0B-29	System status information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-
	1Fh	H0B-30	System fault information given by FPGA		0 to 0xFFFF	0	1	16 bits	-	-
	20h	H0B-31	Encoder fault information		0 to 0xFFFF	0	1	16 bits	-	-
	22h	H0B-33	Fault log		0 to 9	0	1	16 bits	During running	Immedi-ately
	23h	H0B-34	Fault code of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	24h	H0B-35	Time stamp upon occurrence of the selected fault		0 to 4294967295	0	0.1s	32 bits	-	-
	26h	H0B-37	Motor speed upon occurrence of the selected fault		–9999 to +9999	0	1 RPM	16 bits	-	-
	27h	H0B-38	Motor phase U current upon occurrence of the selected fault		–32768 to +32767	0	0.01 A	16 bits	-	-

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
380B	28h	H0B-39	Motor phase V current upon occurrence of the selected fault		–32768 to +32767	0	0.01 A	16 bits	-	-
	29h	H0B-40	Bus voltage upon occurrence of the selected fault		0 to 65535	0	0.1 V	16 bits	-	-
	2Ah	H0B-41	Input terminal status upon occurrence of the selected fault		0 to 0x00FFFFFF	0	1	32 bits	-	-
	2Ch	H0B-43	Output terminal status upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	2Eh	H0B-45	Internal fault code		0 to 0xFFFF	0	1	16 bits	-	-
	2Fh	H0B-46	Absolute encoder fault information given by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	30h	H0B-47	System status information generated by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	31h	H0B-48	System fault information given by FPGA upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	32h	H0B-49	Encoder fault information upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	34h	H0B-51	Internal fault code upon occurrence of the selected fault		0 to 0xFFFF	0	1	16 bits	-	-
	36h	H0B-53	Position following deviation (reference unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	38h	H0B-55	Actual motor speed		–60000 to +60000	0	0.1 RPM	32 bits	-	-
	3Ah	H0B-57	Bus voltage of the control power		0 to 65535	0	0.1 V	16 bits	-	-
	3Bh	H0B-58	Mechanical absolute position (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-
	3Dh	H0B-60	Mechanical absolute position (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	47h	H0B-70	Number of absolute encoder revolutions		0 to 65535	0	1	16 bits	-	-
	48h	H0B-71	Position of the absolute encoder within one turn		0 to 2147483647	0	1 p	32 bits	-	-
	4Eh	H0B-77	Encoder position (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-
	50h	H0B-79	Encoder position (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
380B	52h	H0B-81	Single-turn position of the rotating load (low 32 bits)		0 to 4294967295	0	1 p	32 bits	-	-
	54h	H0B-83	Single-turn position of the rotating load (high 32 bits)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	56h	H0B-85	Single-turn position of the rotating load (reference unit)		–2147483648 to +2147483647	0	1 p	32 bits	-	-
	5Bh	H0B-90	Group No. of the abnormal parameter		0 to 0xFFFF	0	1	16 bits	-	-
	5Ch	H0B-91	Offset of the abnormal parameter within the group		0 to 65535	0	1	16 bits	-	-
380Dh/H0D Auxiliary Function Parameters										
380D	02h	H0D-01	Fault reset	0: No operation 1: Fault reset	0 to 1	0	1	16 bits	During running	Immedi-ately
	04h	H0D-03	Encoder initial angle auto-tuning	0: No operation 1: Enabled	0 to 1	0	1	16 bits	At stop	Immedi-ately
	05h	H0D-04	Encoder ROM read/write	0: No operation 1: Write ROM 2: Read ROM	0 to 2	0	1	16 bits	At stop	Immedi-ately
	06h	H0D-05	Emergency stop	0: No operation 1: Emergency stop	0 to 1	0	1	16 bits	During running	Immedi-ately
	0Dh	H0D-12	UV phase current balance correction	0: Disabled 1: Enabled	0 to 1	0	1	16 bits	At stop	Immedi-ately
	15h	H0D-20	Absolute encoder reset selection	0: No operation 1: Reset the fault 2: Reset the fault and multi-turn data	0 to 2	0	1	16 bits	At stop	Immedi-ately
380Eh/H0E Communication Parameters										
380E	01h	H0E-00	Node address		1 to 127	1	1	16 bits	During running	Immedi-ately
380E	02h	H0E-01	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 EEPROM	0 to 3	3	1	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
380E	03h	H0E-02	Axis address		1 to 127	1	1	16 bits	-	-
	09h	H0E-08	Servo node address selection	0: Node address determined by H0E-00 1: Node address determined by DIP switch 1	0 to 1	0	1	16 bits	During running	Immedi-ately
	0Bh	H0E-10	CAN communication mode	0: N/A 1: CANopen 2: CANlink	0 to 2	1	1	16 bits	During running	Immedi-ately
	0Ch	H0E-11	CAN baud rate	0: 20 K 1: 50 K 2: 100 K 3: 125 K 4: 250 K 5: 500 K 6: 1 M	0 to 6	5	1	16 bits	During running	Immedi-ately
	0Dh	H0E-12	Number of CAN frames received per unit time		0 to 65535	0	1	16 bits	-	-
	0Eh	H0E-13	Maximum CAN reception errors per unit time		0 to 255	0	1	16 bits	-	-
	0Fh	H0E-14	Maximum CAN transmission errors per unit time		0 to 255	0	1	16 bits	-	-
	10h	H0E-15	CAN bus disconnection times per unit time		0 to 65535	0	1	16 bits	-	-
	11h	H0E-16	CAN configuration mode		0 to 1	0	1	16 bits	During running	Immedi-ately
	15h	H0E-20	EtherCAT slave name		0 to 65535	0	1	16 bits	-	-
	16h	H0E-21	EtherCAT slave alias		0 to 65535	0	1	16 bits	At stop	Immedi-ately
	17h	H0E-22	Number of synchronization interrupts allowed by EtherCAT		1 to 20	9	1	16 bits	During running	Immedi-ately
	18h	H0E-23	EtherCAT synchronization detection mode	0: Standard mode 1: Surplus mode	0 to 1	0	1	16 bits	During running	Immedi-ately
	19h	H0E-24	Synchronization loss count		0 to 65535	0	1	16 bits	-	-
	1Ah	H0E-25	Maximum error value and invalid frames of EtherCAT port 0 per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Bh	H0E-26	Maximum error value and invalid frames of EtherCAT port 1 per unit time		0 to 0xFFFF	0	1	16 bits	-	-

