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SV680F-INT Series Servo Drive

User Guide

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

Data code PS00021512A00

Legal Information

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Disclaimer

Due to the continuous update and improvement of the product and technologies, the content of this document may not be completely consistent with the actual product. In case of any discrepancy, the actual product shall prevail.

The content of this document is subject to change without prior notice.

Disposal

The storage, use and disposal of this product (including optional accessories) shall comply with local laws and regulations.

Requirements for personnel

The product/system discussed in this document are only allowed to be operated by qualified professionals. Operators must follow all the instructions in this document, especially the safety instructions and warnings. Trained qualified personnel shall be able to detect the risks of this product/system and avoid possible hazards.

Use this product as specified

Correct transportation, storage, assembly, installation, commissioning, operation and maintenance ensure safe and normal operation of the product. Always maintain the allowable environmental conditions and operate in line with the instructions of this document.

Preface

Introduction

The SV680F-INT series high-performance AC servo drive covers a power range from 50 W to 7.5 kW. It supports PROFINET communication protocol and carries Ethernet communication interfaces to work with the host controller for a networked operation of multiple servo drives.

The drive supports stiffness level setting, inertia auto-tuning and vibration suppression to simplify the operation process. It allows a quiet and stable operation through cooperating with the MS1 series medium-to-small inertia high-response servo motors configured with a 20-, 23- or 26-bit multi-turn absolute encoder.

It is suitable for lithium battery PACK, printing and packaging, logistics, automobile manufacturing, tobacco and other industries to achieve fast and accurate collaborative control.

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

Note

The drawings in the manual are shown for description only and may not match the product you purchased.

The instructions are subject to change due to product upgrade, specification modification as well as efforts to increase the accuracy and convenience of the manual.

More documents

Name	Data Code	Description
SV680F-INT Series Servo Drive User Guide	PS00021512	Provides information on selection, installation, commissioning, function, troubleshooting and parameters of the equipment.
SV680F-INT Series Servo Drive Parameter Guide	PS00018071	Introduces the parameters of the drive, including description of parameters, a list of fault codes, a list of alarm codes, description of faults and description of alarms.
SV680F-INT Series Servo Drive Function Application Guide	PS00018069	Introduces the functions and faults of the drive, including function overview, adjustment, communication, basic servo functions and fault handling.
SV680F-INT Series Servo Drive Hardware Guide	PS00018067	Describes technical data, installation, terminals, required certificates and standards and solutions to common EMC problems of the drive.
SV680F-INT Series Servo Drive Quick Start Guide	PS00018068	Describes the model number, installation, terminals and quick commissioning and operation of the drive.
SV680F-INT Series Servo Drive Safety Guide	PS00009744	Presents installation of the servo drive, including installation steps, mechanical installation, and electrical installation.

Revision History

Date	Version	Description
2025–03	A00	First release.

Access to the Guide

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

- Do keyword search at *http://www.inovance.com*.
- Scan the QR code on the equipment to acquire more.
- Scan the QR code below to install the app, where you can search for and download manuals.

Scope of standard functions

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

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

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

Warranty

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

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

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

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

For details, see the Product Warranty Card.

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Safety Instructions

Disclaimer

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

Safety Levels and Definitions

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

Safety Instructions

- Drawings in the guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.

Unpacking
 • Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon unpacking. • Do not install the equipment if you find water seepage or missing or damaged components upon unpacking. • Do not install the equipment if you find the packing list does not conform to the equipment you received.
 • Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking. • Unpack the package by following the unpacking sequence. Do not strike the package violently. • Check whether there is damage, rust, or injuries on the surface of the equipment and equipment accessories before unpacking. • Check whether the package contents are consistent with the packing list before unpacking.

Storage and Transportation



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



- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing the 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 the equipment with other equipment or materials that may harm or have negative impacts on this equipment.

Installation



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



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



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

Wiring



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Before wiring, cut off all the power supplies of the equipment. and wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. After waiting for the designated time, measure the DC voltage in the main circuit to ensure the DC voltage is within the safe voltage range. Failure to comply will result in an electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply will result in an electric shock.
- Check that the equipment is grounded properly. Failure to comply can result in electric shock.



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



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

Power-on



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



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

Operation



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



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

Maintenance
 • Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals. • Do not maintain the equipment with power ON. Failure to comply will result in an electric shock. • Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label. • In case of a permanent magnet motor, do not touch the motor terminals immediately after power-off because the motor terminals will generate induced voltage during rotation even after the equipment power supply is off. Failure to comply will result in an electric shock.
 • Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.
Repair
 • Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals. • Do not repair the equipment with power ON. Failure to comply will result in an electric shock. • Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
 • Submit the repair request according to the warranty agreement. • When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in death, personal injuries or equipment damage. • When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly. • Replace quick-wear parts of the equipment according to the replacement instructions. • Do not use damaged equipment. Failure to comply may result in death, personal injuries, or severe equipment damage. • After the equipment is replaced, check the wiring and set parameters again.
Disposal
 • Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, personal injuries, or even death. • Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

Additional Precautions

Cautions for Motor Grounding

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

Effect of the electromagnetic field on implants

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

Safety label

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

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

1 Safety Precautions

CE Certification

reference	Standard	
EMC command 2014/30/EU	Servo drive	EN 61800-3
	Servo Motor	EN 61800-6-2 EN 61800-6-4 EN 55011
Low Voltage Directive 2014/35/EU	Servo drive	EN 61800-5-1
	Servo Motor	EN 60034-1 EN 60034-5
RoHS Directive 2011/65/EU	Servo drive	EN 50581
	Servo Motor	

UL/cUL certification

Certification	Standard	
UL/cUL certification	Servo drive	UL61800-5-1 C22.2 No.274-17
	Servo Motor	UL 1004-1 UL 1004-6 CSA C22.2 No. 100-14

Note

The drive complies with the latest version of directives and standards for CE and UL/cUL certifications.

KC Certification

Certification	Standard	
KC Certification	Servo drive	KN 61800-3 (Ver 2014.06) (IEC 61800-3 Ver 2012.03)

Others

The SV680F-INT series servo drive meets the requirements of EAC, UKCA and functional safety certification.

Certification	Standard	
EAC Certification	Servo drive	TP TC 004/2011 TP TC 020/2011

1.1 Terms and Abbreviations

Terms and Abbreviations	Description
Cat.	Safety category It includes B, 1, 2, 3, and 4.
CCF	Common cause failure

Terms and Abbreviations	Description
DCavg	Average diagnostic coverage (%)
DTI	Diagnostic test interval time
SFF	Safe failure fraction
HFT	Hardware fault tolerance
PFH_D	Probability of a dangerous Failure per Hour
PL	Performance Level
SC	Systematic capability
SIL	Safety integrity level
T_1	Test interval
DI	Digital inputs
DO	Digital output
PCB	Printed circuit board
MCU	Micro computer unit
FPGA	Field programmable gate array
MTTFd	Mean time to dangerous failure
STO	The safe torque off (STO) function brings the machine safely into a no-torque state and prevents it from unexpected start. When the STO function is activated, the servo drive stops according to the preset stop mode (H02.08).

1.2 Safety Standards

Standards compliance

- EC directives and standards
  Low Voltage Directive 2014/35/EU Standard EN 61800-5-1

  EMC Directive 2014/30/EU Standard EN 61800-3: 2018

  Machinery Directive 2006/42/EC (Safety Functions) Standard IEC 61800-5-2
- Safety standard

Safety standard	Reference
Functional safety	IEC 61508: 2010 ISO 13849-1: 2015 ISO 13849-2: 2012 IEC 62061: 2021 EN 61508: 2010 EN ISO 13849-1: 2015 EN ISO 13849-2: 2012 EN IEC 62061: 2021 IEC 60204-1: 2016 (in extracts) EN 60204-1: 2018 (in extracts)
EMC	IEC 61800-5-2: 2016 IEC 61800-3: 2017 IEC 61326-3-1: 2017 IEC 61000-6-7: 2014 EN 61800-5-2: 2017 EN IEC 61800-3: 2018 EN 61326-3-1: 2017 EN 61000-6-7:2015
LVD	IEC 61800-5-1:2007/AMD1:2016 EN 61800-5-1:2007/A1:2017

- Safety data

Item	Safety data
SIL	SIL3, IEC61508 Maximum SIL3, EN IEC62061
PFH_D	$PFH_D \leqslant 1.1\times10^{-9}$[1/h] (1.1% of SIL3)
Cat.	3, EN ISO 13849-1
PL	e, EN ISO 13849-1
MTTFd	904 years (high)
DCavg	⩾90% (medium)
T_1	20 years
HFT	1
SC	SC3
λ_S	2.2×10^{-7}/h
λ_{DD}	1.3×10^{-7}/h
λ_{DU}	2.7×10^{-9}/h
MTTR	0 hour
MRT	0 hour
Application mode	High demand or continuous mode
Device type	Type B
Safe speed accuracy	2197.98 rpm

λ_S means the failure rate of safe failure which brings the system into safe state.

λ_{DD} means the failure rate of dangerous failure but can be diagnosed by the diagnosis subsystem.

λ_{DU} means the failure rate of dangerous failure and can't be diagnosed by the diagnosis subsystem.

Note

- See ISO13849-2: 2012 for failure modes of devices.
- Failure sharing of different failure modes of each device.
- See SN29500 for failure rate of each device.

2 Model Selection

Motor with 26-bit encoder

Motor				Drive SV680F-INT			
Models without brake	Models with brake	Frame size (mm)	Capacity (kW)	Voltage class (V)	Size	Recommended model	No.
MS1H1 (n_N= 3000 rpm, n_{max}=7000 rpm) series ratings							
MS1H1-05B30CB-A6/S630R-INT	MS1H1-05B30CB-A6/S632R-INT	40	0.05	Single-phase/ Three-phase 200 V	A	S1R6	00002
MS1H1-10B30CB-A6/S630R-INT	MS1H1-10B30CB-A6/S632R-INT	40	0.1	Single-phase/ Three-phase 200 V			
MS1H1-20B30CB-A6/S631R-INT	MS1H1-20B30CB-A6/S634R-INT	60	0.2	Single-phase/ Three-phase 200 V			
MS1H1-40B30CB-A6/S631R-INT	MS1H1-40B30CB-A6/S634R-INT	60	0.4	Single-phase/ Three-phase 200 V		S2R8	00003
MS1H1-55B30CB-A6/S631R-INT	-	80	0.55	Single-phase/ Three-phase 200 V	C	S5R5	00005
MS1H1-75B30CB-A6/S631R-INT	MS1H1-75B30CB-A6/S634R-INT	80	0.75	Single-phase/ Three-phase 200 V		S5R5	00005
MS1H1-10C30CB-A6/S631R-INT	MS1H1-10C30CB-A6/S634R-INT	80	1.0	Single-phase/ Three-phase 200 V	C	S7R6	00006
MS1H2 (n_N= 3000 rpm, n_{max}= 6000 rpm) series ratings							
MS1H2-10C30CB-A6/S631R-INT	MS1H2-10C30CB-A6/S634R-INT	100	1.0	Single-phase/ Three-phase 200 V	C	S7R6	00006
MS1H2-10C30CD-A6/S631R-INT	MS1H2-10C30CD-A6/S634R-INT	100	1.0	Three-phase 400 V		T3R5	10001
MS1H2-15C30CB-A6/S631R-INT	MS1H2-15C30CB-A6/S634R-INT	100	1.5	Single-phase/ Three-phase 200 V	D	S012	00007
MS1H2-15C30CD-A6/S631R-INT	MS1H2-15C30CD-A6/S634R-INT	100	1.5	Three-phase 400 V	C	T5R4	10002
MS1H2-20C30CB-A6/S631R-INT	MS1H2-20C30CB-A6/S634R-INT	100	2.0	Three-phase 200 V	E	S018	00008
MS1H2-20C30CD-A6/S631R-INT	MS1H2-20C30CD-A6/S634R-INT	100	2.0	Three-phase 400 V	D	T8R4	10003

Motor				Drive SV680F-INT			
Models without brake	Models with brake	Frame size (mm)	Capacity (kW)	Voltage class (V)	Size	Recommended model	No.
MS1H2-25C30CB-A6/S631R-INT	MS1H2-25C30CB-A6/S634R-INT	100	2.5	Three-phase 200 V	E	S022	00009
MS1H2-25C30CD-A6/S631R-INT	MS1H2-25C30CD-A6/S634R-INT	100	2.5	Three-phase 400 V	D	T012	10004
MS1H2-30C30CB-A6/S631R-INT	MS1H2-30C30CB-A6/S634R-INT	130	3.0	Three-phase 200 V	E	S022	00009
MS1H2-30C30CD-A6/S631R-INT	MS1H2-30C30CD-A6/S634R-INT	130	3.0	Three-phase 400 V	D	T012	10004
MS1H2-40C30CB-A6/S631R-INT	MS1H2-40C30CB-A6/S634R-INT	130	4.0	Three-phase 200 V	E	S027	00010
MS1H2-40C30CD-A6/S631R-INT	MS1H2-40C30CD-A6/S634R-INT	130	4.0	Three-phase 400 V		T017	10005
MS1H2-50C30CB-A6/S631R-INT	MS1H2-50C30CB-A6/S634R-INT	130	5.0	Three-phase 200 V		S027	00010
MS1H2-50C30CD-A6/S631R-INT	MS1H2-50C30CD-A6/S634R-INT	130	5.0	Three-phase 400 V		T021	10006
MS1H3 (n_N=1500 rpm, n_{max}= 4500 rpm) series ratings							
MS1H3-85B15CB-A6/S631R-INT	MS1H3-85B15CB-A6/S634R-INT	130	0.85	Single-phase/ Three-phase 200 V	C	S7R6	00006
MS1H3-85B15CD-A6/S631R-INT	MS1H3-85B15CD-A6/S634R-INT	130	0.85	Three-phase 400 V		T3R5	10001
MS1H3-13C15CB-A6/S631R-INT	MS1H3-13C15CB-A6/S634R-INT	130	1.3	Single-phase/ Three-phase 200 V	D	S012	00007
MS1H3-13C15CD-A6/S631R-INT	MS1H3-13C15CD-A6/S634R-INT	130	1.3	Three-phase 400 V	C	T5R4	10002
MS1H3-18C15CB-A6/S631R-INT	MS1H3-18C15CB-A6/S634R-INT	130	1.8	Three-phase 200 V	E	S018	00008
MS1H3-18C15CD-A6/S631R-INT	MS1H3-18C15CD-A6/S634R-INT	130	1.8	Three-phase 400 V	D	T8R4	10003
MS1H3-29C15CB-A6/S631R-INT	MS1H3-29C15CB-A6/S634R-INT	180	2.9	Three-phase 200 V	E	S022	00009
MS1H3-29C15CD-A6/S631R-INT	MS1H3-29C15CD-A6/S634R-INT	180	2.9	Three-phase 400 V	D	T012	10004
MS1H3-44C15CB-A6/S631R-INT	MS1H3-44C15CB-A6/S634R-INT	180	4.4	Three-phase 200 V	E	S027	00010

Motor				Drive SV680F-INT			
Models without brake	Models with brake	Frame size (mm)	Capacity (kW)	Voltage class (V)	Size	Recommended model	No.
MS1H3-44C15CD-A6/S631R-INT	MS1H3-44C15CD-A6/S634R-INT	180	4.4	Three-phase 400 V	E	T017	10005
MS1H3-55C15CD-A6/S631R-INT	MS1H3-55C15CD-A6/S634R-INT	180	5.5	Three-phase 400 V		T021	10006
MS1H3-75C15CD-A6/S631R-INT	MS1H3-75C15CD-A6/S634R-INT	180	7.5	Three-phase 400 V		T026	10007
MS1H4 (n_N= 3000 rpm, n_{max}=7000 rpm) series ratings							
MS1H4-05B30CB-A6/S630R-INT	MS1H4-05B30CB-A6/S632R-INT	40	0.05	Single-phase/ Three-phase 200 V	A	S1R6	00002
MS1H4-10B30CB-A6/S630R-INT	MS1H4-10B30CB-A6/S632R-INT	40	0.1	Single-phase/ Three-phase 200 V		S1R6	00002
MS1H4-05B30CB-A6/S631R-INT	MS1H4-05B30CB-A6/S634R-INT	40	0.05	Single-phase/ Three-phase 200 V		S1R6	00002
MS1H4-10B30CB-A6/S631R-INT	MS1H4-10B30CB-A6/S634R-INT	40	0.1	Single-phase/ Three-phase 200 V		S1R6	00002
MS1H4-20B30CB-A6/S631R-INT	MS1H4-20B30CB-A6/S634R-INT	60	0.2	Single-phase/ Three-phase 200 V		S1R6	00002
MS1H4-40B30CB-A6/S631R-INT	MS1H4-40B30CB-A6/S634R-INT	60	0.4	Single-phase/ Three-phase 200 V		S2R8	00003
MS1H4-55B30CB-A6/S631R-INT	-	80	0.55	Single-phase/ Three-phase 200 V	C	S5R5	00005
MS1H4-75B30CB-A6/S631R-INT	MS1H4-75B30CB-A6/S634R-INT	80	0.75	Single-phase/ Three-phase 200 V		S5R5	00005
MS1H4-10C30CB-A6/S631R-INT	MS1H4-10C30CB-A6/S634R-INT	80	1.0	Single-phase/ Three-phase 200 V	C	S7R6	00006

Note

Models of drives:

- S: 200 V voltage class
- T: 400 V voltage class
- 1R6: 1.6 A rated output current, 2R8: 2.8 A rated output current..., 026: 26 A rated output current, 027: 27 A rated output current

3 Product Information

3.1 Drive Information

Description of the Model

SV680 F S 2R8 I - GINT
① ② ③ ④ ⑤ ⑥

1 **Series** SV680: SV680 general-purpose servo drive	4 **Rated output current**		5 **Model configuration** I: Standard type S: Functional safety type
2 **Product Type** F: PROFINET communication	S: 200 V	1R6: 1.6 A 2R8: 2.8 A 5R5: 5.5 A 7R6: 7.6 A 012: 12.0 A 018: 18.0 A 022: 22.0 A 027: 27.0 A	6 **Model configuration** GINT: global version
3 **Voltage class** S: 200 V T: 400 V	T: 400 V	3R5: 3.5 A 5R4: 5.4 A 8R4: 8.4 A 012: 12.0 A 017: 17.0 A 021: 21.0 A 026: 26.0 A	

Nameplate

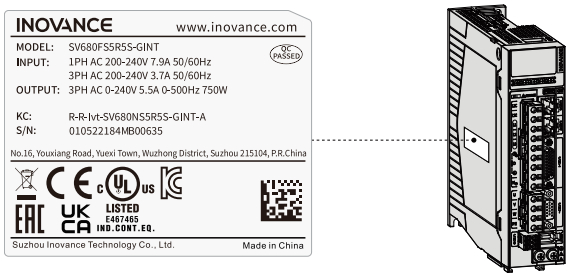


Figure 3-1 Nameplate

Encryption of the production serial number

01050202 4 S 7 00001
① ② ③ ④ ⑤

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

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

3.1.1 Components

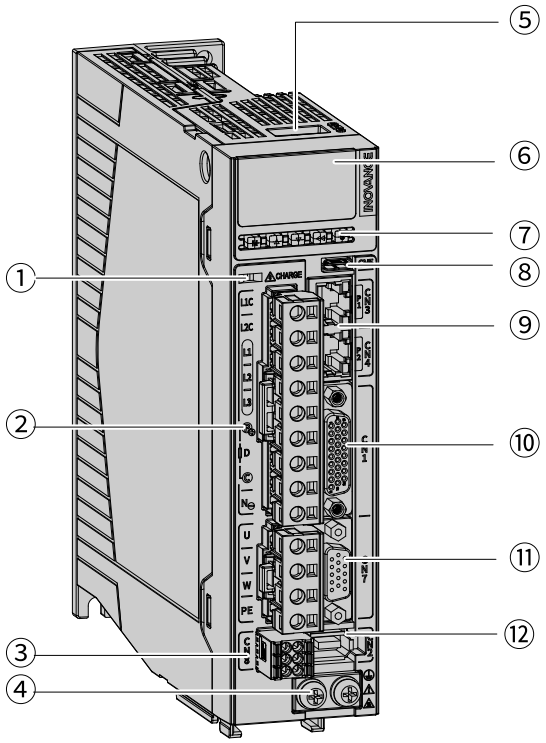


Figure 3-2 Servo drive components

Table 3–1 Description of servo drive components

No.	Name	Description
1	CHARGE (bus voltage indicator)	Indicates the electric charge is present in the bus capacitor. When the indicator turns on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To prevent electric shock, do not touch the power terminals when this indicator lights up.
2	Main circuit terminal	For detailed description of main circuit terminals, see *"6.1.1 Terminal Pin Arrangement" on page 56.*
3	CN8 (brake and PTC input terminal)	Connected to brake and PTC.
4	Servo drive grounding terminal	Connected to the grounding terminal of the motor/power supply for grounding purpose.
5	CN6 (STO safety function terminal)	Connected to external functional safety signal for functional safety purpose.
6	LED display	The 5-digit 8-segment LED display is used to show servo system’ s running state and parameter setting.
7	Keys	M: Used to switch parameters in sequence. ▲: Increases the value of the blinking digit. ▼: Decreases the value of the blinking digit. ◀◀: Used to shift the blinking position leftwards (long press to turn to the next page when the displayed number exceeds five digits). S: Saves modifications and enters the next menu.
8	CN5 (communication terminals)	Supports online upgrade and background commissioning when the drive is powered on.
9	CN3, CN4 (PROFINET communication terminal)	CN3 (P1) is connected to the host controller, and CN4 (P2) is connected to a slave.
10	CN1 (control terminal)	Used by reference input signals and other I/O signals.
11	CN7 (encoder feedback terminal)	Supports communication encoder and pulse encoder.
12	CN2 (encoder feedback terminal)	Supports communication-type encoders.