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
380E	1Ch	H0E-27	Maximum transfer error of EtherCAT port per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Dh	H0E-28	Maximum EtherCAT data frame processing unit error per unit time		0 to 0x0255	0	1	16 bits	-	-
	1Eh	H0E-29	Maximum link loss of EtherCAT port 0 per unit time		0 to 0xFFFF	0	1	16 bits	-	-
	1Fh	H0E-30	EtherCAT master type		0 to 3	2	1	16 bits	At stop	Immedi-ately
	20h	H0E-31	EtherCAT synchronization mode		0 to 2	1	1	16 bits	At stop	Next power-on
	21h	H0E-32	EtherCAT synchronization error threshold		0 to 2000	500	1	16 bits	At stop	Immedi-ately
	22h	H0E-33	EtherCAT state machine status		0 to 8	0	1	16 bits	-	-
	23h	H0E-34	Excessive position reference increment count in CSP mode		0 to 7	1	1	16 bits	During running	Immedi-ately
	29h	H0E-40	EOE selection	0: Disable EOE 1: Enable EOE	0 to 1	0	1	16 bits	During running	Immedi-ately
	2Ah	H0E-41	Most significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Bh	H0E-42	Second most significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Ch	H0E-43	Second least significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Dh	H0E-44	Least significant byte of EOE IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Eh	H0E-45	Most significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	2Fh	H0E-46	Second most significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	30h	H0E-47	Second least significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	31h	H0E-48	Least significant byte of EOE subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	32h	H0E-49	Most significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	33h	H0E-50	Second most significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	34h	H0E-51	Second least significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	35h	H0E-52	Least significant byte of default EOE gateway		0 to 255	0	1	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
380E	36h	H0E-53	Most significant byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	37h	H0E-54	2nd byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	38h	H0E-55	3rd byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	39h	H0E-56	4th byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Ah	H0E-57	5th byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Bh	H0E-58	Least significant byte of MAC used by EOE		0 to 0x00FF	0	1	16 bits	-	-
	3Dh	H0E-60	Automatic Ethernet IP address identification	0: Disabled 1: Enabled	0 to 1	0	1	16 bits	During running	Immedi-ately
	3Eh	H0E-61	Most significant byte of Ethernet IP address		0 to 255	192	1	16 bits	During running	Immedi-ately
	3Fh	H0E-62	Second most significant byte of Ethernet IP address		0 to 255	168	1	16 bits	During running	Immedi-ately
	40h	H0E-63	Second least significant byte of Ethernet IP address		0 to 255	0	1	16 bits	During running	Immedi-ately
	41h	H0E-64	Least significant byte of Ethernet IP address		0 to 255	2	1	16 bits	During running	Immedi-ately
	42h	H0E-65	Most significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately
	43h	H0E-66	Second most significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately
	44h	H0E-67	Second least significant byte of Ethernet subnet mask		0 to 255	255	1	16 bits	During running	Immedi-ately
	45h	H0E-68	Least significant byte of Ethernet subnet mask		0 to 255	0	1	16 bits	During running	Immedi-ately
	46h	H0E-69	Most significant byte of default Ethernet gateway		0 to 255	192	1	16 bits	During running	Immedi-ately
	47h	H0E-70	Second most significant byte of default Ethernet gateway		0 to 255	168	1	16 bits	During running	Immedi-ately
	48h	H0E-71	Second least significant byte of default Ethernet gateway		0 to 255	0	1	16 bits	During running	Immedi-ately
	49h	H0E-72	Least significant byte of default Ethernet gateway		0 to 255	1	1	16 bits	During running	Immedi-ately

Parameter Group			Name	Description	Value Range	Default	Min. Unit	Width	Change Condition	Effective Time
Hex.		Dec.								
Group	Index Code	Para. No.								
380E	51h	H0E-80	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	0 to 9	9	1	16 bits	During running	Immedi-ately
	52h	H0E-81	Modbus data format	0: No parity, 2 stop bits (8-N-2) 1: Even parity, 1 stop bit (8-E-1) 2: Odd parity, 1 stop bit (8-O-1) 3: No parity, 1 stop bit (8-N-1)	0 to 3	3	1	16 bits	During running	Immedi-ately
	53h	H0E-82	Modbus response delay		0 to 20	0	1	16 bits	During running	Immedi-ately
	54h	H0E-83	Modbus communication timeout		0 to 600	0	1	16 bits	During running	Immedi-ately
	5Bh	H0E-90	Modbus version No.		0 to 65535	0	0.01	16 bits	-	-
	5Ch	H0E-91	CANopen version No.		0 to 65535	0	0.01	16 bits	-	-
	5Dh	H0E-92	CANlink version No.		0 to 65535	0	0.01	16 bits	-	-
	5Eh	H0E-93	EtherCAT COE version No.		0 to 65535	0	0.01	16 bits	-	-
	5Fh	H0E-94	EtherCAT EOE version No.		0 to 65535	0	0.01	16 bits	-	-
	60h	H0E-95	Ethernet version No.		0 to 65535	0	0.01	16 bits	-	-