3.2 Motor Information

3.2.1 Model and Nameplate

Description of the Model

MS1 H1 - 75B 30C B A3 3 1 R - INT
① ② ③ ④ ⑤ ⑥ ⑦⑧⑨ ⑩

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

Nameplate

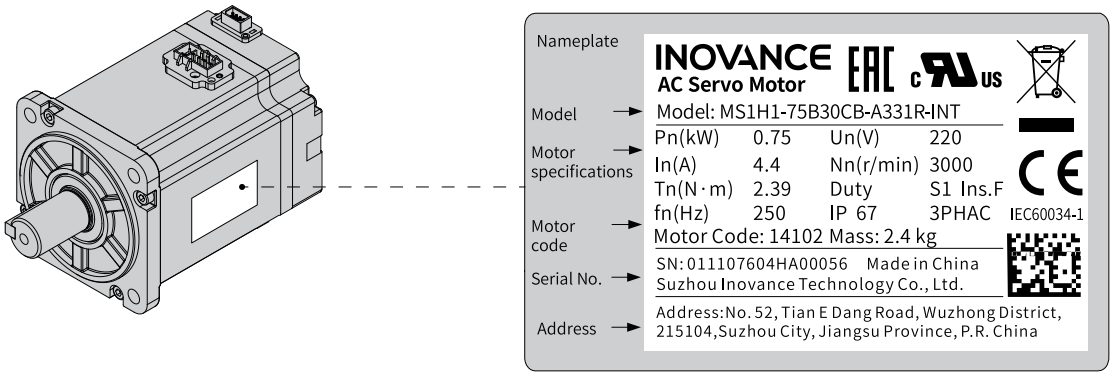


Figure 3-3 Model Number and Nameplate

Note

For models with A3/A6/S6 encoders, a CE/UL/EAC certification mark will be printed on the nameplate.

3.2.2 Components

Motor (frame size 40)

- **Terminal-type servo motor**

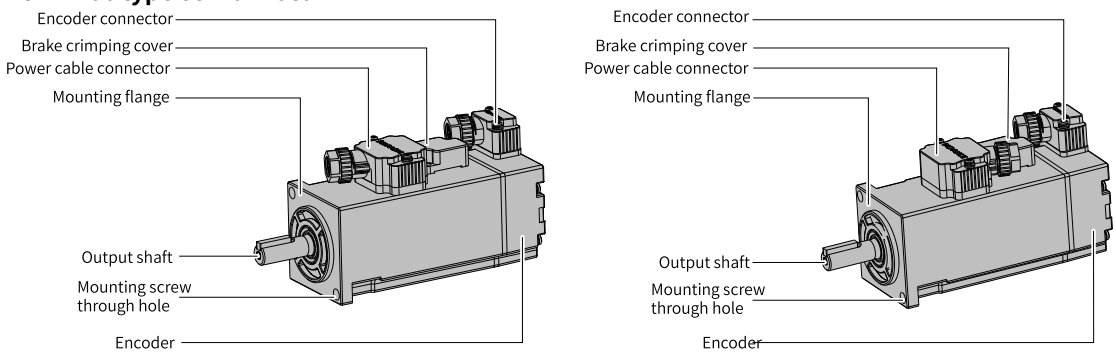


Figure 3-4 Components of a terminal-type servo motor (Left: motor with front cable outlet; Right: motor with rear cable outlet)

- **Flying leads type servo motors**

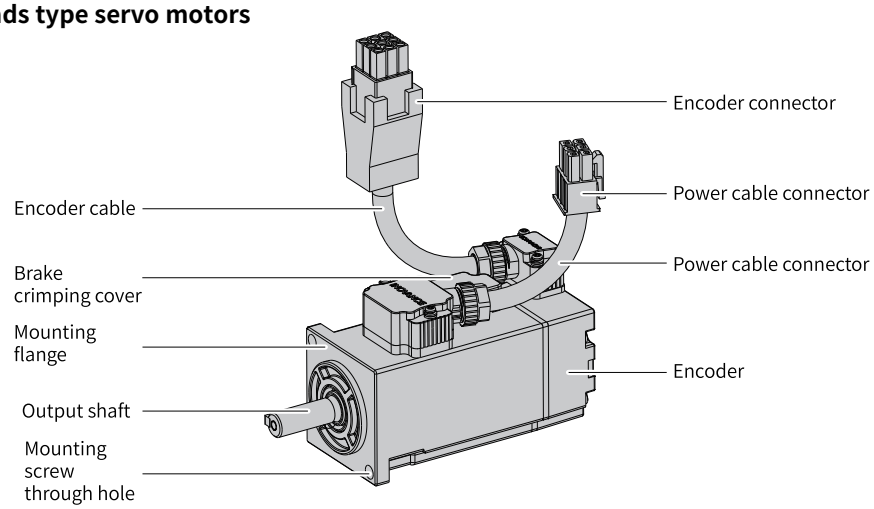


Figure 3-5 Components of flying leads type motors

Note

- For 50 W terminal type models, use rear outlet for power cables.
- For 100 W models, if the mounting flange face is internally stepped type, only terminal-type models can be used, which are equipped with power cables with rear outlet.

Motor (frame sizes 60/80)

- **Terminal-type servo motor**

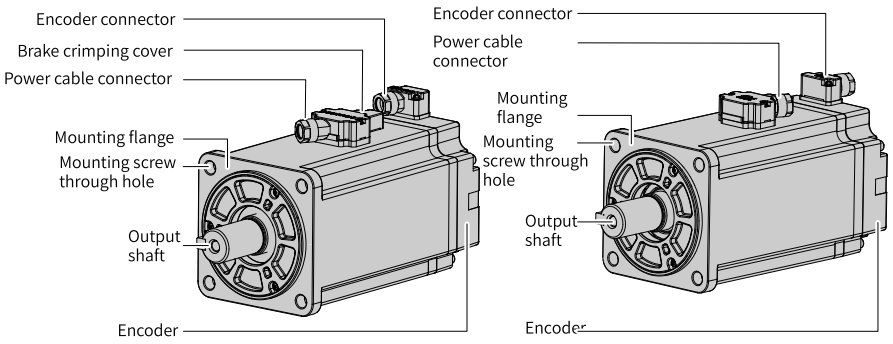


Figure 3-6 Components of a terminal-type servo motor (Left: motor with front cable outlet; Right: motor with rear cable outlet)

- **Flying leads type servo motors**

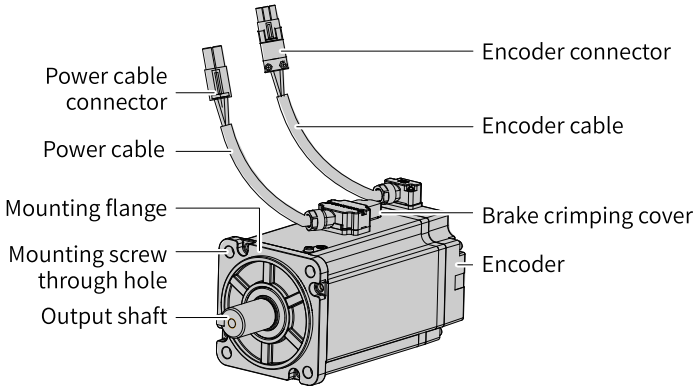


Figure 3-7 Components of flying leads type motors

Motor (frame sizes 100/130/180)

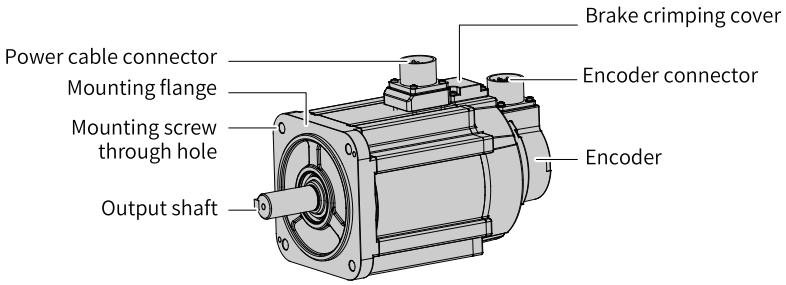


Figure 3-8 Components of servo drives in frame sizes 100/130/180

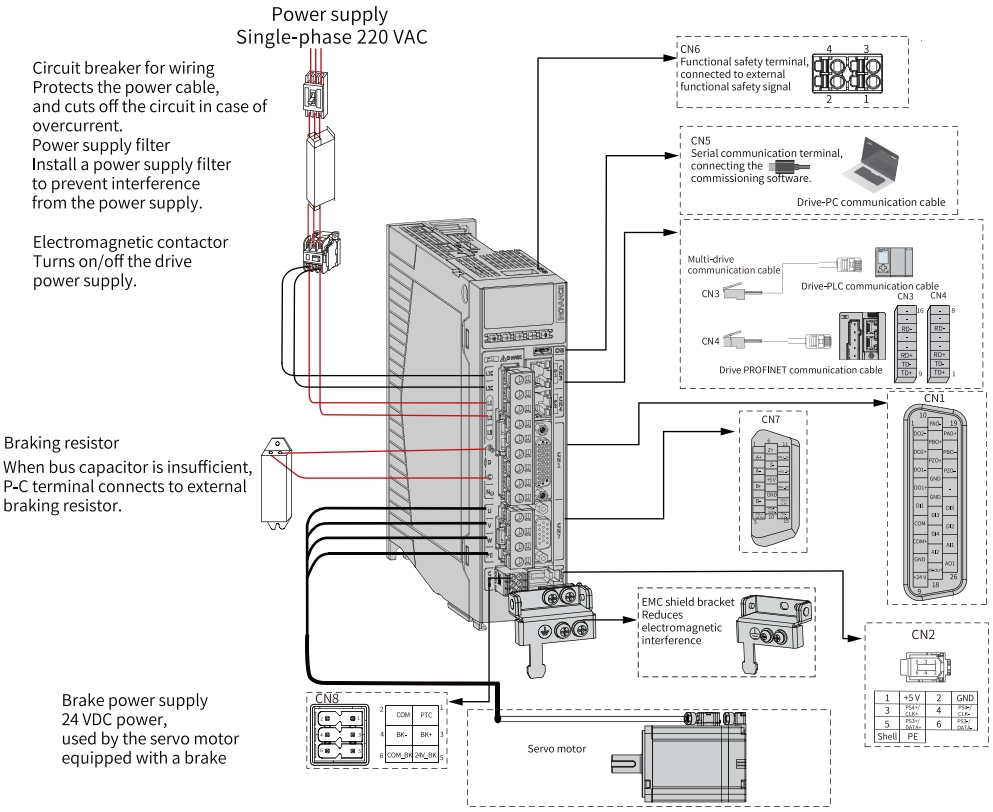
4 System Wiring

4.1 System Composition

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

4.2 System Wiring Diagram

System wiring diagram of single-phase 220 VAC models



System wiring diagram of three-phase 220 VAC or 380 VAC models

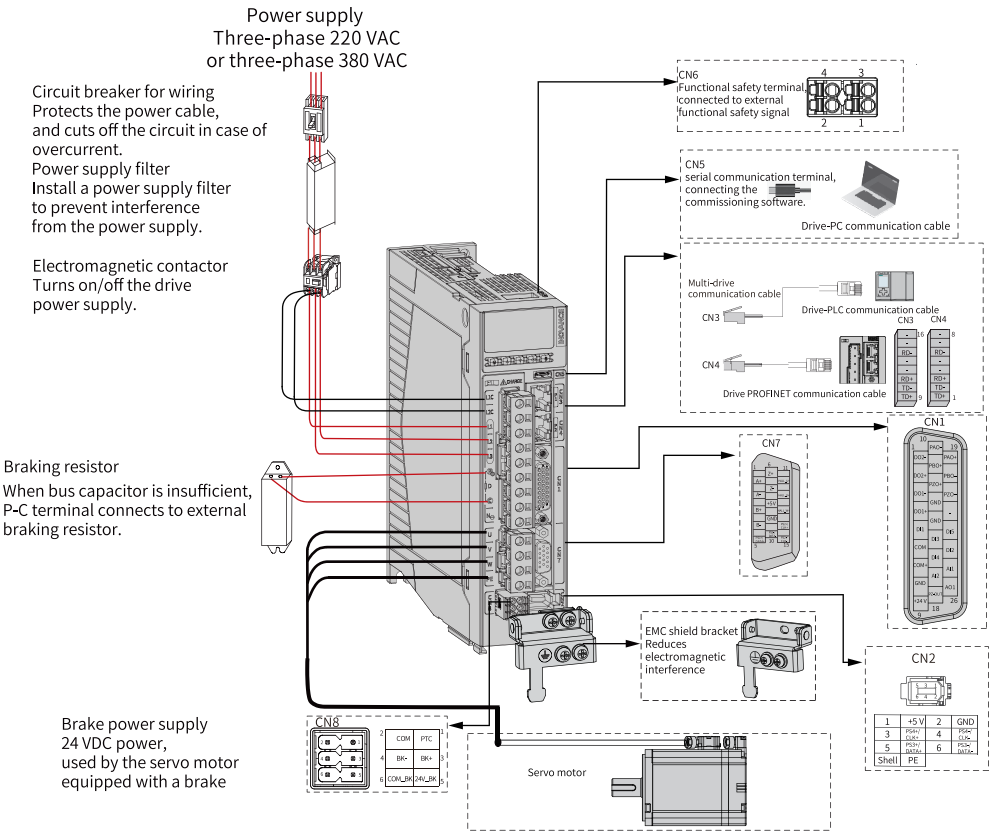


Figure 4-1 System wiring example

Note

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

4.3 Common DC Bus

Up to 6 drives can connect to the common DC bus. With the common DC bus, the energy fed back by the drive working in the regenerative mode can be used by the drive working in the drive mode, rather than being consumed on the braking resistor. That improves the system efficiency.

The topology of the common DC bus is as follows.

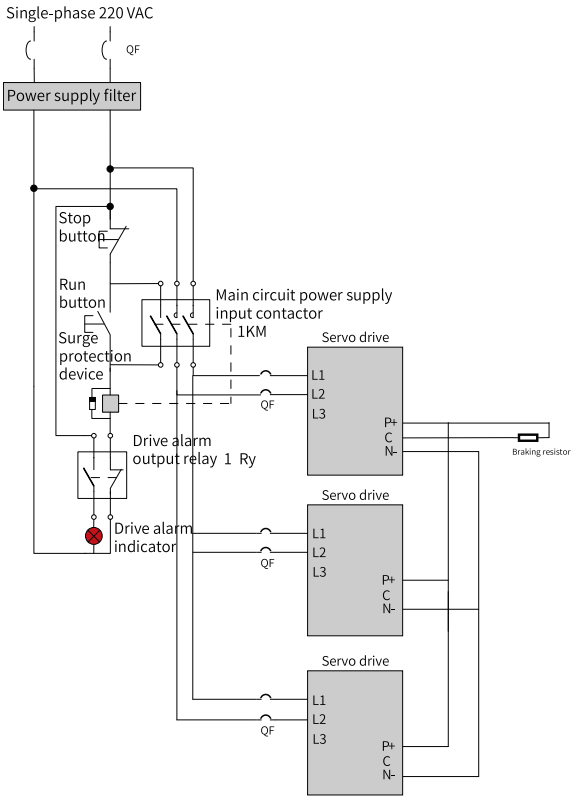


Figure 4-2 Topology of single-phase 220 VAC input common DC bus

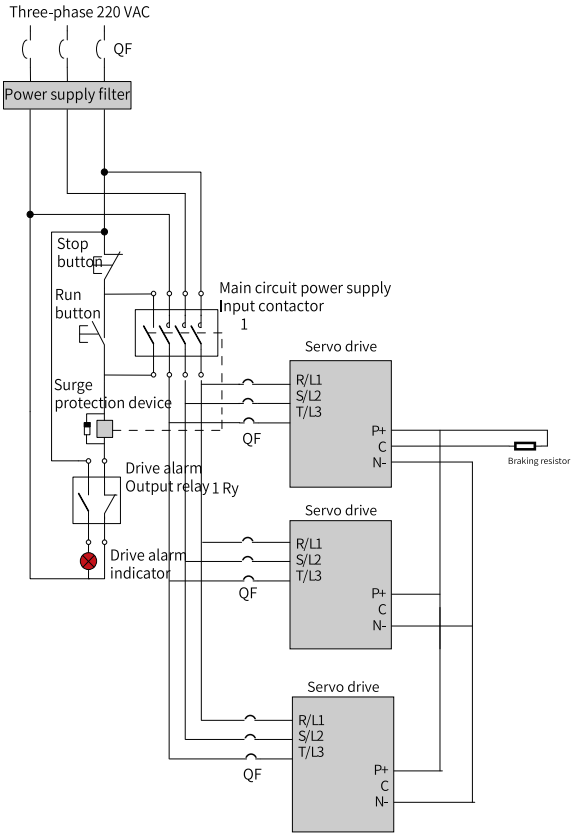


Figure 4-3 Topology of three-phase 220 VAC/380 VAC input common DC bus

Model requirements

Note

- Drives with the same or adjacent power can connect to the same common DC bus. Only two models are allowed in the same common DC bus system.For example, if one is an SV680FS5R5I-GINT drive, then the other can be an SV680FS2R8I-GINT or SV680FS7R6I-GINT drive.
- The voltage classes of drives on the common DC bus must be the same. A single-phase 220 V drive cannot coexist with a three-phase 220 V drive.For example, an SV680FS5R5I-GINT and an SV680FS7R6I-GINT powered by single-phase 220 V can connect to the same common DC bus. However, an SV680FS5R5I-GINT powered by single-phase 220 V and an SV680FS7R6I-GINT powered by three-phase 220 V cannot connect to the same common DC bus.

Wrong example:

- Wrong common bus connection of a single-phase 220 V model and a three-phase 380 V model

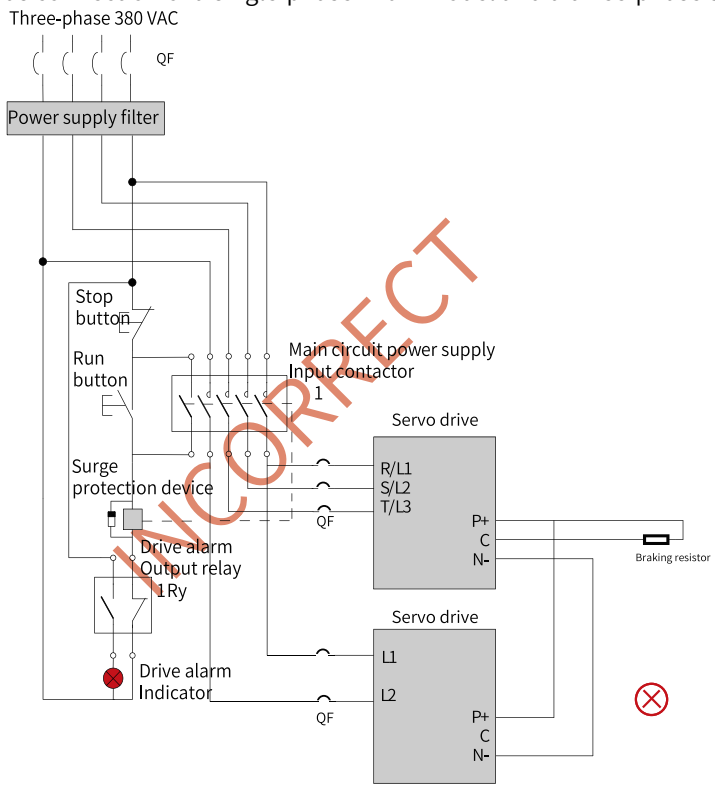


Figure 4-4 Wrong common bus connection of a single-phase 220 V model and a three-phase 380 V model

- Wrong common bus connection of a single-phase 220 V model and a three-phase 220 V model

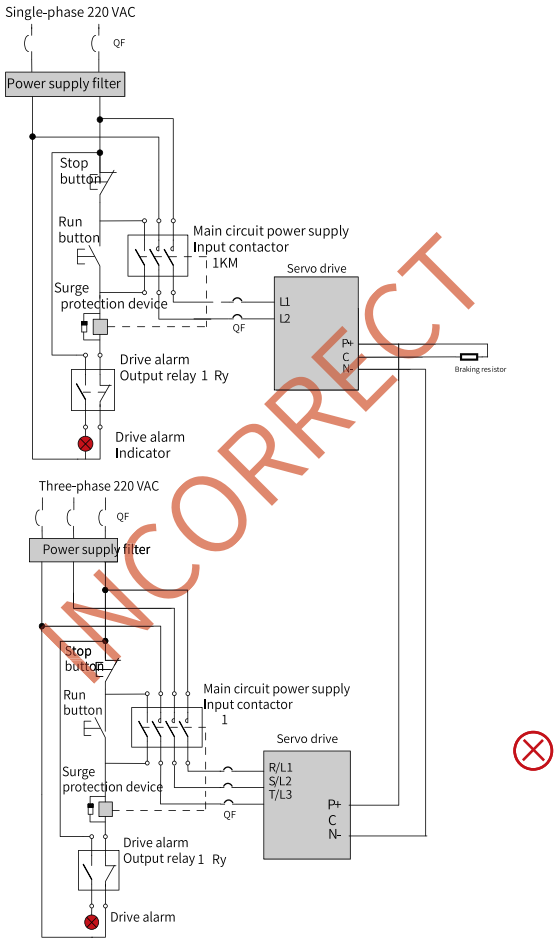


Figure 4-5 Wrong common bus connection of a single-phase 220 V model and a three-phase 220 V model

Requirements on circuit breakers and contactors

For details, see contents related to circuit breaker selection in Section "Peripheral Components".

Installation requirements

- It is recommended to arrange the servo drives on the common DC bus in the order of power from large to small (viewed from the direction of AC power incoming line).
- It is recommended to mount the servo drives on the common DC bus in the same control cabinet.

Wiring requirements

Caution

- You must connect an AC power supply to the AC input terminal of each drive, and all AC power supplies must come from the same transformer.
- In a common DC bus system, do not use different phases of the transformer for the single-phase AC power supplies of different drives .For example, the AC transformer output terminals are R/S/T/N. If drive A uses a single-phase power supply and the input terminals are connected to R and N, then the AC input terminals of other drives on the common DC bus must also connect to R and N.
- Do not connect a DC power supply to the DC bus terminal.
- When the braking resistor is used, it is recommended to connect it to the drive with the largest power. If a single braking resistor cannot meet the requirements of frequent braking, connect a braking resistor to each drive. For the evaluation method, see Section "Option-Braking Resistor" in the ***selection guide***.