SDO transfer abort code

Abort Code	Description
0503 0000	Trigger bits not alternated
0504 0000	SDO protocol timeout
0504 0001	Client/server command word invalid or unknown
0504 0005	Memory overflow
0601 0000	Access to objects not supported
0601 0001	Attempt to read a write-only object
0601 0002	Attempt to write a read-only object
0602 0000	Object not existed in the object dictionary
0604 0041	Object cannot be mapped to PDO
0604 0042	Number and length of mapped objects exceed the PDO length
0604 to 0043	General parameters incompatible
0604 0047	General device content incompatible
0606 0000	Access to object fails due to a hardware error
0607 0010	Data type and service parameter length not match
0607 0012	Data type not match and service parameter too long
0607 0013	Data type not match and service parameter too short
0609 0011	Sub-index not existed
0609 0030	Invalid parameter value
0609 0031	Parameter value entered too large
0609 0032	Parameter value entered too small
0609 0036	Maximum value smaller than the minimum value
0800 0000	General error
0800 to 0020	Data cannot be transmitted or stored to the application
0800 to 0021	Data cannot be transmitted or stored to the application due to local control
0800 to 0022	Data cannot be transmitted or stored to the application due to current device status
0800 to 0023	Object dictionary error occurs or object dictionary not existed
0800 to 0024	Value not existed

Appendix B STO Function

Safety Information and Instructions

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 installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read the operating instructions and this safety information.

Technical Terms

Abbreviations	Terms	Description
STO	Safe Torque Off	Safety Torque Off The servo drive output will be cut off safely when STO is activated, preventing the servo drive from generating any torque that may incur hazards.
EDM	External Device Monitor	External Device Monitor An EDM signal will be sent to the external device monitor when STO is activated.

Description of STO

The SV820N series servo drive is integrated with Safe Torque Off (STO) function that complies with IEC 61800-5-2:2016. The STO function disables the control voltage of the power semiconductors on the drive output end, preventing the servo drive from generating torque at the motor shaft.

STO function prevents the movement of the motor by two redundant external hardware signals: STO1 and STO2 that block the PWM signals to the power layer of the servo drive. These two +24VDC signals must be active to ensure normal operations of the servo drive. If either one or both signals are set to low level, the PWM signals will be blocked within 20 ms. Such a delay (from controller informed to PWM signal blocked) enables the controller to stop all the shafts. The STO mechanism is built into the servo drive so that the motor will not act in any foreseeable cases (failure or damage).

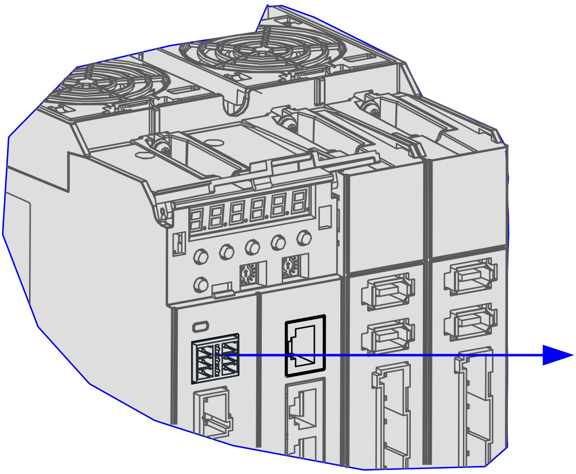
If there is no input of one or two +24 VDC "STO Enable" signals, STO will be enabled to stop the servo drive from starting. In this case, the servo drive will not be enabled by failure of one component or all the three components. The servo drive therefore can be used as a final actuator in a machinery safety application to prevent unexpected motor operations, typically as part of an interlock system to replace traditional layout of contactors with auxiliary cross-checking contacts.

Product Information

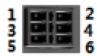
STO Model and Nameplate

See "1.1 Nameplate and Model Number" for the STO model and nameplate

STO Terminals



1	STO1	2	-
3	STO_GND	4	-
5	STO2	6	-

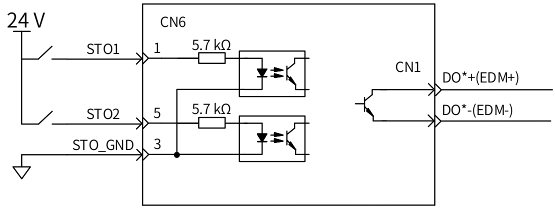


Terminal	PIN	Signal Name	Description
CN6	1	STO1	Signal input of STO channel 1 of axis 1 to axis 4
	3	STO_GND	Reference ground of STO signal
	5	STO2	Signal input of STO channel 2 of axis 1 to axis 4
	2	STO3	Signal input of STO channel 1 of axis 5 to axis 8
	4	STO_GND	Reference ground of STO signal
	6	STO4	Signal input of STO channel 2 of axis 5 to axis 8
CN1	-	EDM+	Monitor signal for detecting safety function fault
	-	EDM-	

NOTE

◆ To use the EDM signal, select the EDM function in the corresponding DO function of CN1.

Wiring Diagram



Electrical Specifications

STO Input Signal	
Voltage range of the 24 V power supply	24 V±15%
Minimum voltage at high status	15 V
Maximum voltage at low status	3 V (or open circuit)
Input current	Less than 20 mA per channel
Cables	
Category	Low-voltage single-shielded twisted pair
Maximum size	0.8 mm^2 (18AWG)
Minimum size	0.3 mm^2 (28AWG)
Maximum length	25 m between the STO inputs and the operating contact
STO activation delay	
Activation delay	< 15 ms

STO Function Implementation

Function Selection

1 Axis selection for STO function

The SV820N is a multi-axis servo drive featuring four STO input channels: STO1, STO2, STO3, and STO4.

STO1 and STO2 are used for functional safety of axis 1 to axis 4 through cutting off the torque of one axis or all the axes simultaneously. STO3 and STO4 are used for functional safety of axis 5 to axis 8.

2 EDM output terminal selection

Set DO3 (H04-04 = 132) as the DO terminal of STO EDM, and the corresponding DO output is the EDM signal.

STO Status Display and EDM Output

Signal Status	STO1 Input Status	STO2 Input Status	EDM	Display Status
Logic	H	H	OFF	-
	H	L	OFF	Er.150
	L	H	OFF	Er.150
	L	L	ON	Er.150

Example of Application Circuits

Compared with traditional functional safety mode that uses two separated STO enabling inputs, the STO function features an additional advantage: it can be used to disable a highly-integrated servo drive.

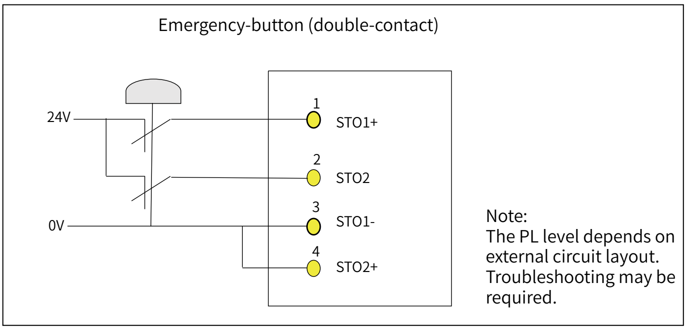
Both inputs must be provided with STO voltage input to enable the servo drive. If one or two channels changed to 0 V, the servo drive output will be disabled completely.

The stop function can be divided into different categories based on EN 60204/A1:2009. The STO can also be used in applications requiring highly-reliable disabling operation.

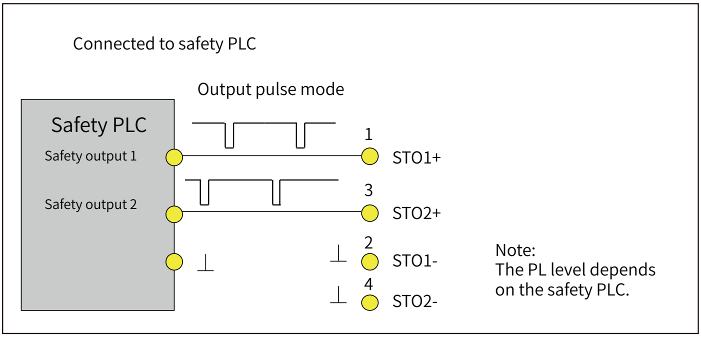
For example, a contactor latch circuit can be used for start/stop to avoid non-safety related injuries caused by unexpected start. The Stop Category 0 and Stop Category 1 can be integrated into SV820N servo drives through proper safety control devices.

According to IEC 61800-5-2:2016, the same safety functions are called Safe Stop 0 and Safe Stop 1.