Wrong example:

- Wrong common DC bus connection of two drives with different AC input sources

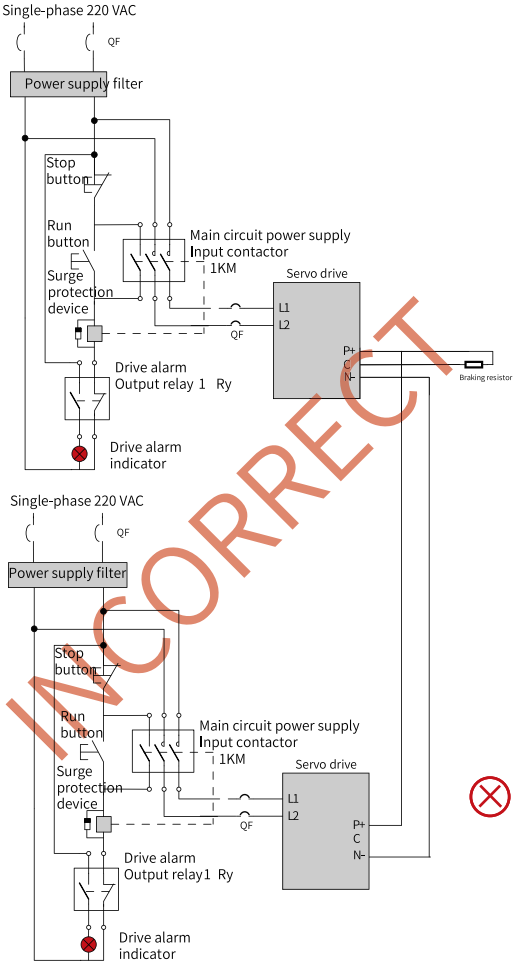


Figure 4-6 Wrong common DC bus connection of two drives with different AC input sources

- Wrong common DC bus connection of two drives using R/N and S/N AC inputs respectively

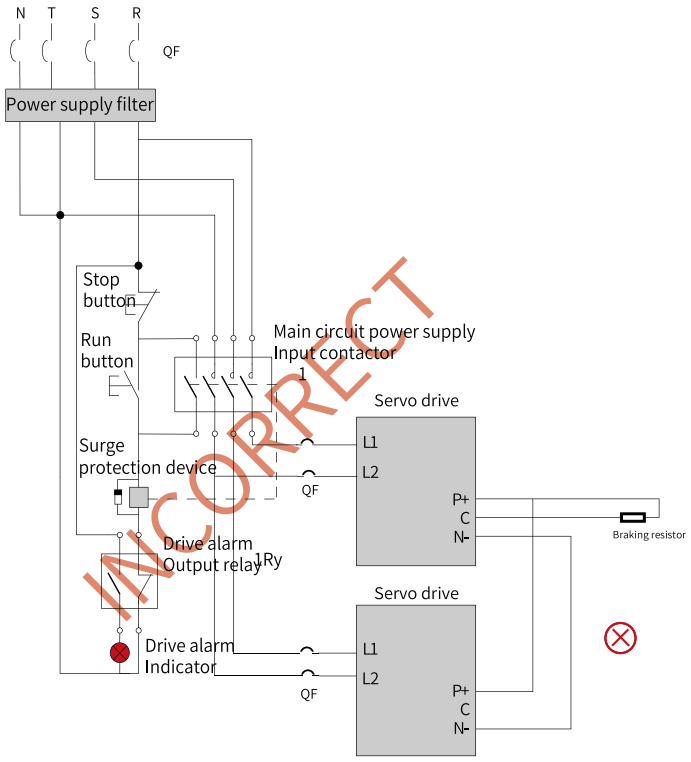


Figure 4-7 Wrong common DC bus connection of two drives using R/N and S/N AC inputs respectively

Cable requirements

- The wiring length between common DC bus terminals should be as short as possible. The length of cables should be kept as consistent as possible. The length of the common bus cable between two drives must not exceed 0.5 meters.
- The diameter of the DC side cable cannot be smaller than that of the motor power line and the AC side input cable. For the evaluation method, see Section "Selection of cables" in the selection guide.

Operation requirements

- Drives on the common bus system must be powered on and off at the same time.
- Drives on the common bus system must be in the run state at the same time. Failure to comply will affect the service life of the drives.
- Drive braking is subject to current carrying limiting. The following table lists the limits. According to actual conditions, if the average current exceeds the current carrying limit, you must connect a braking resistor to each servo drive. According to the selection instructions of the braking resistor, the current flows through the braking resistor I_{break} is:

$$I_{break} = \frac{E_1 - E_c}{T \times U_{uv}}$$

Item	S1R6	S2R8	S5R5	S7R6	S012	S018	S022	S027	T3R5	T5R4	T8R4	T012	T017	T021	T026
Brake current carrying limit (A)	3	3	7	7	7	14	14	14	7	7	7	7	14	14	14

E_l is the braking energy, in J. E_c is the energy absorbed by the capacitor, in J. U_{UV} is the drive discharge threshold voltage, in V. T is the reciprocating period, in s.

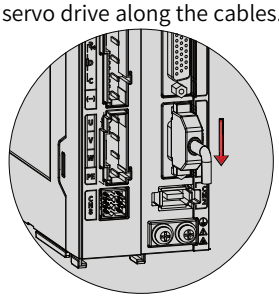
5 Installation

5.1 Precautions

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

Table 5–1 Installation Precautions

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

Item	Description
Grounding	Ground the grounding terminal properly. Failure to comply may result in electric shock or malfunction due to interference.
Wiring requirements	As shown in the figure below, route the servo drive cables downwards to prevent liquid from flowing into the servo drive along the cables.  Route the cable connected downwards.

5.2 Installatin Preparation

5.2.1 Installation Environment Requirements

Table 5–2 Environment requirements

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

Item	Requirement
Impact resistance	Below 19.6 m/s^2
IP rating	IP20 Note: excluding terminals (IP00)
Environment	Pollution Degree 2 and below Install the servo drive in a place that meets the following requirements: • Free from direct sunlight, dust, radioactive materials, combustible materials, corrosive gases, combustible and explosive gases, harmful gases and liquids, oil mist, water vapor, water drops, or salt • Not prone to vibration and away from equipment such as punch presses • Free from unwanted objects such as metal powder, oil, and water inside the servo drive • Away from combustible materials such as wood • Do not use it in the vacuum environment. It is recommended to use it in air pressure above 89.9 kPa (altitude 1000 m).

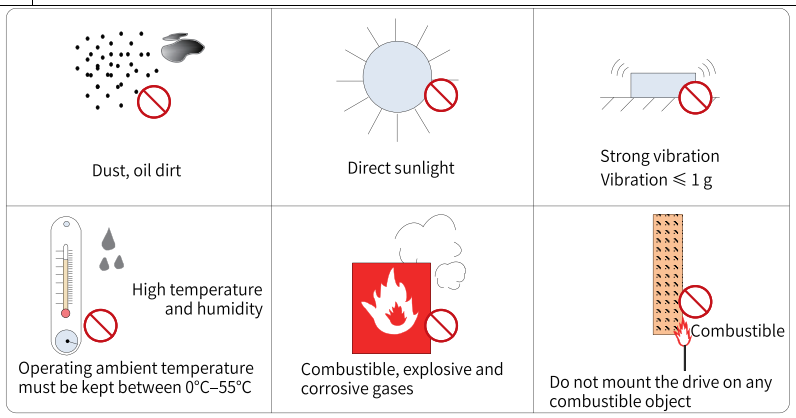


Figure 5-1 Environment requirements

5.2.2 Installation Clearance

Spaced installation

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

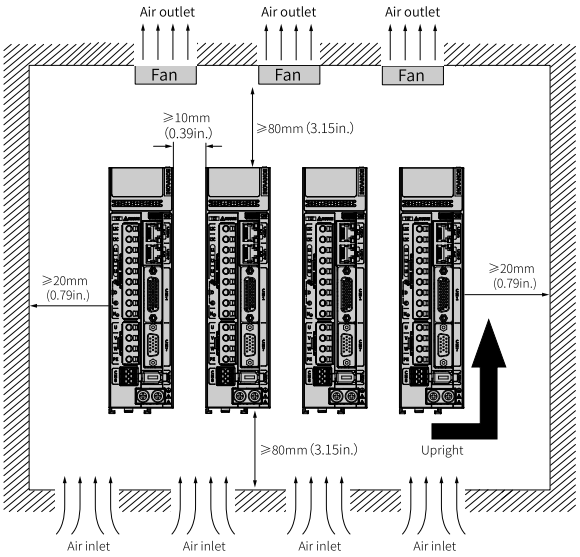


Figure 5-2 Clearance for side-by-side installation

Compact installation

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

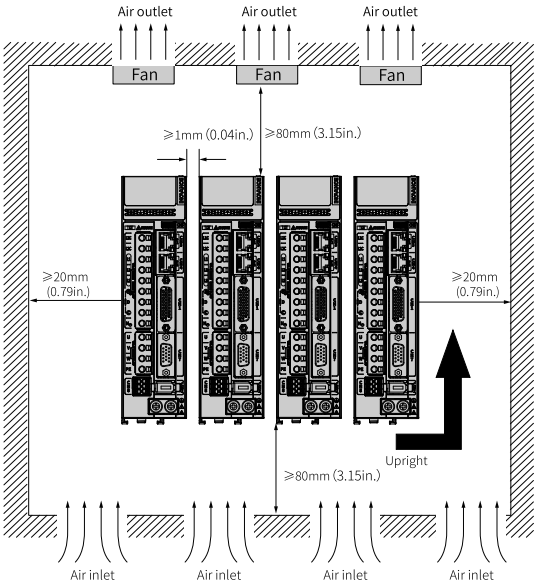


Figure 5-3 Clearance for compact installation

Zero-clearance installation

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

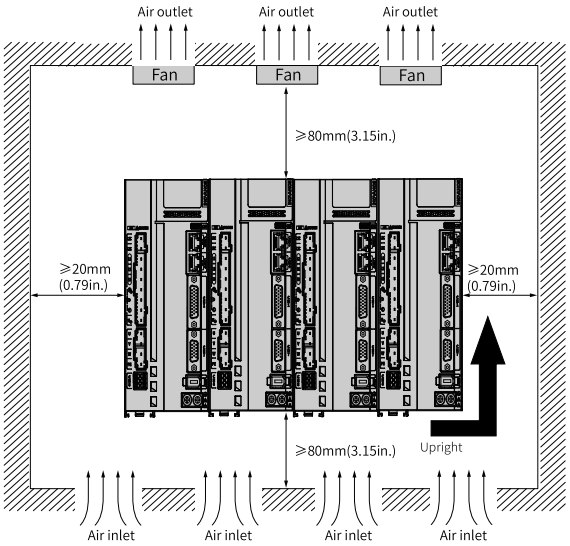


Figure 5-4 Zero-clearance installation

5.2.3 Installation Dimensions

Size A drives (rated power: 0.2 kW to 0.4 kW)

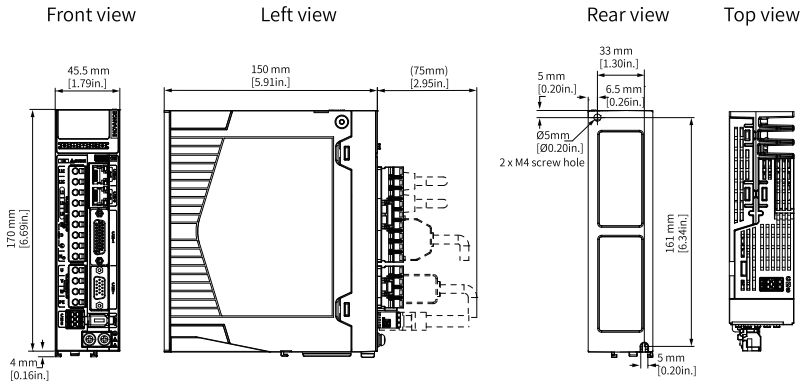


Figure 5-5 Dimensions of Size A

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

Mass: 0.96 kg

Size C drives (rated power: 0.75 kW to 1.5 kW)

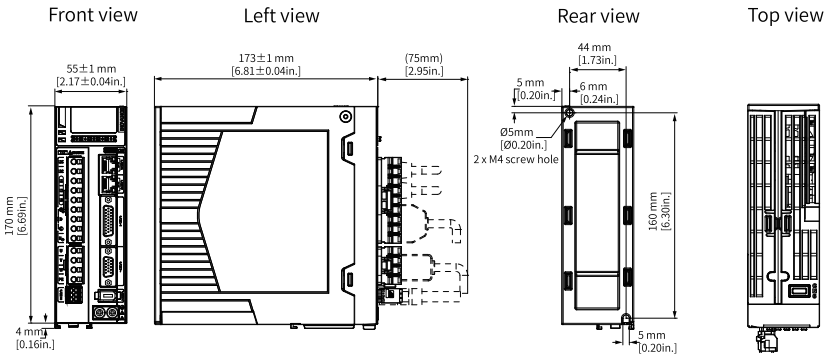


Figure 5-6 Dimensions of Size C

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

Mass: 1.3 kg

Size D drives (rated power: 1.5 kW to 3.0 kW)

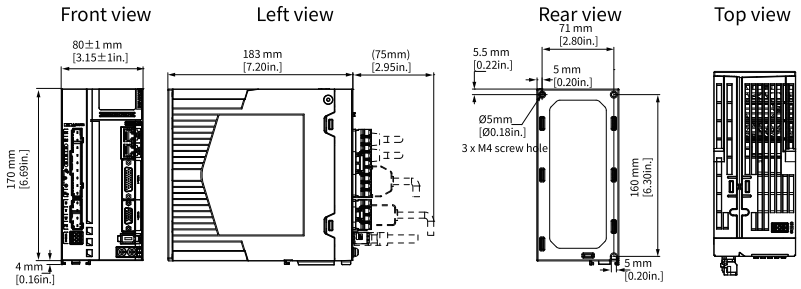


Figure 5-7 Dimensions of Size D

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

Mass: 1.8 kg

Size E drives (rated power: 2.0 kW to 7.5 kW)

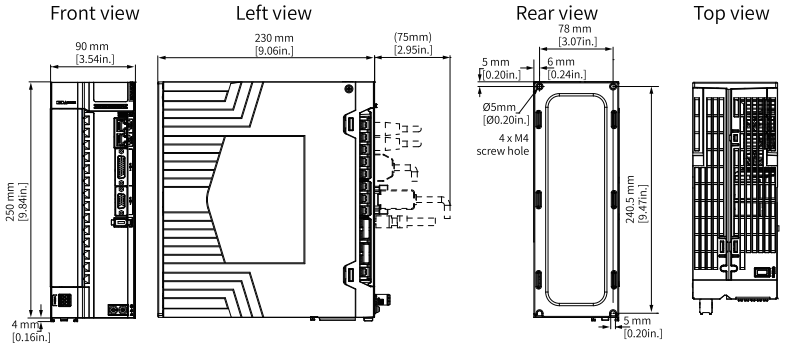


Figure 5-8 Dimensions of Size E

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

Mass: 3.6 kg

5.3 Unpacking Inspection

Check the following items upon unpacking.

Item	Description
Check whether the delivered product is consistent with your order.	Check whether the servo drive model and specifications comply with your order. See the dimensions of the packing box in *"Table 5–3" on page 46*. The deliverables include the product, cushion, carton box, and screw bag, as shown in *"Figure 5–9" on page 46* .
Check whether the product is intact.	Check whether the product delivered is in good condition. If there is any missing or damage, contact your supplier immediately.

Table 5–3 Dimensions of the outer packing box

Size	Model SV680F-INT Series Servo Drive	Outer Width (mm)	Outer Height (mm)	Outer Depth (mm)	Mass (kg)
A	S1R6, S2R8	240	193	85	1.13
C	S5R5, S7R6, T3R5, T5R4	230	223	95	1.5
D	S012, T8R4, T012	240	223	125	2.0
E	S018, S022, S027, T017, T021, T026	325	285	145	3.9

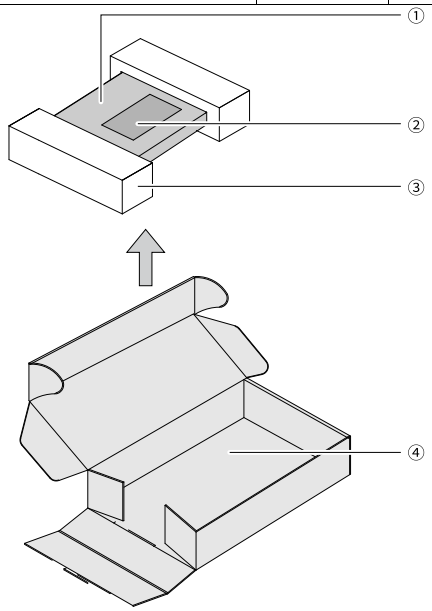
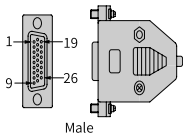
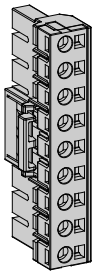
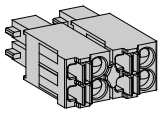
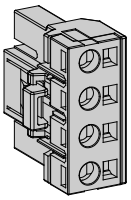
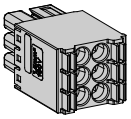
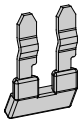
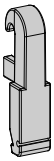


Figure 5-9 Contents inside the packing box

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

Table 5–4 Terminal accessory package list

Material Code	Diagram	Name
1504CK54		Cable set–servo drive S6–C74–DB26 connector kit (RoHS)
15210577		Plug-in terminal block-plug-spring clamp wiring-9P-black-with safety lock
15210648		Plug-in terminal block-plug-spring clamp wiring-2*2P-black-printing on both sides
15210695		Plug-in terminal block-plug-spring clamp wiring-4P-black
15211052		Plug-in terminal block-plug-spring clamp wiring-3.5mm-2*3P-black-180°-screen printed-RoHS
15220274		Jumper bar-16A-pluggable bridge
19024735	-	Labels-labels for servo drive terminals
2120021		Plastic parts-plug wiring key-for use with servo drive power plug

If you need to purchase the terminal accessory package separately, contact Inovance.

5.4 Mechanical Installation

5.4.1 Pre-installation Check

Table 5–5 Pre-inspection checklist

No.	Item	Checked
1	The delivered product is consistent with your order.	□
2	No deformation or cracks are present on the casing.	□

No.	Item	Checked
3	All screws are in position and tightened.	☐
4	The signal terminal is free from fracture, foreign objects and bent pins.	☐

5.4.2 Mounting the Drive

Caution

- Note that the drive is energized with high voltage, and all wiring work must be carried out with the drive de-energized.
- Before maintenance, power off the drive, wait for 15 minutes and confirm that the voltage of the drive is lower than 36 VDC. Failure to comply can result in personal injury due to the residual voltage in the capacitor.
- Only trained persons are allowed to repair and maintain the drive. Failure to comply can result in major property loss, severe personal injury or even death.
- Due to the potential external power voltage, exert extreme caution when you are working on the device. Because the power supply and terminals may be live even if the motor does not run.
- Only trained persons are allowed to handle heavy equipment or equipment with high center of gravity. Improper lifting or handling may result in major property loss, serious personal injury or even death.

The servo drive supports backplate mounting only.

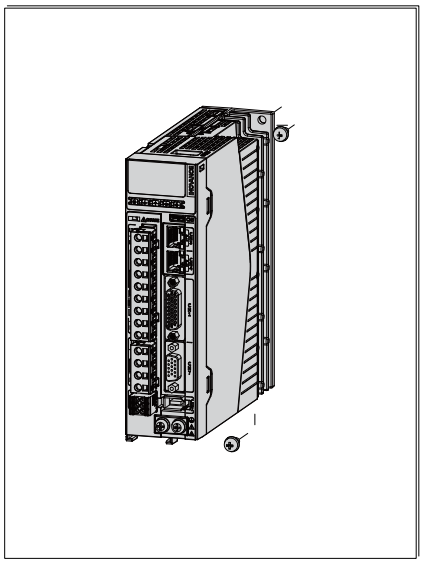


Figure 5-10 Backplate mounting

- Servo drives in sizes A and C are secured by two screws, with one screw on the top and the other one at the bottom.
- Servo drives in size D are secured by three screws, with two screws on the top and another one at the bottom.
- Size E is secured by four screws, with two screws on the top and the other two at the bottom.
- M4 screw, tightening torque: 1.2 N·m

Mounting the drive

1. Fix the drive with M4 screws, tightened to a recommended torque of 1.2 N · m. For details, see Section "Installation".

2. Perform wiring. Check the wiring according to the post-installation checklist. For wiring details, see Section "Terminals".
3. Turn on the power supply of the drive.
4. Perform a complete commissioning with the commissioning tool. For details, see Sections "Commissioning Tool" and "Commissioning and Operation".

Replacing the drive

1. Turn off the driver power supply.
2. Wait for 15 minutes, and check that the drive voltage is lower than 36 VDC.
3. Remove all cables on the drive.
4. Unscrew the two M4 screws and take off the drive.
5. Mount the drive. Fore details, see *" Mounting the drive" on page 48*.

5.4.3 Post-Inspection

Table 5–6 Inspection Checklist

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

5.5 Installing Options

5.5.1 Instructions for Installing the Fuse and Circuit Breaker



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

5.5.2 Instructions for Installing the AC Input Reactor

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

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

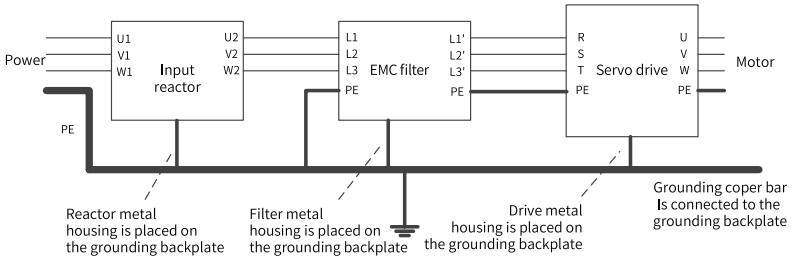


Figure 5-11 Connection of the AC input reactor

5.5.3 Instructions for Installing the EMC Filter

Note

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

Use CE-compliant filters that comply with the emission requirements in Category C2 of EN 61800-3 and EN 12015. Properly ground the filter. Keep the cable connecting the filter to the controller shorter than 30 cm.

The following figure shows the connection of the EMC filter.

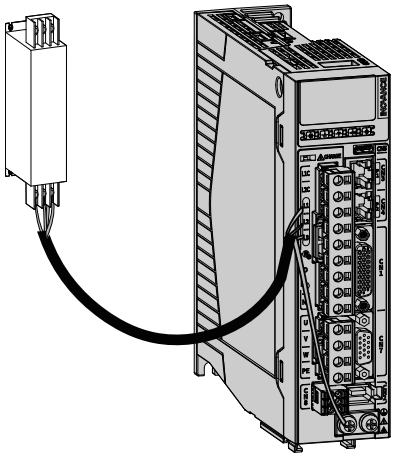


Figure 5-12 Connection of the EMC filter

5.5.4 Instructions for Installing the Magnetic Ring and Ferrite Clamp

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

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

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

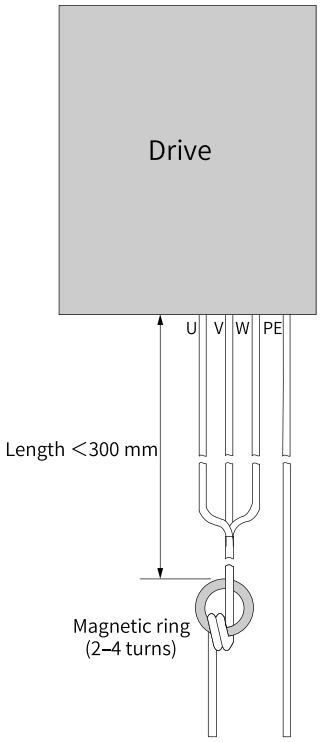


Figure 5-13 Installing the magnetic ring

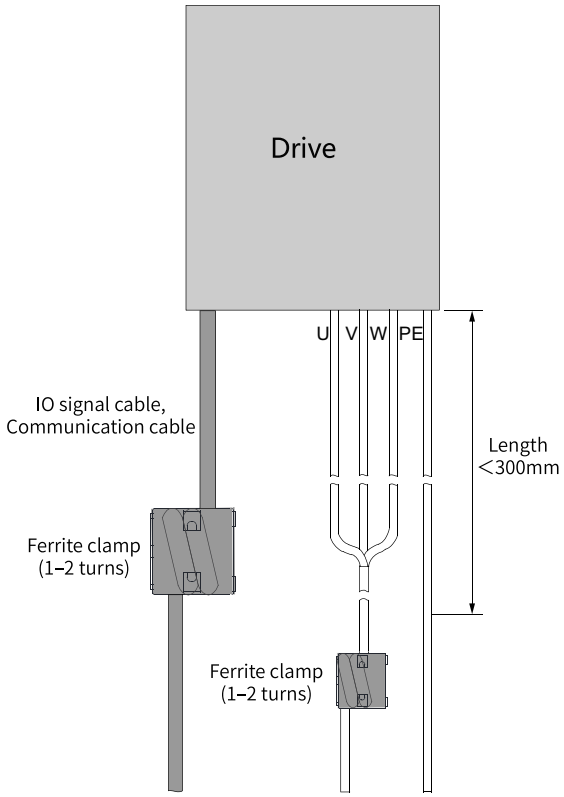


Figure 5-14 Installation of the ferrite clamp

5.5.5 Instructions for Installing the Shield Bracket

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

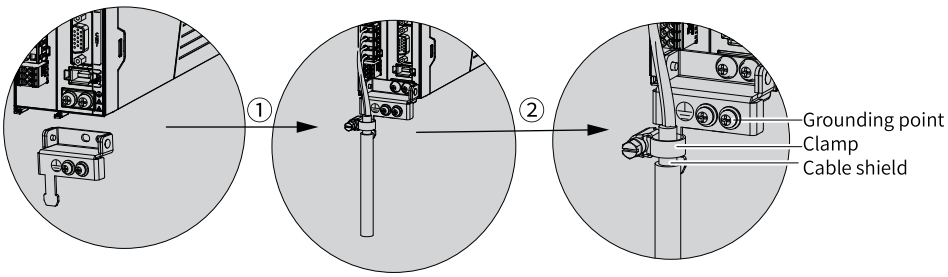


Figure 5-15 Installation of the shield bracket

- ①: Fix the shielding bracket to the drive with two M4 screws. The recommended tightening torque is 1.2 N·m.
- 2. Put the clamp on the cable shield and the shielding bracket and tighten the screw to fix the cable shield on the shielding bracket. Wire motor power cables and brake cables according to the wiring drawings.

5.5.6 Instructions for Installing the Absolute Encoder Battery Box

The optional S6-C4A battery box contains the following items:

- One plastic case.
- One battery (3.6 V, 2700 mAh).

- Terminal block and crimping terminal.

Installing the battery box

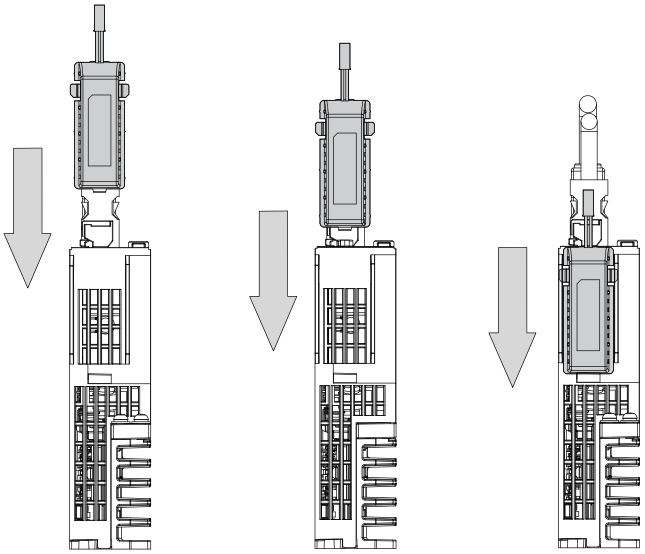
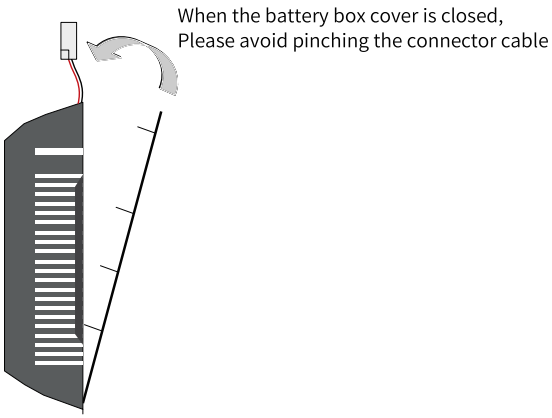


Figure 5-16 Installing the battery box (bottom view)

Removing the battery box

The battery may generate leakage liquid after long-term use. Replace it every two years. Remove the battery box in steps shown in the preceding figure, but in the reverse order.

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



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

Caution

- Insert the battery with polarity (+/-) placed correctly.
- Leaving an idled or retired battery inside the device may lead to electrolyte leakage. The electrolyte inside the battery is highly corrosive, not only corroding surrounding components but also incurring the risk of short circuit. Replace the battery periodically (recommended interval: Every 2 years).
- Do not disassemble the battery because the internal electrolyte may spread out and result in personal injury.
- Do not throw the battery into the fire or heat up the battery. Failure to comply may result in an explosion.
- 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 result in a large current, not only weakening the battery power, but also incurring the risk of explosion due to severe heating.
- This battery is not rechargeable.
- Dispose of the retired battery according to local regulations.

5.5.7 Connection of the network cable

Connecting the cable

1. The network port on the top is equipped with a dustproof plug. Remove it before inserting the cable connector.
2. When inserting the network cable, please insert the crystal head into the bottom of the network port, and the crystal head shrapnel will be stuck into the network port card slot to ensure the reliable connection of the network cable.

Removing the cable

Press the connector latch and pull out the network cable at the same time.

Caution

- It is forbidden to violently pull out the network cable; If the network cable is difficult to pull out, it is necessary to check whether the crystal head buckle is completely loose.
- It is recommended to use Inovance cable, specific model see *"6.4.2 Cable Requirements" on page 85*.

6 Wiring

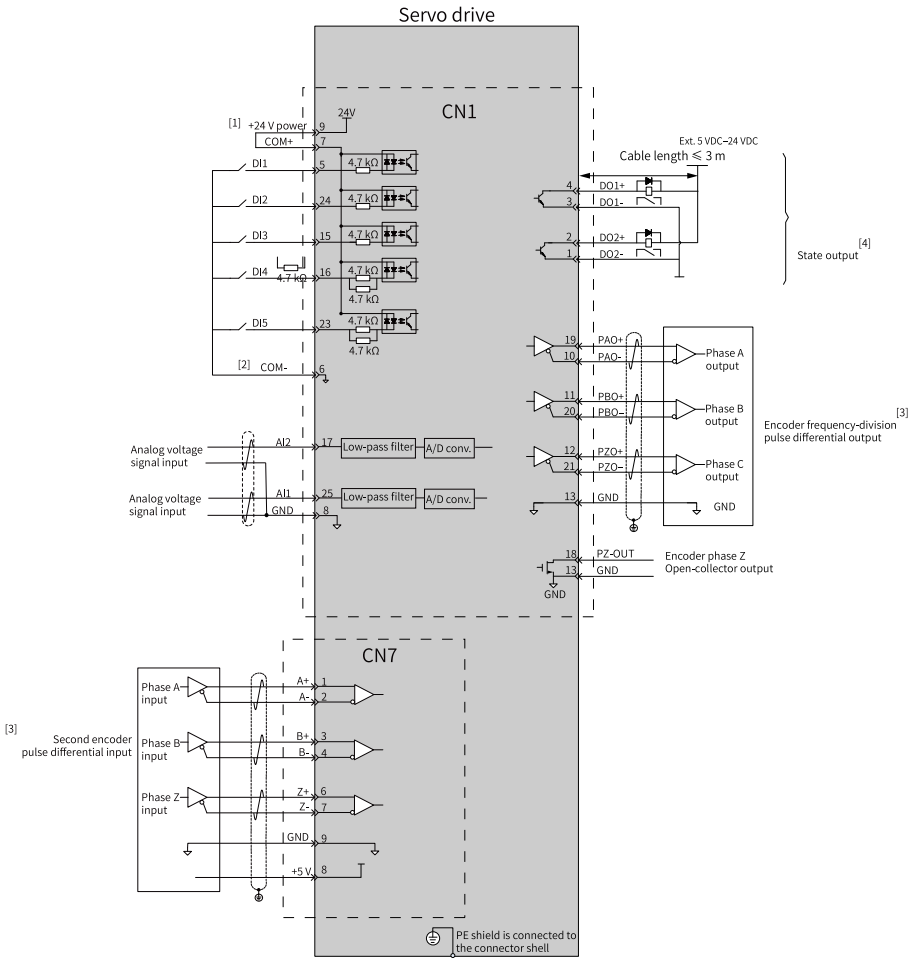


Figure 6-1 Electrical Wiring Diagram

Note

- indicates shielded twisted pairs.
- [1] The range of the internal +24 V power supply is 20 V to 30 V, with maximum operating current being 150 mA (@25°C).
- [2] DI4 and DI5 are high-speed DIs that must be used according to their functions assigned. DI allows external power supplies. See *" DI circuit" on page 73* for details.
- [3] Use shielded twisted pairs as frequency-division output cables and full closed-loop input cables, with both ends of the cable shield connected to PE. Connect GND to the signal ground of the host controller properly.
- [4] The DO power supply (voltage range: 5 V to 24 V) needs to be prepared by users. The DO terminals support 30 VDC voltage and 50 mA current to the maximum. You can enable optocoupler input on the affiliated device through an additional current limiting resistor. For details, see *" DO circuit" on page 74*.

6.1 Main Circuit Terminals

6.1.1 Terminal Pin Arrangement

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

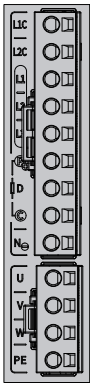


Figure 6-2 Main circuit terminals

Table 6–1 Description of main circuit terminals

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

Note

[1]: The power input terminals of the 200V servo drive's main circuit are L1, L2, and L3, you can use any two of which for single-phase input.

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

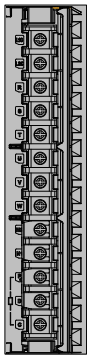


Figure 6-3 Main circuit terminals

Table 6–2 Description of main circuit terminals

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

Note

[1]: The power input terminals of the 200V servo drive's main circuit are L1, L2, and L3, you can use any two of which for single-phase input.

6.1.2 Wiring Precautions and Requirements

Danger

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

Caution

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

Caution

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

Caution

- Ensure that the shielded cable is securely connected to the drive grounding terminal. Ensure that the cables are properly and securely installed. Failure to comply will result in motor malfunction or damage.
- Fasten the screws on the power side. Failure to comply will result in a fire. Use the motor within the rated voltage range. Failure to comply will result in a fire.
- Reduce the routing length and cable length as possible. For cable diameters, see the instructions in this manual about the precautions for wiring the signal cable. Keep the power cable away from the signal cable at least 100 mm. Interference on the signal cables will cause vibration or malfunction.
- Cables of the standard specifications are recommended. If cables of other specifications need to be used, select the cables properly based on the rated current of the equipment and the running environment. The cables of other specifications must be twisted-pair or multi-core twisted pair.
- Do not connect the commercial-use power directly to the motor. Risk of fire or malfunction.

6.1.3 Cable Requirements

Cable Model

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

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

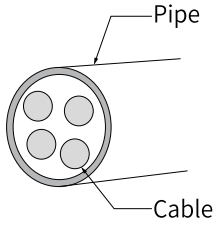


Table 6–3 Reduction coefficient of conductor current-carrying density

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

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

Cable selection

To comply with the EMC standards, use shielded cables. You can use shield-less cables if EMC is not a concern.

The shielded cable must be four-core, with one core being the PE wire. See the following figure.

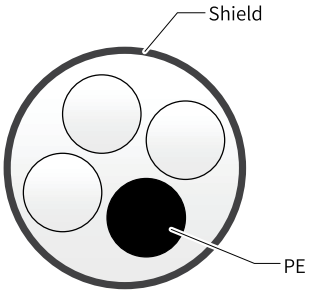


Figure 6-4 Four-core shielded cable

The shield of the shielded cable is comprised of cooper braids to suppress radio frequency interference. To enhance the shielding performance and conductivity, the braided density of the shield must be greater than or equal to 85%.

Observe national or regional regulations when selecting cable dimensions. The IEC cable must meet the following requirements:

- EN 60204-1 and IEC 60364-5-52 standards
- Use PVC insulated cables with copper conductors.
- Heat resistance: 40°C ambient temperature and 70°C cable surface temperature

Note

If the recommended cable specifications for peripheral devices or optional parts exceed the applicable cable specification range, contact Inovance.

Cable Specifications

Table 6–4 Input/Output current specifications of the servo drive

Servo Drive Model		Rated input current (A)	Rated output current (A)	Maximum Output Current (A)
Single-phase 200 V				
Size A	S1R6	2.3	1.6	5.8
	S2R8	4.0	2.8	10.1
Size C	S5R5	7.9	5.5	16.9
	S7R6	9.6	7.6	23.0
Size D	S012	12.8	12.0	32.0
Three-phase 200 V				
Size A	S1R6	1.1	1.6	5.8
	S2R8	2.3	2.8	10.1
Size C	S5R5	4.4	5.5	16.9
	S7R6	5.1	7.6	23.0
Size D	S012	8.0	12.0	32.0
Size E	S018	8.7	18.0	45.0
	S022	11.0	22.0	55.0
	S027	23.8	27.0	67.5

Servo Drive Model		Rated input current (A)	Rated output current (A)	Maximum Output Current (A)
Three-phase 400 V				
Size C	T3R5	2.4	3.5	11.0
	T5R4	3.6	5.4	14.0
Size D	T8R4	5.6	8.4	20.0
	T012	8.0	12.0	30.0
Size E	T017	12.0	17.0	42.5
	T021	16.0	21.0	52.5
	T026	21.0	26.0	65.0

Recommended main circuit cables

- For CE, see *"6.1.4.1 Cable Specifications (CE)" on page 61*.
- For UL, see *"6.1.4.2 Cable Specifications (UL)" on page 64*.

6.1.4 Cable Specifications

6.1.4.1 Cable Specifications (CE)

Table 6–5 Recommended main circuit cables

Servo Drive Model			L1C, L2C		L1, L2, L3/R, S, T		$P\oplus$, D, C, $N\ominus$, N2, N1		U, V, W, PE		Grounding terminal	
Size	Model	Rated input current (A)	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG
Single-phase 200 V												
A	S1R6	2.3	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18
	S2R8	4	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18
C	S5R5	7.9	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
	S7R6	9.6	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
D	S012	12.8	2×3.33	12	3×3.33	12	2×3.33	12	4×1.31	16	3.33	12
Three-phase 200 V												
A	S1R6	1.1	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18
	S2R8	2.3	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18
C	S5R5	4.4	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
	S7R6	5.1	2×2.08	14	3×2.08	14	2×2.08	14	4×0.52	20	2.08	14
D	S012	8	2×2.08	14	3×2.08	14	2×2.08	14	4×1.31	16	2.08	14
E	S018	8.7	2×3.33	12	3×3.33	12	2×3.33	12	4×2.08	14	3.33	12
	S022	11	2×5.26	10	3×5.26	10	2×5.26	10	4×2.08	14	5.26	10
	S027	23.8	2×8.4	8	3×8.4	8	2×8.4	8	4×3.33	12	8.4	8
Three-phase 400 V												
C	T3R5	2.4	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18
	T5R4	3.6	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18

Servo Drive Model			L1C, L2C		L1, L2, L3/R, S, T		P ⊕ , D, C, N ⊖ , N2, N1		U, V, W, PE		Grounding terminal	
Size	Model	Rated input current (A)	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG
D	T8R4	5.6	2×0.81	18	3×0.81	18	2×0.81	18	4×0.52	20	0.81	18
	T012	8	2×2.08	14	3×2.08	14	2×2.08	14	4×1.31	16	2.08	14
E	T017	12	2×3.33	12	3×3.33	12	2×3.33	12	4×2.08	14	2.08	14
	T021	16	2×5.26	10	3×5.26	10	2×5.26	10	4×2.08	14	3.33	12
	T026	21	2×8.4	8	3×8.4	8	2×8.4	8	4×3.33	12	8.4	8

Note

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

Table 6–6 Recommended Cable Specifications and Models

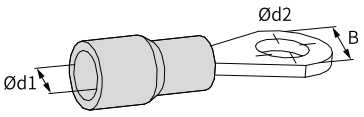
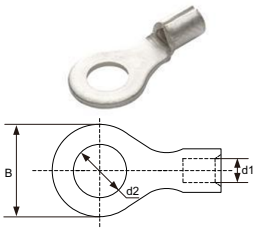
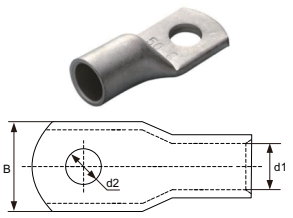
Cable Type	Cable Size	OD (mm)
Power cable	4×10AWG	14.1±0.5
	4×12AWG	12.2±0.4
	4×14AWG	10.5±0.3
	4×20AWG	6.5±0.2
Power cable shield	4×10AWG	14.1±0.5
	4×12AWG	12.9±0.4
	4×14AWG	11.2±0.4
	4×20AWG	6.5±0.2
Power cable + brake cable	4 × 20AWG + 2 × 24AWG	6.5±0.2
Brake cable	2×18AWG	5.8±0.2
	2×20AWG	5.0±0.2

Table 6–7 Main circuit cable lug model and tightening torque

Servo Drive Model			Recommended PVC Cable Model (at 40°C)			
Size	Model	Rated Input Current (A)	U, V, W, PE	Recommended Model of Brake Cable Lug	Recommended Model of Grounding Cable Lug	Tightening Torque (N·m)
Single-phase 200 V						
A	S1R6	2.3	GTVE10008	GTVE05008	TVR1.25–4	1.36
	S2R8	4				
C	S5R5	7.9	GTVE15008	GTVE10008	TVR2-4	
	S7R6	9.6	GTVE20008	GTVE15008		
D	S012	12.8			TNR3.5–4	1.36
Three-phase 200 V						

Servo Drive Model			Recommended PVC Cable Model (at 40°C)			
Size	Model	Rated Input Current (A)	U, V, W, PE	Recommended Model of Brake Cable Lug	Recommended Model of Grounding Cable Lug	Tightening Torque (N·m)
A	S1R6	1.1	GTVE10008	GTVE05008	TVR1.25–4	1.36
	S2R8	2.3				
C	S5R5	4.4	GTVE15008	GTVE10008	TVR2-4	
	S7R6	5.1	GTVE20008	GTVE15008		
D	S012	8.0				1.36
E	S018	8.7	GTVE40008	GTVE15008	TNR3.5–4	1.36
	S022	11.0	GTVE15008	GTVE10008	TNR5.5–4	
	S027	23.8	GTVE25010	GTVE15008	GTNR10-4	1.36
Three-phase 400 V						
C	T3R5	2.4	GTVE10008	GTVE05008	TVR1.25–4	1.36
	T5R4	3.6				
D	T8R4	5.6	GTVE20008	GTVE15008		
	T012	8.0			TVR2-4	1.36
E	T017	12.0	TVR3.5–4	GTVE10008	TNR3.5–4	
	T021	16.0	TVR3.5–4	GTVE10008	TNR5.5–4	1.36
	T026	21.0	TVR5.5–4	GTVE10008	GTNR10-4	1.36

Table 6–8 Dimension drawing of the recommended grounding cable lug

Lug Model		d1 (mm)	d2 (mm)	B (mm)	Dimension Drawing
TVR	1.25–4	4.0	4.3	8.0	
	2–4	4.8	4.3	8.5	
TNR	3.5–4	3.2	4.3	9.5	
	5.5–4	3.5	4.3	9.5	
GTNR	10–4	5.0	4.3	12.4	