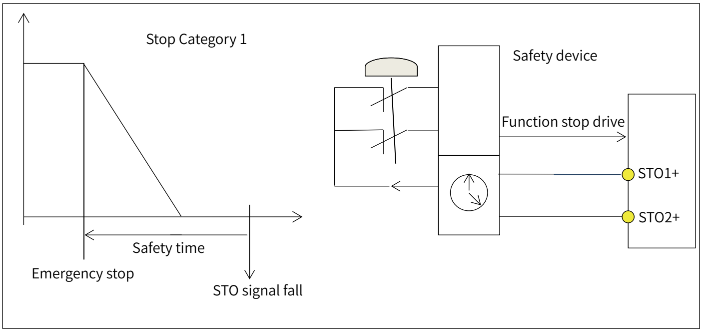
■ Example 1: Direct stop, Stop Category 1, Safe Stop 1



■ Example 2: Internal 24 VDC power supply, Stop Category 0/1, Safe Stop 0/1



■ Example 3: External safety timer, Stop Category 1, Safe Stop 1



Notes

The STO function is not intended as a replacement for an Emergency Stop function (E-stop). Therefore maintenance work on electrical parts of the servo 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 through other means such as dynamic or regenerative braking.

NOTE

◆ In the use of permanent-magnet motors, reluctance motors and salient-pole induction motors, in spite of the activation of the STO function, a possible (although highly unlikely) failure mode is for two power devices in the drive circuit to conduct incorrectly. The drive system can produce an alignment torque which maximally rotates the motor shaft by 180° electrical for a permanent-magnet motor, or 90° electrical for a salient-pole induction motor or reluctance motor. This possible failure mode must be allowed for in the machine system design.

CAUTION

◆ Max. motor shaft rotate = 360° /Motor poles number

◆ 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 Safe Torque Off functions, which are intended for safety-related applications, does not in itself ensure that the complete system is safe.

STO Acceptance Test

The acceptance test must be performed:

■ At initial start-up of the safety function

■ After any changes related to the safety function (wiring, components, settings, and so on)

■ 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 authorized person.

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, references to failure reports and resolution of failures. Any new acceptance tests performed due to changes or maintenance shall be logged into the logbook.

■ Start up checklist

Action	Result
Ensure that the drive can be run and stopped freely during commissioning.	
Stop the drive (if running), switch the input power off and isolate the drive from the power line by a disconnecter.	
Check the STO circuit connections against the circuit diagram.	
Check that the shield of the STO input cable is grounded to the drive frame.	

Action	Result
Close the disconnecter and switch the power on.	
Test the STO signal #1 when the motor is stopped: Give a stop command for 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 give a start command for the drive. Ensure that the motor stays standstill and the keypad displays "Er.150".	
Energize the STO input signal #1, restart the servo drive and check whether the motor runs normally.	
Test the STO signal #2 when the motor is stopped: Give a stop command for 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 standstill and the keypad displays "Er.150".	
Energize the STO input signal #2, restart the drive and check that the motor runs normally.	
Test the STO channel #1 when the motor is running: 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 standstill and the keypad displays "Er.150".	
Energize the STO input signal #1. Restart the drive and check that the motor runs normally.	
Test the STO channel #2 when the motor is running: 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 standstill and the keypad displays "Er.150".	
Energize the STO input signal #2. Restart the drive and check that the motor runs normally.	
Document and sign the acceptance test report which verifies that the safety function is safe and accepted to operation.	

STO Maintenance

1) Incorporate the STO operation test described in "STO Acceptance Test" to the routine maintenance program of the drive.

If the drive stays in the STO state, in spite of the two energized STO input signals, try to:

■ Check the STO terminal of the drive.

- Check the two STO signal voltages on the STO terminal side.
- If the STO signal voltage is not between 24 V±15%, check the power supply of the safety equipment (such as safety sensor and safety relay), check all the STO related connections.

2) The servo drive must be powered off and on again once per 3 months to perform the power-on diagnostic. Wait until the keypad displays "rdy" before you power off or operate the servo drive.

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