6.1.4.2 Cable Specifications (UL)

Table 6–9 Recommended main circuit cables

Servo Drive Model			L1C, L2C		L1, L2, L3/R, S, T		P ⊕ , D, C, N ⊖ , N2, N1		U, V, W, PE		Grounding terminal	
Size	Model	Rated input current (A)	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG	(mm^2)	AWG
Single-phase 200 V												
A	S1R6	2.3	2×2.08	14	3×2.08	14	2×0.75	18	4×0.52	20	3.33	12
	S2R8	4	2×2.08	14	3×2.08	14	2×0.75	18	4×0.52	20	3.33	12
C	S5R5	7.9	2×2.08	14	3×2.08	14	2×0.75	18	4×0.52	20	3.33	12
	S7R6	9.6	2×2.08	14	3×2.08	14	2×0.75	18	4×0.52	20	3.33	12
D	S012	12.8	2×2.08	14	3×2.08	14	2×0.75	18	4×1.31	16	3.33	12
Three-phase 200 V												
A	S1R6	1.1	2×2.08	14	3×2.08	14	2×0.75	18	4×0.52	20	3.33	12
	S2R8	2.3	2×2.08	14	3×2.08	14	2×0.75	18	4×0.52	20	3.33	12
C	S5R5	4.4	2×2.08	14	3×2.08	14	2×0.75	18	4×0.52	20	3.33	12
	S7R6	5.1	2×2.08	14	3×2.08	14	2×0.75	18	4×0.52	20	3.33	12
D	S012	8	2×2.08	14	3×2.08	14	2×0.75	18	4×1.31	16	3.33	12
E	S018	8.7	2×2.08	14	3×2.08	14	2×0.75	18	4×2.08	14	3.33	12
	S022	11	2×2.08	14	3×2.08	14	2×0.75	18	4×2.08	14	3.33	12
	S027	23.8	2×2.08	14	3×3.33	12	2×0.75	18	4×3.33	12	3.33	12
Three-phase 400 V												
C	T3R5	2.4	2×2.08	14	3×2.08	14	2×0.75	18	4×0.52	20	3.33	12
	T5R4	3.6	2×2.08	14	3×2.08	14	2×0.75	18	4×0.52	20	3.33	12
D	T8R4	5.6	2×2.08	14	3×2.08	14	2×0.75	18	4×0.52	20	3.33	12
	T012	8	2×2.08	14	3×2.08	14	2×0.75	18	4×1.31	16	3.33	12
E	T017	12	2×2.08	14	3×2.08	14	2×0.75	18	4×2.08	14	3.33	12
	T021	16	2×2.08	14	3×2.08	14	2×0.75	18	4×2.08	14	3.33	12
	T026	21	2×2.08	14	3×3.33	12	2×0.75	18	4×3.33	12	3.33	12

Table 6–10 Recommended Cable Specifications and Models

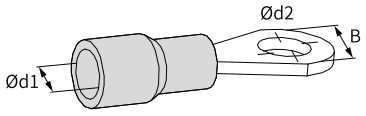
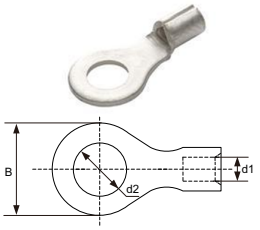
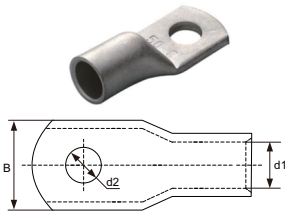
Cable Type	Cable Size	OD (mm)
Power cable	4×10AWG	14.1±0.5
	4×12AWG	12.2±0.4
	4×14AWG	10.5±0.3
Power cable shield	4×10AWG	14.1±0.5
	4×12AWG	12.9±0.4
	4×14AWG	11.2±0.4
Power cable + brake cable	4 × 20AWG + 2 × 24AWG	6.5±0.2

Cable Type	Cable Size	OD (mm)
Brake cable	2×18AWG	5.8±0.2
	2×20AWG	5.0±0.2

Table 6–11 Main circuit cable lug model and tightening torque

Servo Drive Model			Recommended PVC Cable Model (at 40°C)			
Size	Model	Rated Input Current (A)	U, V, W, PE	Recommended Model of Brake Cable Lug	Recommended Model of Grounding Cable Lug	Tightening Torque (N·m)
Single-phase 200 V						
A	S1R6	2.3	GTVE10008	GTVE05008	TVR2-4	1.36
	S2R8	4				
C	S5R5	7.9				
	S7R6	9.6	GTVE15008	GTVE10008		
D	S012	12.8			TNR3.5–4	1.36
Three-phase 200 V						
A	S1R6	1.1	GTVE10008	GTVE05008	TVR2-4	1.36
	S2R8	2.3				
C	S5R5	4.4				
	S7R6	5.1				
D	S012	8.0			TNR3.5–4	1.36
E	S018	8.7			TNR5.5–4	1.36
	S022	11.0	GTVE15008	GTVE10008		
	S027	23.8	GTVE60010	GTVE60010	GTNR10-4	1.36
Three-phase 400 V						
C	T3R5	2.4	GTVE10008	GTVE05008	TVR2-4	1.36
	T5R4	3.6				
D	T8R4	5.6			TNR3.5–4	1.36
	T012	8.0				
E	T017	12.0	TVR1.25–4	GTVE10008	TNR5.5–4	1.36
	T021	16.0	TVR2-4	GTVE10008		1.36
	T026	21.0	TVR5.5–4	GTVE60010	GTNR10-4	1.36

Table 6–12 Dimension drawing of the recommended grounding cable lug

Lug Model		d1 (mm)	d2 (mm)	B (mm)	Dimension Drawing
TVR	2–4	4.8	4.3	8.5	
TNR	3.5–4	3.2	4.3	9.5	
	5.5–4	3.5	4.3	9.5	
GTNR	10–4	5.0	4.3	12.4	

6.1.5 Wiring Example

6.1.5.1 Wiring of the Power Supply

Single-phase 200V Models

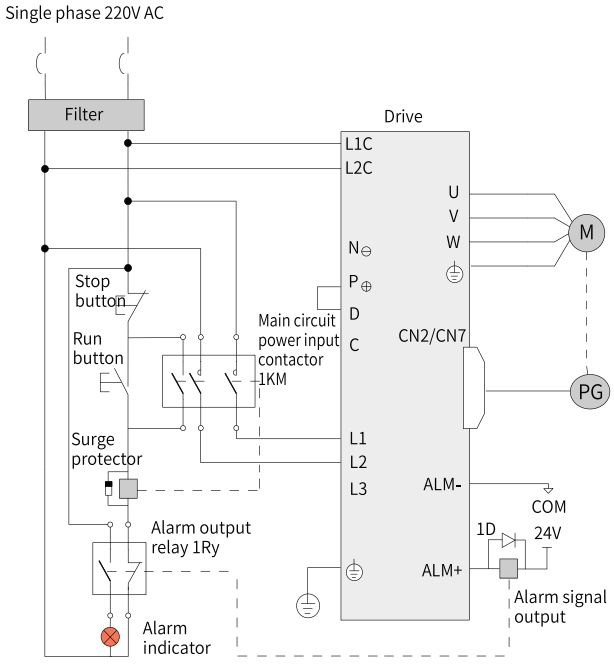


Figure 6-5 Main circuit wiring of single-phase 200 V models

Note

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

Three-phase 200V Models

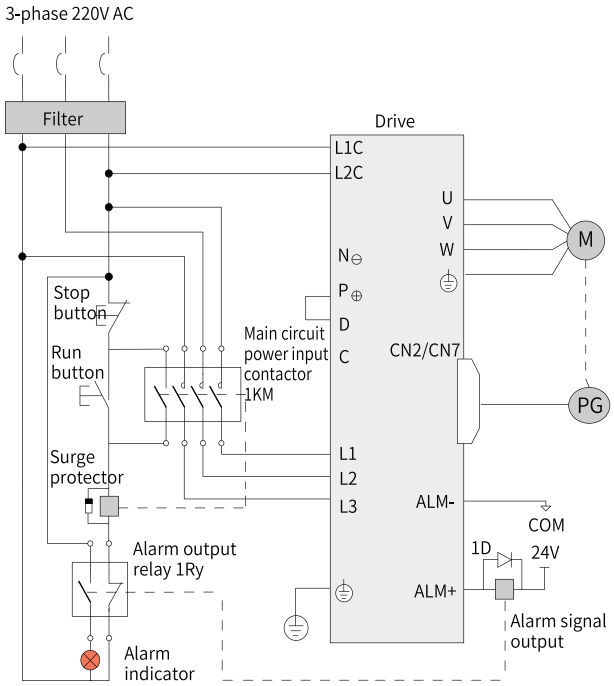


Figure 6-6 Main circuit wiring

Note

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

Three-phase 400V Models

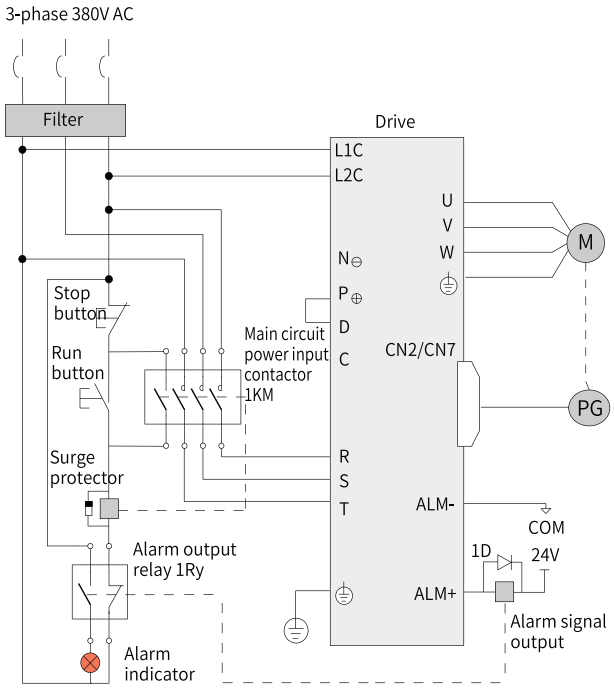


Figure 6-7 Main circuit wiring

Note

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

6.1.5.2 Wiring of the Grounding Cable

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

Warning

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

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

Grounding requirements

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

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

Multi-drive grounding

Side-by-side installation of multiple drives:

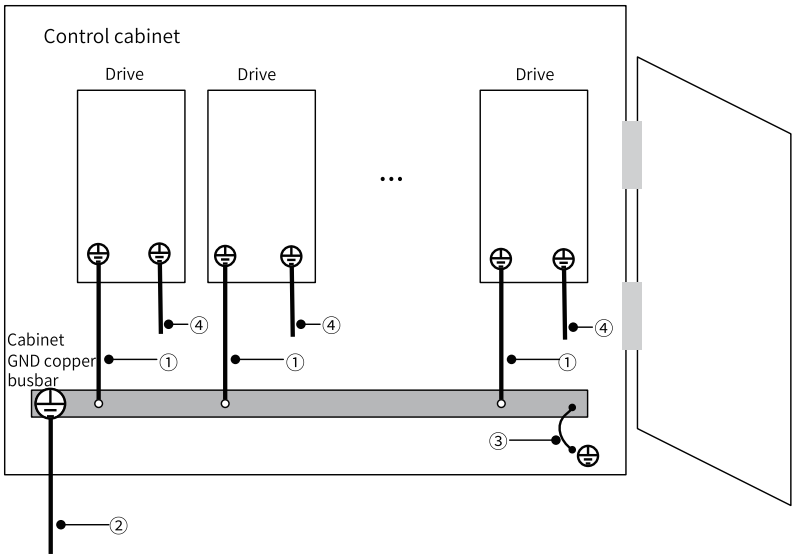


Table 6–13 Description for grounding of multiple drives installed in parallel

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

Grounding the control cabinet system

The most cost-effective method of suppressing interference in a control cabinet is to isolate the interference source from devices that may be interfered with. Divide the control cabinet into multiple EMC compartments or use multiple control cabinets based on the intensity of interference sources, and install each device in accordance with the following wiring principles.

Table 6–14 Wiring requirements

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

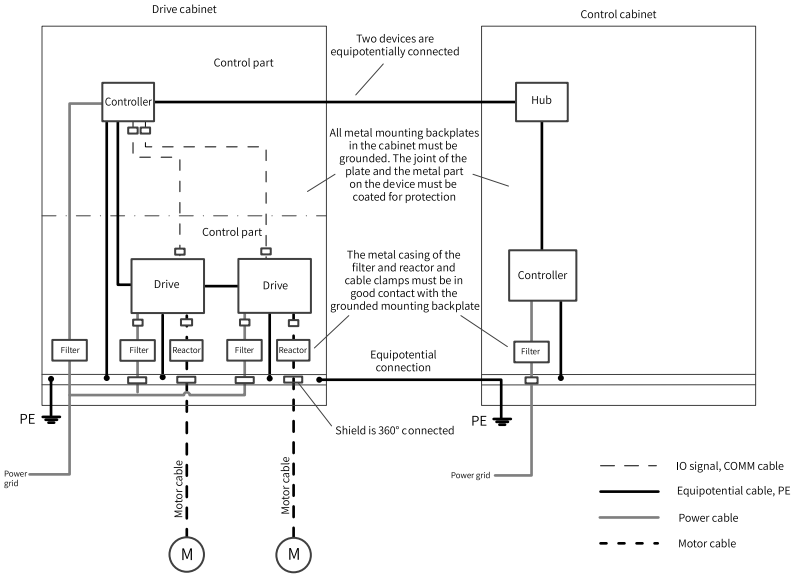


Figure 6-8 Recommended wiring for the control cabinet system

6.2 CN1 Control Terminal

6.2.1 Terminal Pin Arrangement

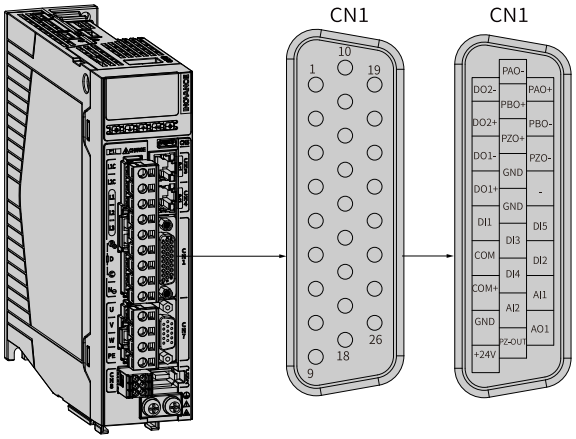


Figure 6-9 Control terminal pin layout (CN1)

Note

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

Table 6–15 Description of DI/DO signals

Signal Name		Default Function	Pin No.	Function
General	DI1	P-OT	5	Positive limit switch
	DI2	N-OT	24	Negative limit switch
	DI3	HomeSwitch	15	Home switch
	DI4	Emergence Stop	16	Emergency stop
	DI5	TouchProbe1	23	Touch probe 1
	+24 V		9	Internal 24 V power supply; voltage range: 20V to 30V; maximum output current: 150 mA (@25°C)
	COM–		6	
	COM+		7	Common terminal of DI terminals
	DO1+	S-RDY+	4	Ready to switch on
	DO1-	S-RDY-	3	
	DO2+	ALM+	2	Fault
	DO2-	ALM+	1	

Table 6–16 Encoder frequency-division output signals

Signal Name		Pin No.	Function	
General	PAO+	19	Phase A frequency-division output signal	Quadrature frequency-division pulse output signals of phases A and B
	PAO–	10		
	PBO+	11	Phase B frequency-division output signal	
	PBO–	20		
	PZO+	12	Phase Z frequency-division output signal	Home pulse output signal
	PZO–	21		
	PZ-OUT	18	Home pulse open-collector output signal	
	GND	13	Home pulse open-collector output signal ground	
	PE	Housing	-	

Table 6–17 Specifications of AI/AO signals

Signal Name		Pin No.	Function
General	AO1	26	Analog Output Voltage range: –10 V to +10 V
	GND	8	Common terminal of AI/AO
	AI1	25	Voltage-type AI 1, 16-bit Voltage range: –10 V to +10 V Maximum allowable voltage: ±12 V
	AI2	17	Voltage-type AI 2, 12-bit Voltage range: –10 V to +10 V Maximum allowable voltage: ±12 V
	PE	Housing	-

Note

- When analog input is used as a reference, even after zero drift calibration, the internal circuit of the servo drive cannot provide an absolutely correct 0 value due to the ambient temperature.
- In this case, complete stop must depend on disabling or emergency stop, rather than 0 analog input.
- If reference control is not a concern, you can increase the dead zone (H03.53). If it is impossible, use a high-precision channel.

6.2.2 Wiring Precautions and Requirements

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

Observe the following requirement during control circuit wiring:

Caution

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

6.2.3 Wiring Example

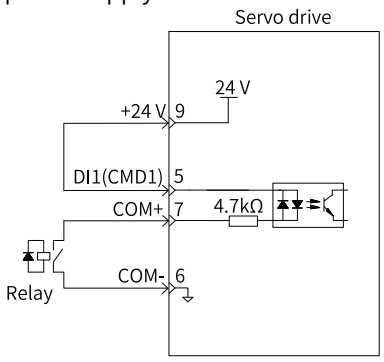
6.2.3.1 DI/DO Signals

DI circuit

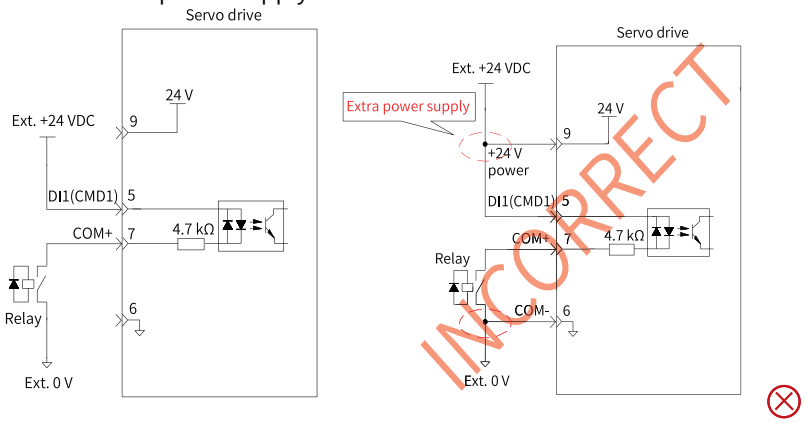
The DI circuits of the drive are the same. The following takes the DI1 circuit as an example.

For DI terminal arrangement, see *"Table 6–15 Description of DI/DO signals" on page 71*.

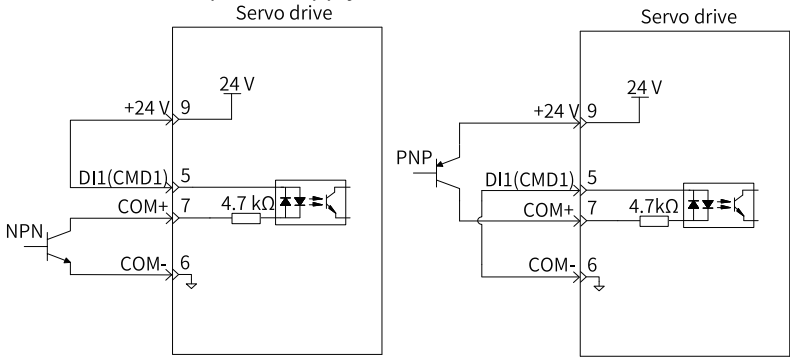
- The host controller provides relay output:
  - When you use the internal 24 V power supply:



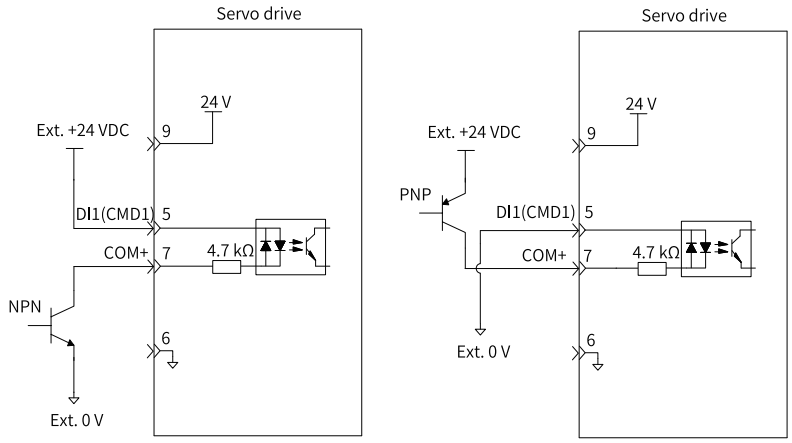
  - When you use an external power supply:



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



  - When you use an external power supply:



Note

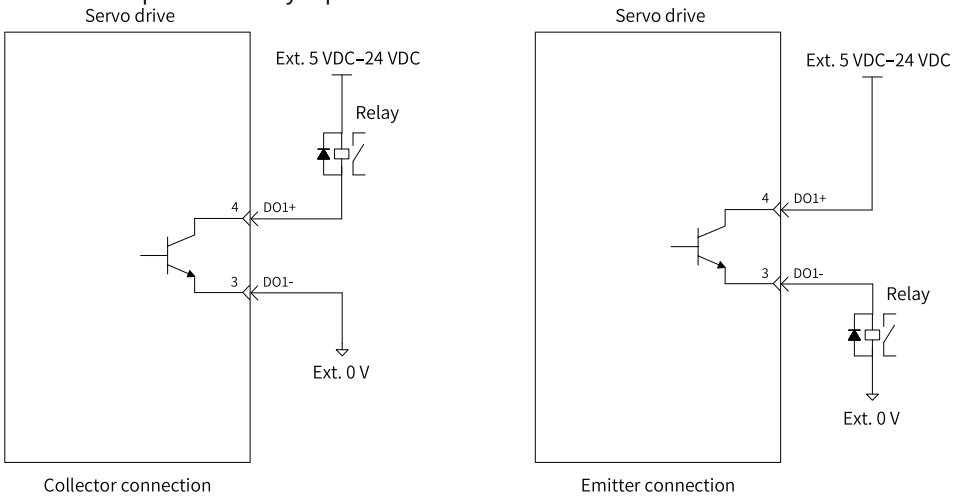
PNP and NPN input cannot be used together in the same circuit.

DO circuit

DO circuits of the drive are the same. The following takes DO1 circuit as an example.

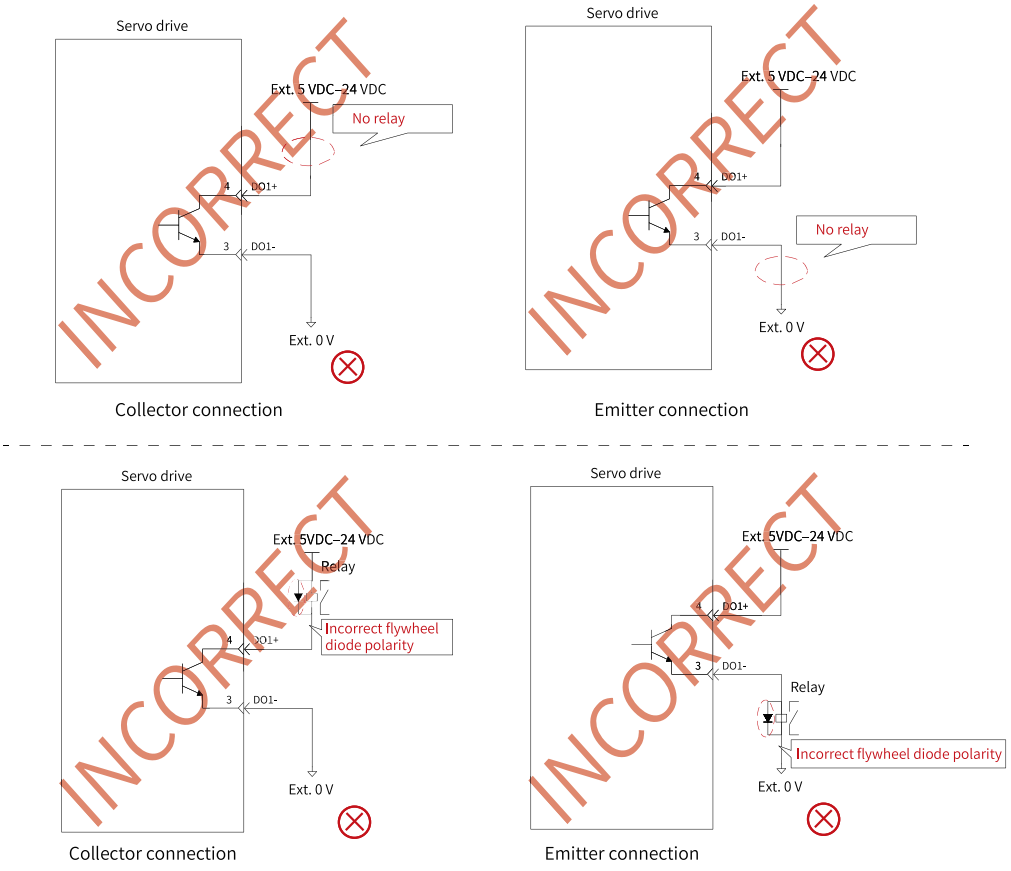
For DO terminal arrangement, see *"Table 6–15 Description of DI/DO signals" on page 71*.

- The host controller provides relay input.

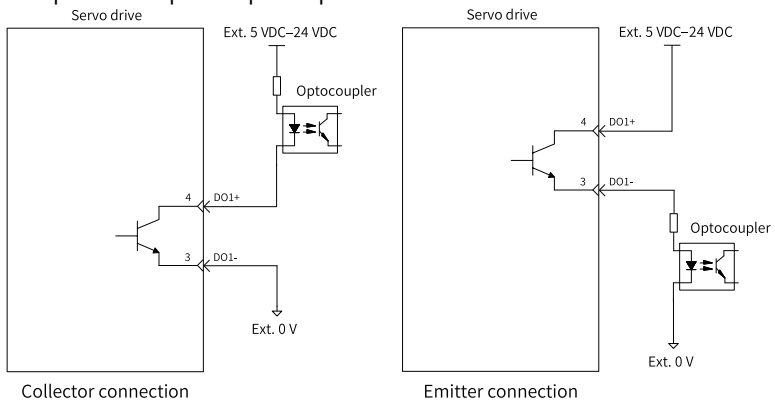


Note

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



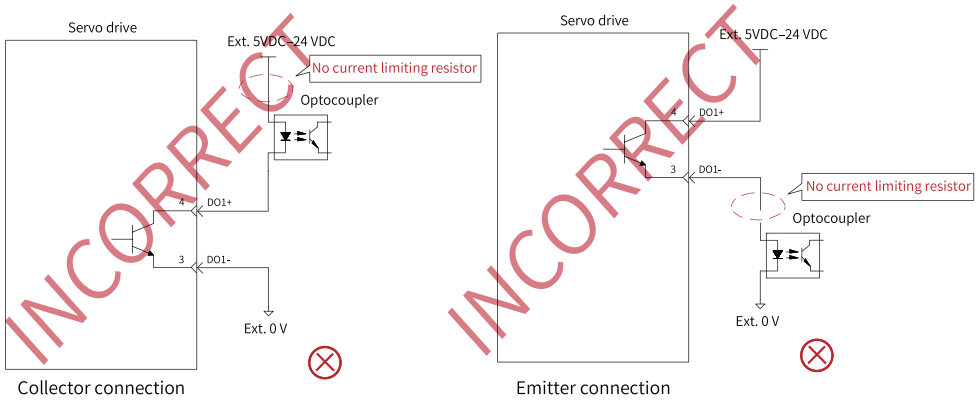
- The host controller provides optocoupler input:



Note

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

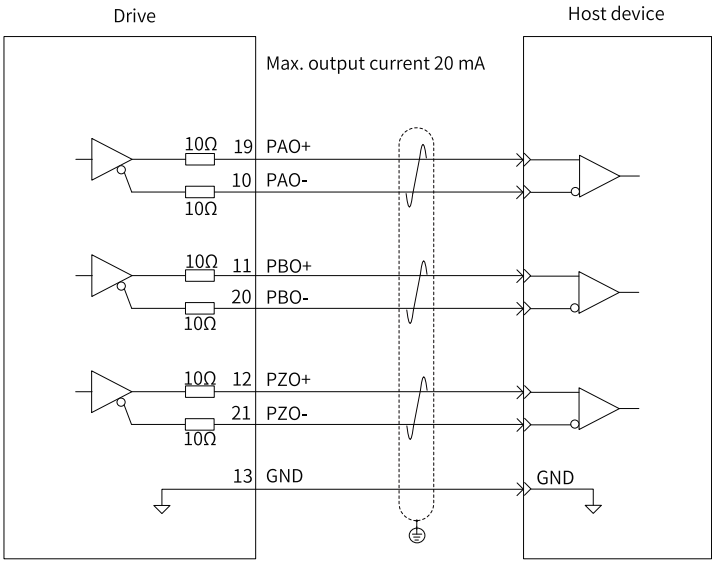
- Max. voltage: 30 VDC
- Max. current: DC 50 mA

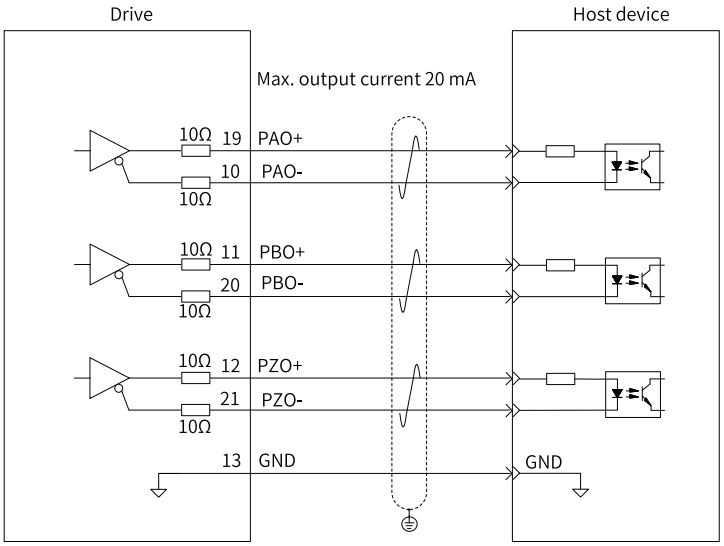


6.2.3.2 Encoder Frequency-Division Output Signals

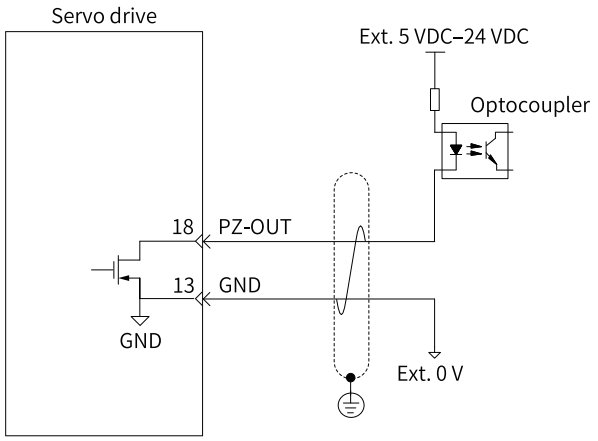
Encoder frequency-division output circuit outputs differential signals via the differential drive. Typically, this circuit provides feedback signals to the host controller in a position control system. Use a differential or optocoupler receiving circuit on the host controller side to receive feedback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

For encoder frequency-division output signal terminal arrangement, see *"Table 6–16 Encoder frequency-division output signals" on page 72*.





Encoder phase Z output circuit outputs OC signals. Typically, this circuit provides feedback signals to the host controller in a position control system. An optocoupler circuit, relay circuit, or bus receiver circuit shall be used in the host controller to receive feedback signals.



Caution

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

6.2.3.3 AI/AO Signals

For analog signal terminal arrangement, see *"Table 6–17 Specifications of AI/AO signals" on page 72*.

Analog input signal

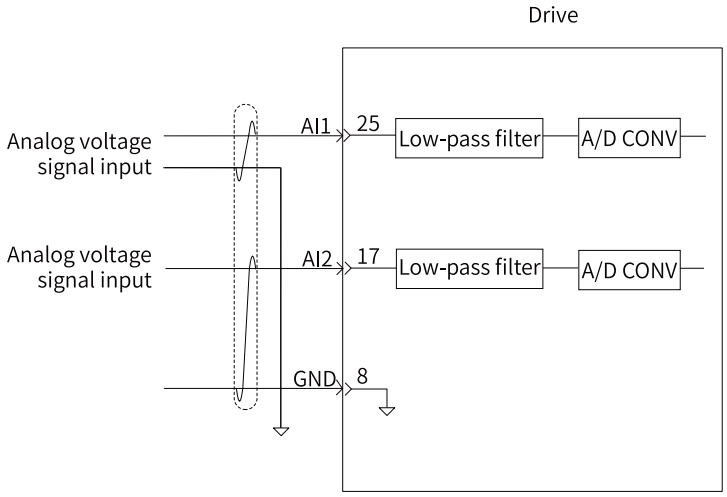
The input terminal for analog speed and torque signals is AI1 and AI2.

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

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

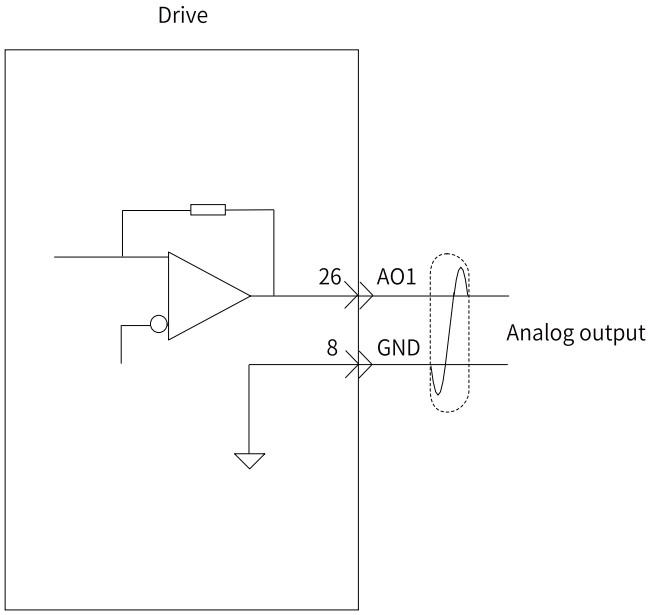
- Voltage-type input specification: –10 V to +10 V; maximum permissible voltage: ±12 V

- Input impedance: approx. 74 kΩ.



Analog output signal

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



6.2.4 Cable Requirements

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

I/O signal cable selection

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

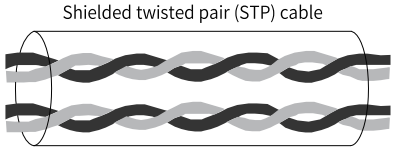


Figure 6-10 Diagram of shielded twisted pairs

Control Cable Specifications

Table 6–18 Recommended Control Cable Specifications

Control terminal	Connector Kit/Material No.	Recommended Lug Size (AWG)
CN1	DB26	16 to 26

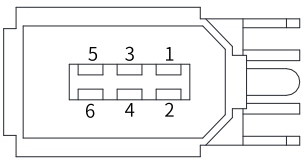
6.3 CN2 Encoder Terminal

6.3.1 Terminal Pin Arrangement

Note

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

Terminal Pin Arrangement



Encoder signal terminal CN2

Figure 6-11 Terminal pin arrangement

Table 6–19 Pin assignment

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

Note

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

6.3.2 Wiring Precautions and Requirements

- Ground the shielded layers on both the servo drive side and the motor side. Otherwise, the servo drive will report a false alarm.
- Do not connect cables to the "reserved" terminals.
- Given the voltage drop caused by cable resistance and signal attenuation caused by distributed capacitance, it is recommended to use twisted-pair cables of 26AWG or above (as per UL2464 standard) with length no longer than 10 m as the encoder cable.

Note

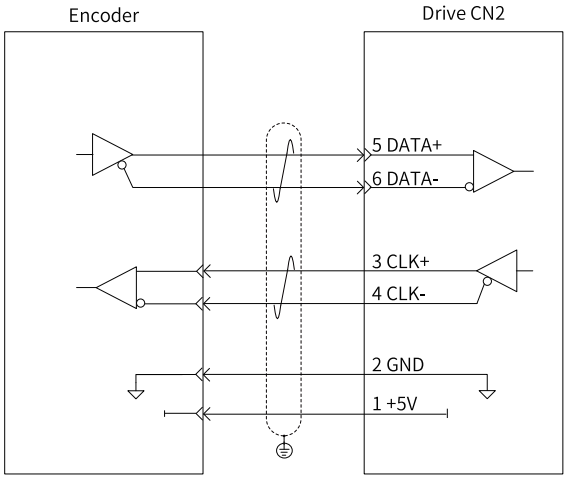
It is recommended to use 22AWG to 26AWG cables and a matching terminal AMP170359-1 for 10B, 20B, 40B, and 75B series motors. If a longer cable is required, increase the cable diameter properly. See *"6.3.4 Cable Requirements" on page 82* for details.

6.3.3 Wiring Example

6.3.3.1 Communication with the First Encoder

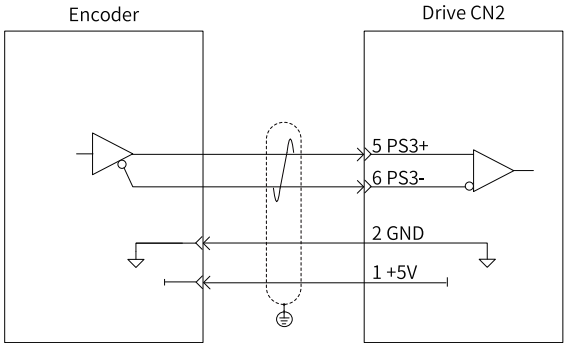
Wiring of Endat2.2/SSI/BiSS-C master encoder

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



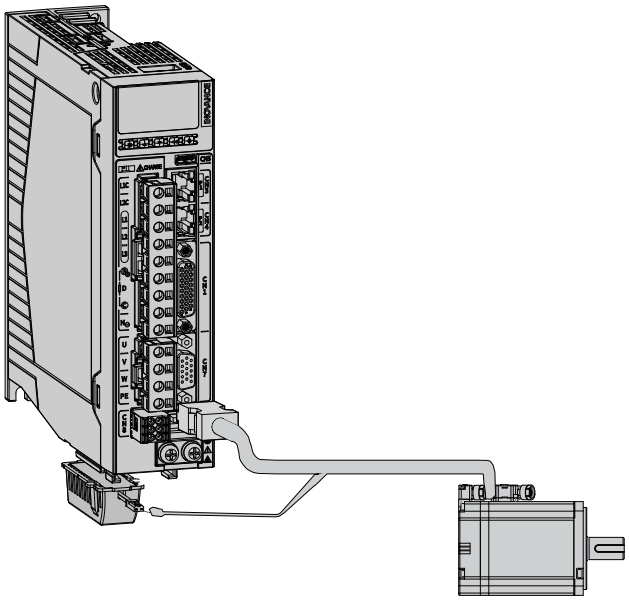
Wiring of the Inovance master encoder

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



For cable requirements, see *"6.3.4 Cable Requirements" on page 82*.

Wiring of Inovance rotary motor



6.3.3.2 Communication with the Second Encoder

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

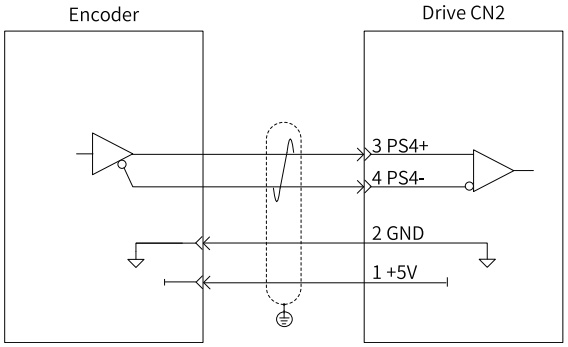
Wiring of Endat2.2/SSI/BISS-C second encoder

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

For details, see *" Wiring of Endat2.2/SSI/BiSS-C master encoder" on page 80*.

Wiring of the Inovance second encoder

The drive communicates with the first encoder normally, that is, the first encoder exists all the time. For an Inovance second encoder, the encoder exchanges data with the drive through PS4+ and PS4- signals.



For cable requirements, see *"6.3.4 Cable Requirements" on page 82*.

6.3.4 Cable Requirements

Note

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

Table 6–20 Recommended cables

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

Note

- The above length can be increased by 2 m to 3 m.
- If the cables of above 16AWG are required, contact the sales personnel of Inovance.
- In the preceding table, P refers to two twisted pairs of cables. 1P: +5V/0V twisted pair; 2P: DC+/- twisted pair; PS +/- twisted pair; 3P: +5V/0V twisted pair; DC+/- twisted pair. PS+/- twisted pair.

6.3.5 Adapters of Power Cables and Encoder Cables

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

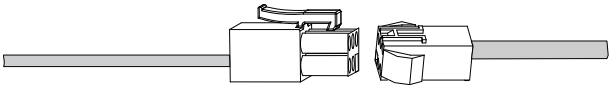


Figure 6-12 Power cable adapter

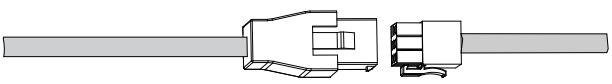


Figure 6-13 Encoder cable adapter

6.4 CN3 and CN4 Communication Terminals

6.4.1 Communication Terminals CN3 and CN4

Terminal Pin Arrangement

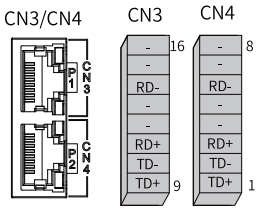


Figure 6-14 Communication Terminal pin layout of the servo drive

Table 6–21 PROFINET communication terminal pin assignment

Pin No.	Name	Description
1	TD+	Data transmit positive
2	TD-	Data transmit negative
3	RD+	Data reception+
4 and 5	-	-
6	RD-	Data reception–
7 and 8	-	-
9	TD+	Data transmit positive
10	TD-	Data transmit negative
11	RD+	Data reception+
12 and 13	-	-
14	RD-	Data reception–
15 and 16	-	-

Description

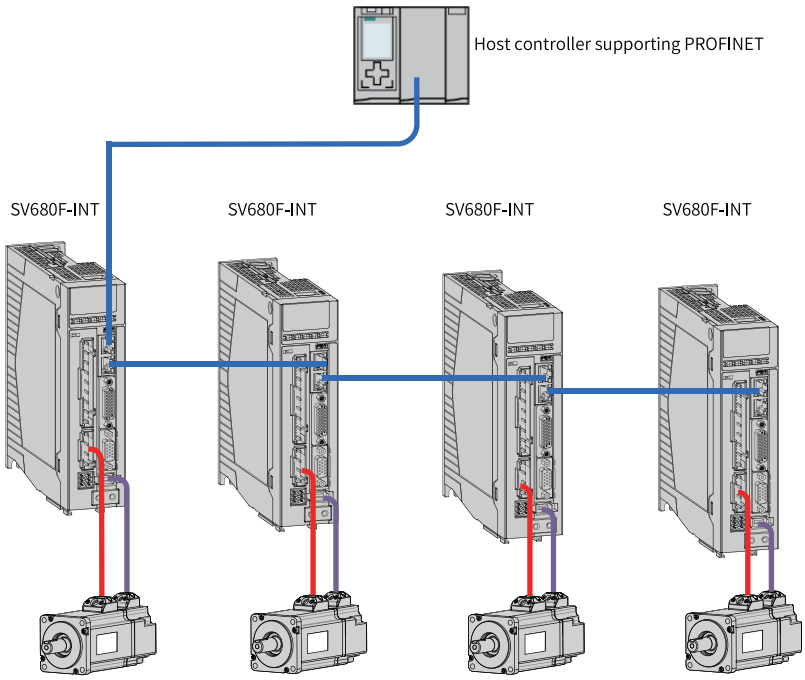


Figure 6-15 Communication network topology

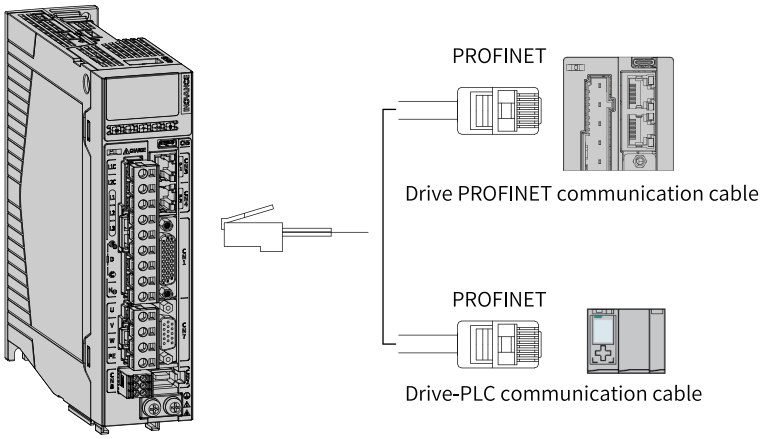


Figure 6-16 Wiring of communication cables

CN3 and CN4 are PROFINET communication port connectors. CN3(P1) is connected to the host controller, and CN4(P2) is connected to a slave. For assignment of CN3/CN4 terminal pins, see *"Table 6–21 PROFINET communication terminal pin assignment" on page 83*.

Note

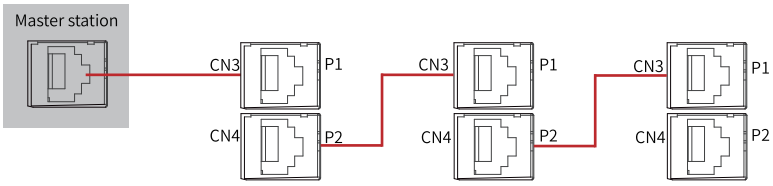
You can also use communication cables to connect the drive and PC through CN3 and CN4 terminals to achieve commissioning of an individual drive or simultaneous commissioning of multiple drives.

Terminal Wiring

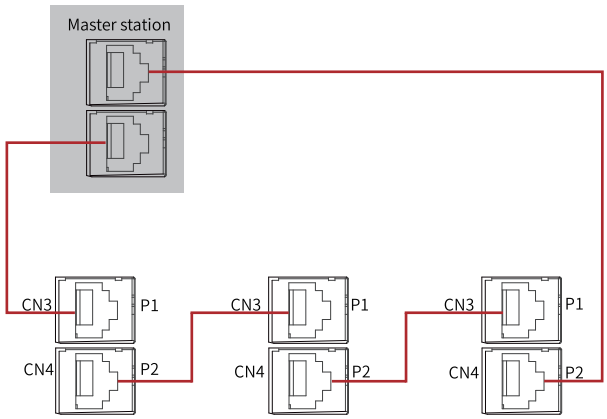
- Topology

Profinet communication topology is flexible and basically has no restrictions. However, in IRT communication mode, the actual physical topology connection sequence must be consistent with the topology connection sequence configured by the PLC.

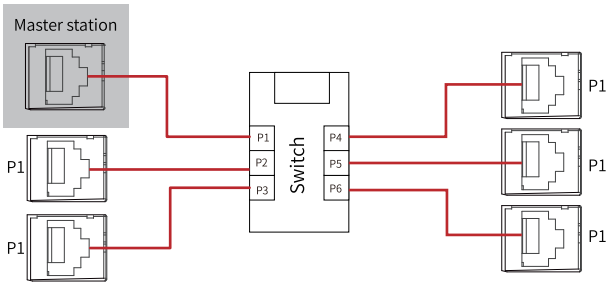
- Linear



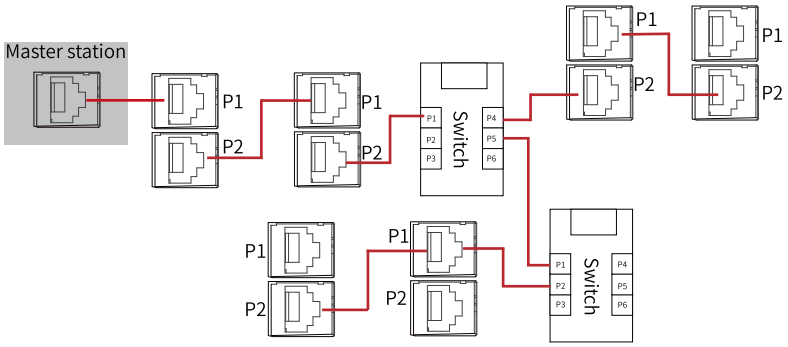
- Redundant ring



- Star



- Tree



6.4.2 Cable Requirements

Rules

PROFINET cables are connected to the network ports (P1 and P2) equipped with the metal shield. The electric characters are compliant with IEEE 802.3 and ISO 8877 standards.

Communication cable types

Table 6–22 Cable data

Material Code	Cable Model	Cable Length (m)	Cable Length
15040261	S6-L-T04-0.3	0.3	CAT.5E 4-core cable
15040262	S6-L-T04-3.0	3.0	
15041960	S6-L-T04-0.2	0.2	
15041961	S6-L-T04-0.5	0.5	
15041962	S6-L-T04-1.0	1.0	
15041963	S6-L-T04-2.0	2.0	
15041964	S6-L-T04-5.0	5.0	
15041965	S6-L-T04-10.0	10.0	
1504QV45	S6-L-T07-0.3	0.3	CAT6A 8-core cable
1504QV46	S6-L-T07-1.0	1.0	
1504QV47	S6-L-T07-3.0	3.0	
1504QV49	S6-L-T08-0.3	0.3	CAT7 8-core cable
1504QV50	S6-L-T08-1.0	1.0	
1504QV51	S6-L-T08-3.0	3.0	

Communication cable specifications

Table 6–23 Specifications

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

Note

Application scenarios:

CAT.5E cable: suitable for home networks, and small and medium-sized enterprise networks.

CAT6A cable: suitable for data centers and applications requiring high-speed data transmission.

Cat7 cable: suitable for scenarios that require extremely high network performance, such as large enterprise networks, data centers, and high-definition video transmission.

Cable shield

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

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

In the planning stage, always refer to the measurement data provided by the cable manufacturer. If the connection between the devices is moving, use flexible cables to avoid damage. If connectors are installed in a chemically corrosive environment, use cables with special coatings to avoid damage. If

other environmental restrictions exist in the application, customized cables must be used according to the specific information provided by the cable manufacturer.

Selection of link cables (recommended by Beckhoff):

For permanent links, the cables must meet the angle value described in *"Table 6–24 References for fixed cables of a permanent link" on page 87* and *"Table 6–25 References for flexible cables of a permanent link" on page 87*.

Table 6–24 References for fixed cables of a permanent link

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

Table 6–25 References for flexible cables of a permanent link

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

Table 6–26 Cable example for a permanent link

	Fixed	Flexible
Shield	S/FTQ	S/FTQ
Round-trip resistance	⩽ 115 Ω/km	⩽ 115 Ω/km
Insertion loss (@100 MHz)	19.5 dB/100 m	21.3 dB/100 m
Near-end crosstalk (@100 MHz)	50 dB/100 m	50 dB/100 m

Only four cables are used for communication. Therefore, it is recommended to use four-conductor (two pairs) balanced Ethernet cables. You can also use four pairs of cables, provided that their performance in IL and NEXT is consistent with that of the four-conductor cables and does not exceed

the angle value of the worst case reported in *"Table 6–24 References for fixed cables of a permanent link" on page 87* and *"Table 6–25 References for flexible cables of a permanent link" on page 87*. The unused cable pairs (especially if these cable pairs are not connected correctly to devices) will actually increase the signal crosstalk between adjacent cable pairs and reduce the cable performance.

6.5 Description of Communication Terminal (CN5)

Terminal Pin Arrangement

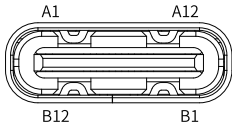


Table 6–27 Pin assignment of communication terminal (CN5)

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

Description

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

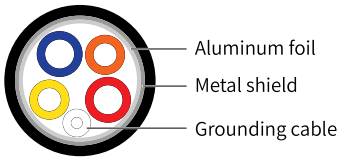


Figure 6-17 Recommended cables

Note

- Supports online upgrade and background commissioning when the drive is powered on.
- In USB mode, the terminal only supports download and upload of parameters, and driver firmware update.
- The terminal uses USB power supply. If there is a fault that cannot be completely reset, disconnect the USB power supply and drive control power, and then power on again.
- If you need more USB ports on the computer, use a properly-branded USB expansion module. In USB mode, to prevent power failure, it is recommended to use a USB expansion module with independent power supply.
- When the drive is only powered through USB, the drive may not be able to enter the USB mode and the display of the keypad will be abnormal due to insufficient power supply of the computer. Therefore, it is recommended to use the USB3.0 port or connect the control power to the drive.

6.6 CN6 STO (Safe Torque Off) Terminal

6.6.1 CN6 STO Safety Terminal

Terminal Arrangement

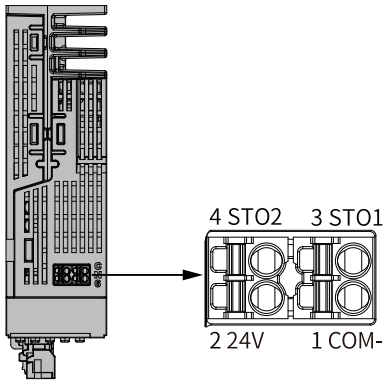


Table 6–28 Pin assignment

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

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

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

Description

- **Electrical specifications and connection of the input circuit**
  This section describes the characteristics of the input signals assigned to the CN6 connectors.
  - Specifications

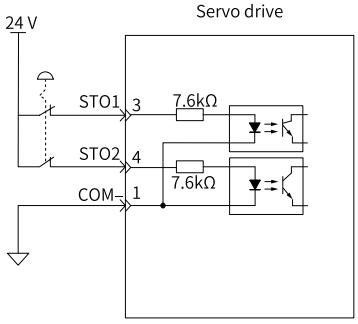
The servo drive operates normally only when the input states of STO1 and STO2 are both "High" ("1" or "H").

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

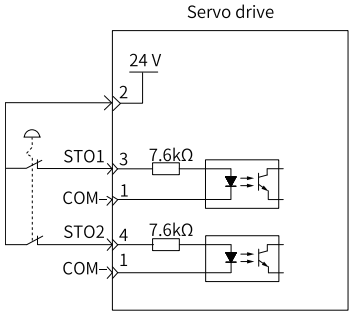
- Electrical characteristics of Safety Request Input Signal are as follows:

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

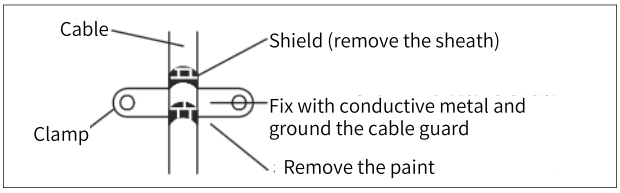
- Connection example of external 24 V



- Connection example of internal 24 V



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



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

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

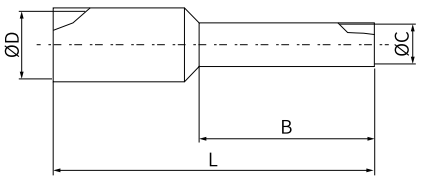
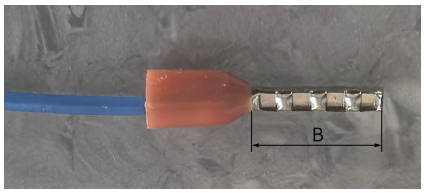
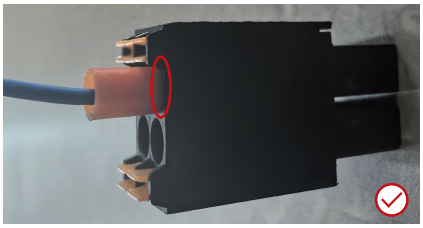
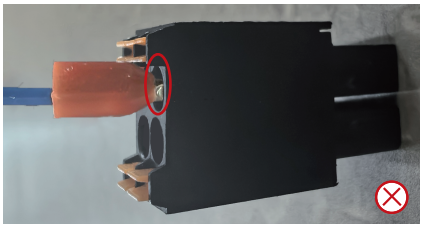
Cable	Description
Category	Low voltage, double-shielded or single-shielded twisted multi-pair cable
Maximum size	0.8 mm^2 (18AWG)
Minimum size	0.3 mm^2 (28AWG)
Maximum length	The max. distance between STO input and the operating contact is 30 m

Applicable servo drives

STO applies to the following servo drives:

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

6.6.2 Wiring Precautions and Requirements

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

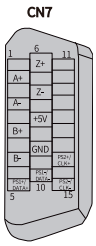
6.7 CN7 Encoder Terminal

6.7.1 Terminal Pin Arrangement

Note

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

Terminal Pin Arrangement



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

6.7.2 Cable Requirements

Note

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

Table 6–29 Recommended cables

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

Note

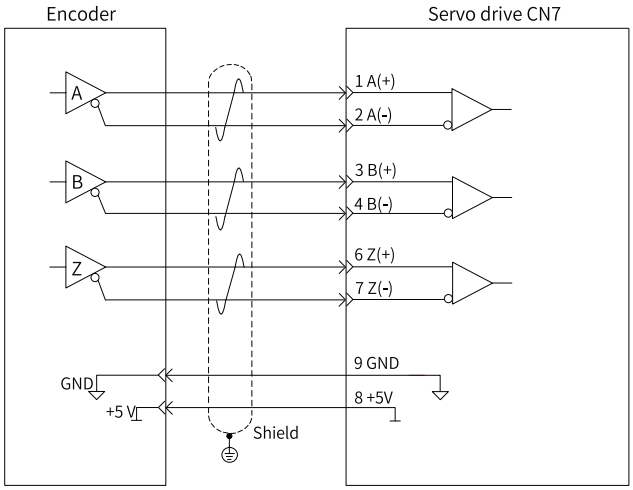
- The above length can be increased by 2 m to 3 m.
- If the cables of above 16AWG are required, contact the sales personnel of Inovance.
- In the preceding table, P refers to two twisted pairs of cables. 1P: +5V/0V twisted pair; 2P: DC+/- twisted pair; PS +/- twisted pair; 3P: +5V/0V twisted pair; DC+/- twisted pair. PS+/- twisted pair.

6.7.3 Wiring Example

6.7.3.1 Communication with the First Encoder

Wiring of ABZ incremental encoder (TTL signal)

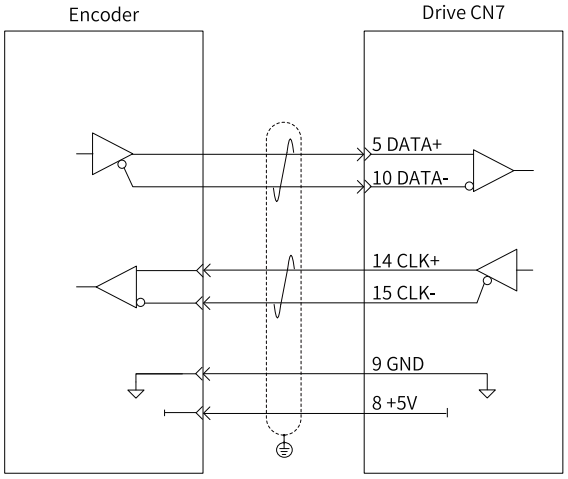
Use shielded twisted pairs to match the high input frequency.



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

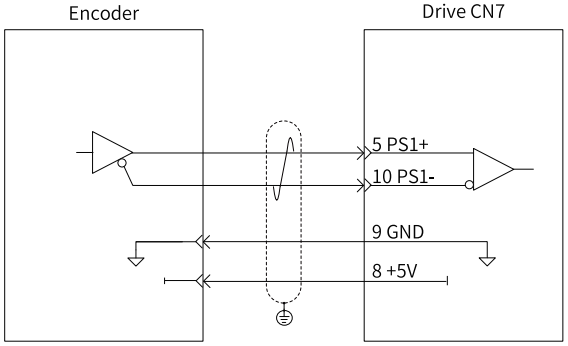
Wiring of Endat2.2/SSI/BiSS-C master encoder

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



Wiring of the Inovance master encoder

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



For cable requirements, see *"6.7.2 Cable Requirements" on page 92*.

6.7.3.2 Communication with the Second Encoder

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

Wiring of ABZ incremental encoder (TTL signal)

For details, see *" Wiring of ABZ incremental encoder (TTL signal)" on page 93*.

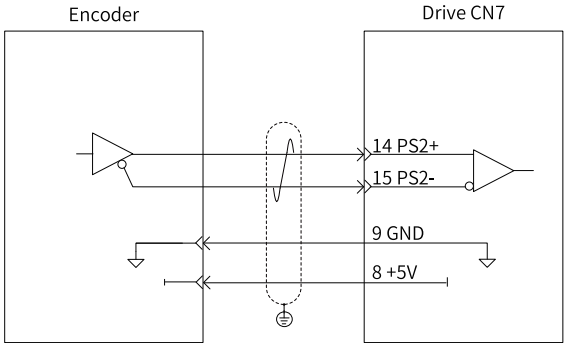
Wiring of Endat2.2/SSI/BiSS-C second encoder

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

For details, see *" Wiring of Endat2.2/SSI/BiSS-C master encoder" on page 93*.

Wiring of the Inovance second encoder

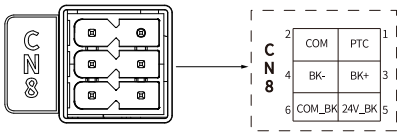
The drive communicates with the first encoder normally, that is, the first encoder exists all the time. For an Inovance second encoder, the encoder exchanges data with the drive through PS2+ and PS2- signals.



For cable requirements, see *"6.7.2 Cable Requirements" on page 92*.

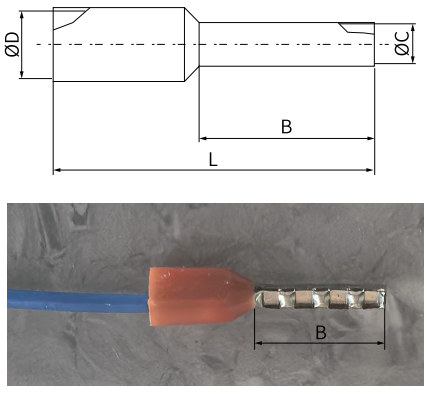
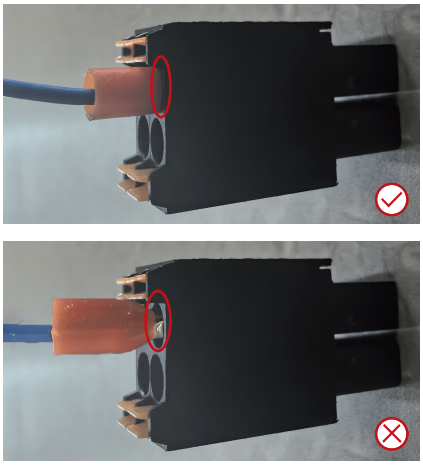
6.8 CN8 Brake and PTC Input Terminal

6.8.1 Terminal Pin Arrangement



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

6.8.2 Wiring Precautions and Requirements

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

6.8.3 Wiring Example

6.8.3.1 PTC Wiring Example

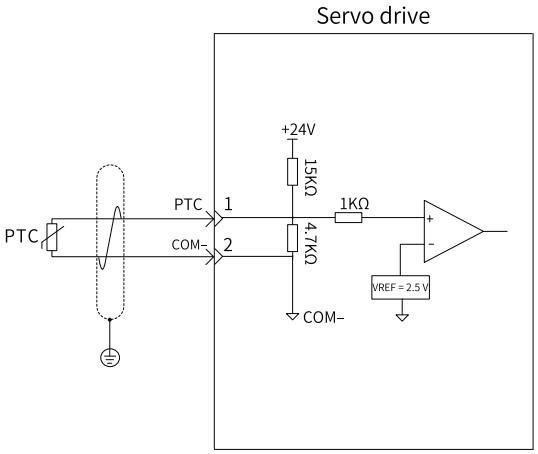


Figure 6-18 PTC wiring diagram

Note

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

6.8.3.2 Brake Wiring Examples

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

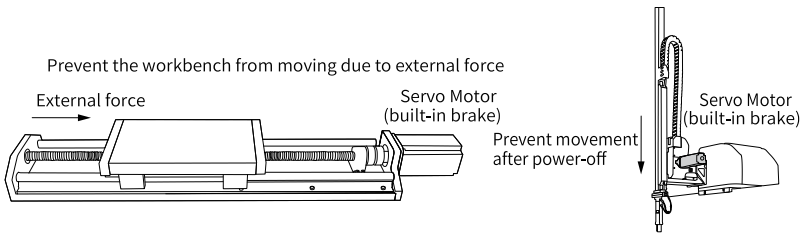
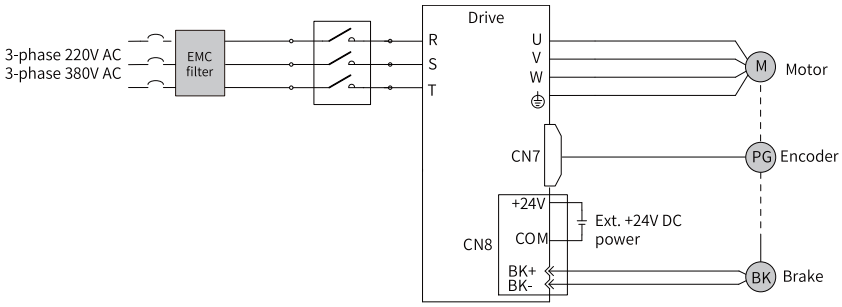


Figure 6-19 Application of the brake

Caution

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

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



Pay attention to the following precautions during wiring:

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

Note

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

6.9 Wiring and Setting of the Braking Resistor

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

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

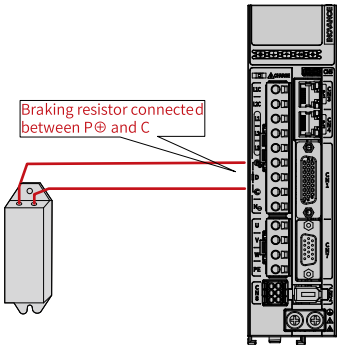


Figure 6-20 Wiring of external braking resistor

Recommended cables for terminals P ⊕ and C: For CE, see *"6.1.4.1 Cable Specifications (CE)" on page 61*. For UL, see *"6.1.4.2 Cable Specifications (UL)" on page 64*.

Caution

Observe the following precautions when connecting the external braking resistor:

- The built-in braking resistor or jumper bar is not available in models S1R6 and S2R8. If an external braking resistor is needed for these models, connect it between terminals P ⊕ and C.
- Remove the jumper between terminals P⊕ and D before using the external braking resistor. Failure to comply will result in overcurrent and damage the braking transistor.
- Do not connect the external braking resistor to the positive or negative pole of the bus directly. Failure to comply will damage the servo drive and result in a fire.
- Select a resistor with resistance higher than or equal to the minimum permissible value. Failure to comply will result in E201 (Overcurrent) or damage the servo drive.
- Make sure parameters H02.25 (Braking resistor setting), H02.26 (Power of external braking resistor) and H02.27 (Resistance of external braking resistor) are set properly before operating the servo drive.
- Install the external braking resistor on incombustible matters (such as metal).

7 Commissioning Tool

7.1 Operating Panel

7.1.1 Components

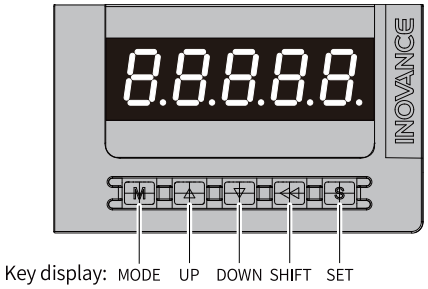


Figure 7-1 Magnified view of the keypad

The operation panel of the SV680F-INT Series servo drive consists of an LED (5-digit, 8-segment) and five buttons. The keypad is used for value display, parameter setting, user password setting and general function execution.

Keys

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

Table 7–1 Descriptions of keys

Name	Illustration	Description
MODE		Switches among different modes. Returns to the previous menu.
UP		Increases the value of the blinking digit for the LED.
DOWN		Decreases the value of the blinking digit for the LED.
SHIFT		Shifts the blinking digit for the LED. You can view the high digits of the number consisting of more than 5 digits.
SET		Switches to the lower-level menu. Executes commands such as storing parameter setting value.

7.1.2 Panel Display

Table 7–2 Physical numbers of the displayed content

Display	Equivalent	Display	Equivalent	Display	Equivalent	Display	Equivalent
0	0	9	9	h	h	r	r
1	1	A	A	c	c	t	t
2	2	b	B	J	J	U	U
3	3	C	C	L	L	y	y
4	4	d	D	n	n	T	T
5	5	E	E	N	N	u	u
6	6	F	F	o	o	-	-
7	7	H	H	P	P	-	-
8	8	G	G	q	q	-	-

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

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

Display mode switchover

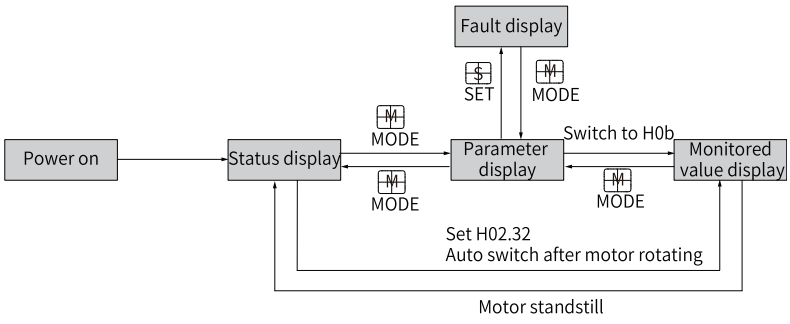


Figure 7-2 Switchover among different display modes

- The keypad enters status display immediately upon power-on.
- Press MODE to switch among different display modes based on the conditions shown in *"Figure 7–2" on page 100* .

- In the status display mode, set H02.32 to select the monitored parameter. When the motor rotates, the operation panel automatically switches to the monitoring display mode. After the motor stops, the panel automatically restores to the status display mode.
- In the parameter display mode, after you select the parameter to be monitored in group H0b, the keypad switches to monitored value display.
- Once a fault occurs, the keypad switches to fault display immediately, with all the five LEDs blinking. Press SET to stop the LEDs from blinking, and then press MODE to switch to parameter display.

Note

STO function display selection:

Switch the status display after the drive integrated STO is triggered by setting bit0 of H0A.21 to 0 or 1: "sto_" or "E150.0" .

bit0 = 0: Displays the STO status. The keypad displays "sto_" after the STO function is triggered. In this case, no fault is reported and no output is generated from the fault DO.

bit0 = 1: Displays the STO fault. The keypad displays "E150.0" after the STO function is triggered. In this case, the servo drive reports E150.0 and the fault DO generates output.

bit1 is disabled.

bit2 = 0: Performs STO noise diagnosis, and displays E150.5.

bit2 = 1: Hides STO noise diagnosis, and does not display E150.5.

SV680F-INT drive status display

The status display of the SV680F-INT series servo drive: xyrn (drive is running), xyry (drive is ready), xynr.z (drive is not ready), and so on, where x represents the communication status, y represents the operating mode, and z indicates the reason why the drive is not ready. For detailed description of x, y, and z, see *"Table 7–3 Meaning of x, y values" on page 101* and *"Table 7–4 Description of z values and troubleshooting" on page 102*.

Table 7–3 Meaning of x, y values

x	1: Communication initialization 2: Communication connecting 4: The communication connected, OP status
y	0: No operation mode 1: AC1 mode 3: AC3 mode 4: AC4 mode

Table 7–4 Description of z values and troubleshooting

nr.z	Cause	Troubleshooting
nr.1	The control voltage H0b.57 is less than the undervoltage threshold H01.78 (the input 220VAC threshold is 190VDC, and the input 400VAC threshold is 380VDC).	1 Measure if the L1C and L2C inputs meet the input specifications. 2 If yes, read H0b.57. If H0b.57 is close to 0, the hardware circuit may be damaged.
nr.2	L1–L3 input is abnormal.	1 Use a multimeter to check whether there is voltage input in L1–L3. 2 Use an oscilloscope to test L1–L3 inputs for phase loss.
nr.3	The bus voltage H0b.26 is less than the undervoltage threshold H01.42 (the input 220VAC threshold is about 200VDC, and the input 400VAC threshold is about 380VDC).	1 Check if inputs L1–L3 meet the input specifications. 2 If yes, and H0b.26 is close to 0, the hardware circuit may be damaged.
nr.4	Servo soft start resistor not bypassed.	Check if bus voltage H0b.26 is in the normal range (input 220VAC: 235VDC–378VDC, input 400VAC: 478VDC–751VDC).
nr.5	Encoder initialization not done.	Contact the manufacturer technical personnel.
nr.6	Short-circuit to ground detection not done.	Check the value of H0b-57.
nr.9	Fully closed-loop encoder initialization not done.	Contact the manufacturer technical personnel.

Display	Name	Applicable Occasion	Meaning
	40nr.z Servo not ready	Initialization done, Single servo drive not ready.	Meaning of z: For specific reasons and troubleshooting methods, see *"Table 7–4 Description of z values and troubleshooting" on page 102*.
	-44rn Servo drive is running	Servo drive is enabled.	The servo drive is running.
	-44ry Servo ready	The servo drive is ready to run.	The servo drive is ready to run and waits for the enabling signal from the host controller.
	- CN3 connection indication	CN3 indicates PROFINET output connection status.	Solid OFF: No communication connection is detected in the physical layer. Solid ON: Communication connection is detected in the physical layer.
	- CN4 connection indication	CN4 indicates successful PROFINET input connection.	

Display	Name	Applicable Occasion	Meaning
	STO STO function display selection	-	Check if the 24V input for the STO terminal is disconnected.
	ACE Blinking state	When the Siemens host controller configuration software finds an SV680F-INT by scanning, and if "Blink LED" is checked in the software, the servo panel will flash "ACE", and the original display will be restored if you unselect this option. If InoDriverShop finds a servo drive by scanning, right-click the device in the Network Configuration interface and select **Blink**, the servo panel will flash "ACE", and right-click the device and select **Stop blinking** to restore the original display.	Detect whether the software successfully finds a servo drive by scanning and locates its position.

Parameter Display

Parameters are divided into groups H00...H3A based on functions. Parameters can be located quickly based on the parameter group they belong to. For details, see "SV680F-INT Series Servo Drive Parameter Guide".

- Display of parameter groups

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

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

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

- Display of negative numbers and numbers with different lengths

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

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

  For example, "65535" is displayed as follows:

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

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

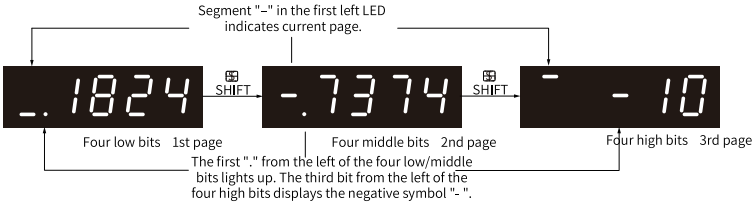
  

  Figure 7-3 Display of "-1073741824"

  Example: "1073741824" is displayed as follows:

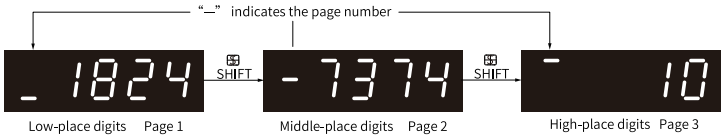
  

  Figure 7-4 Display of "1073741824"

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

Display	Name	Description
	Decimal point	100.0

- Display of parameter setting status

Display	Name	Applicable Occasion	Meaning
	Done Parameter setting completed	The parameter is set successfully.	The parameter is set and saved to the servo drive (Done). The servo drive can execute other operations.
	F.InIt (Restored to default settings)	Parameter initialization is in progress (H02.31 = 1).	The servo drive is in the process of parameter initialization. After parameter initialization is done, switch on the control power supply again.

Display	Name	Applicable Occasion	Meaning
	Error (wrong password)	The user password (H02.30) is activated and the password entered is wrong.	A wrong password is entered. You need to enter the password again.
	TunE	Auto-tuning with one-key enabled	The function of auto-tuning with one-key is in progress.
	FAIL	Auto-tuning with one-key enabled	The function of auto-tuning with one-key fails.
	AdJ_	Enable tuning: phase sequence tuning and resistance and inductance tunning.	The drive is being tuned.

Fault and alarm display

- The panel displays the active or history faults and warning codes. For troubleshooting, see section "Troubleshooting" in *SV680F-INT Series Servo Drive Function Guide*.
- When a fault or alarm occurs, the operating panel displays the corresponding fault or alarm code immediately. When multiple faults or errors occur, the keypad displays the fault or error code of the highest fault level.
- You can select the previous fault/alarm to be viewed through H0b.33 and view the code of the selected fault/alarm in H0b.34.
- You can clear the latest 10 faults or alarms saved in the servo drive by setting H02.31 to 2.
- The fault code is displayed as Exxx.y. The alarm code is displayed as Axxx.y.

For example, "A941.0" is displayed as following:

Display	Name	Description
	A941.0 Alarm code	E/A: A fault or alarm occurs on the servo drive. 941.0: Alarm code

Monitored value display

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

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

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

Note

For details of parameter group H0b, see *"22.2 Display of Monitoring Parameters" on page 932*.

7.1.3 Parameter Settings

Example of parameter settings

You can set parameters through the keypad. For details, see "SV680F-INT Series Servo Drive Parameter Guide". The following figure shows how to switch from position control mode to speed control mode using the keypad after power-on.

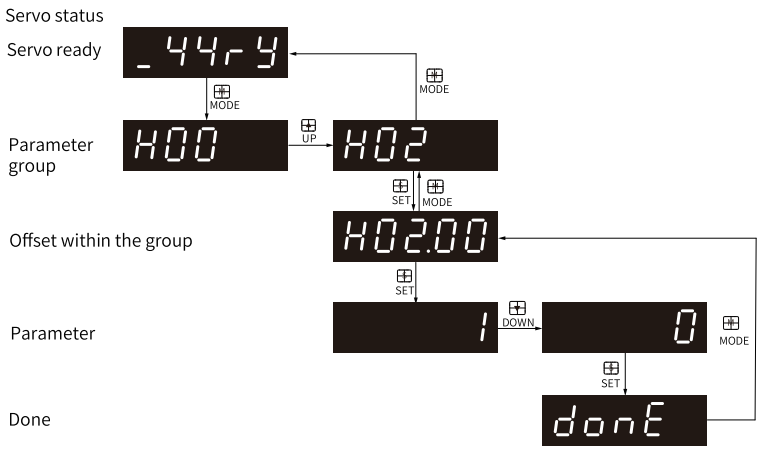


Figure 7-5 Example of parameter setting

For description of keys, see *"Table 7–1 Descriptions of keys" on page 99*.

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

Forced DI/DO signals

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

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

Forced DI signal input

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

- Steps:

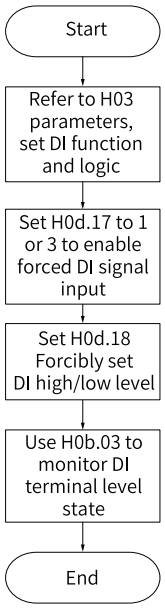


Figure 7-6 Procedure for setting forced DI function

Set the DI logic through parameters in group H03. H0d.18 is used to set the DI forced input, which is displayed in hexadecimal on the keypad. H0b.03 is used to monitor the DI terminal level state.

Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H0d.17	0x0D11	Forced DI/DO enable switch	bit0: Forced DI enable switch 0: Disabled 1: Enabled bit1: Forced DO enable switch 0: Disabled 1: Enabled	0	-	Real-time	" H0d_en.17" on page 597

- Example:
  As shown in the figure below, when the terminal logic is set to active low by H03, assume that the function of terminal DI1 is effective, while the functions of terminals DI2 to DI5 are ineffective. Since the binary number "11110" is "1E" in hexadecimal, the value of H0d.18 can be set to "1E". At this point, the keypad displays that the DI1 terminal is in low level, while terminals DI2 to DI5 are in high level. If the DI function is normal, and the display value of H0b.03 is the same as the value of H0d.18, the value of H0b.03 read by the software is 30 in decimal.

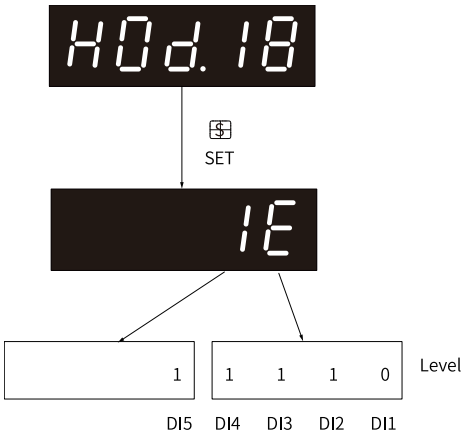


Figure 7-7 Meaning of the H0d.18 setpoint

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

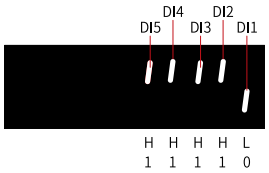


Figure 7-8 DI level status corresponding to H0b.03

Note

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

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

Forced DO function

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

- Operating process

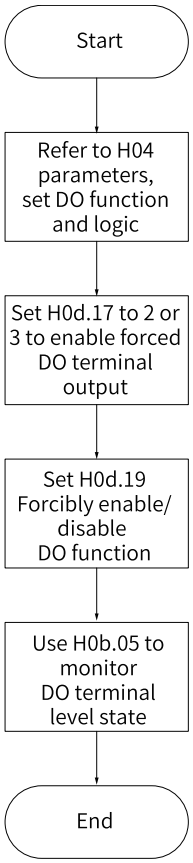


Figure 7-9 Procedure for setting forced DO function

Set the DO logic through parameters in group H04. H0d.19 is used to set the DO forced output, which is displayed in hexadecimal on the keypad. H0b.05 is used to monitor the DO terminal level state.

- Example:
  As shown in the figure below, when the DO function level logic is set to active high by H04, the functions of terminal DO2 are effective, while the functions of terminal DO1 are ineffective. Since the binary number "10" is "2" in hexadecimal, the value of H0d.19 can be set to "2". At this point, the keypad displays terminal DO2 as high level, while terminal DO1 as low level. If the DO function is normal, the read value of H0b.05 is the same as the setpoint of H0d.19. The Inovance drive commissioning software can read the current decimal value as "2".

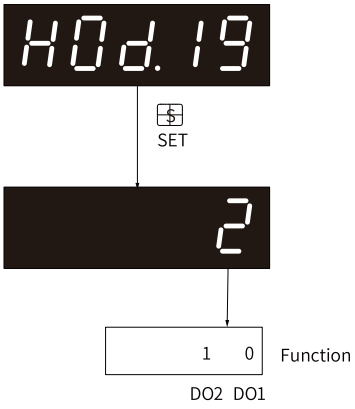


Figure 7-10 Meaning of the H0d.19 setpoint

Monitoring the DO level status through H0b.05. Display on the operating panel:

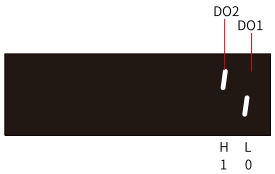


Figure 7-11 DO level status corresponding to H0b.05

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

User password

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

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

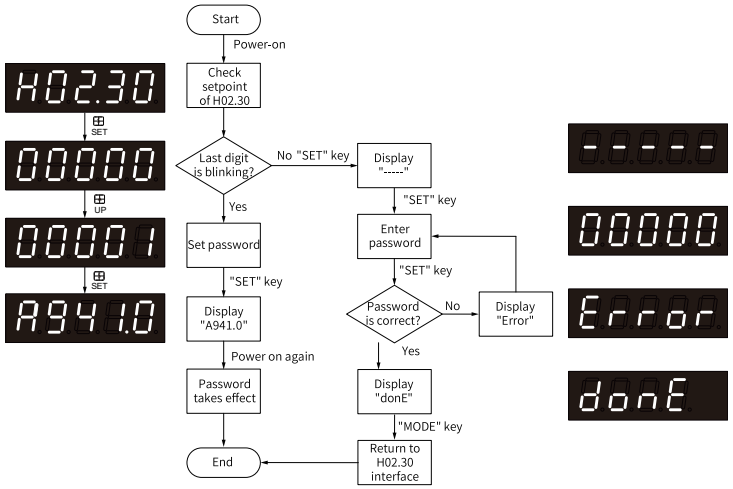


Figure 7-12 Procedure for setting the user password

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

Note

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

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

7.2 Commissioning Software

7.2.1 Overview

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

7.2.2 Installation

1. Software

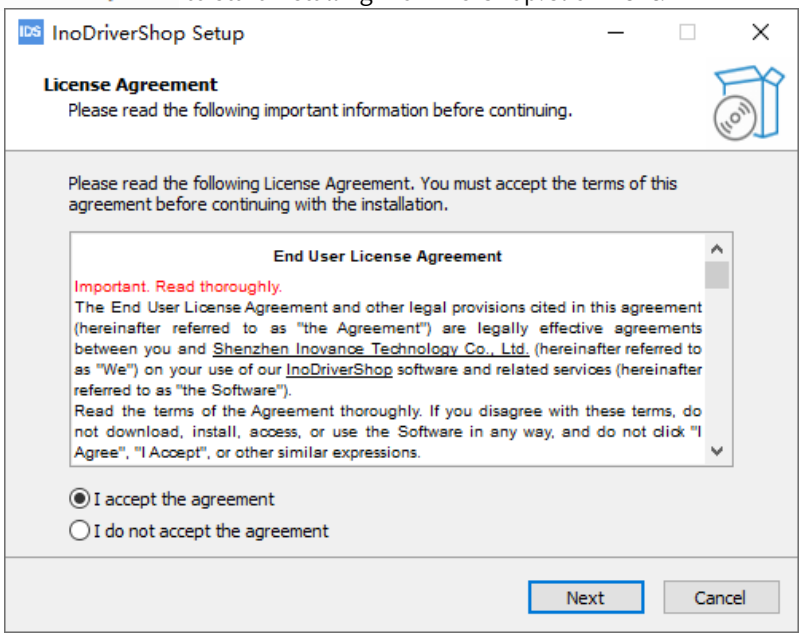
   a. Visit the official website of Inovance as shown below.
   http://www.inovance.com

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

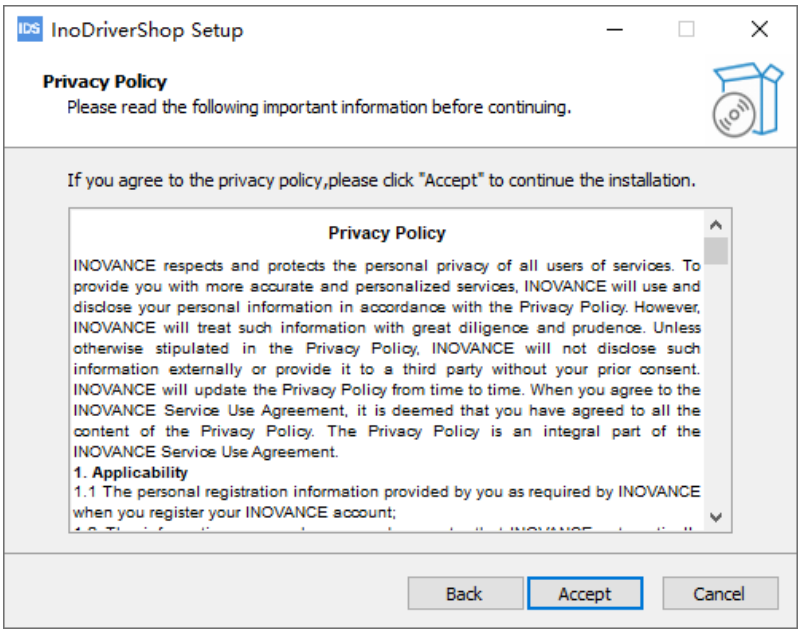
   c. Click Download.

2. Unzip the package downloaded.

3. Click IDS InoDriverShop.exe to start installing InoDriverShop.Click **Next**.

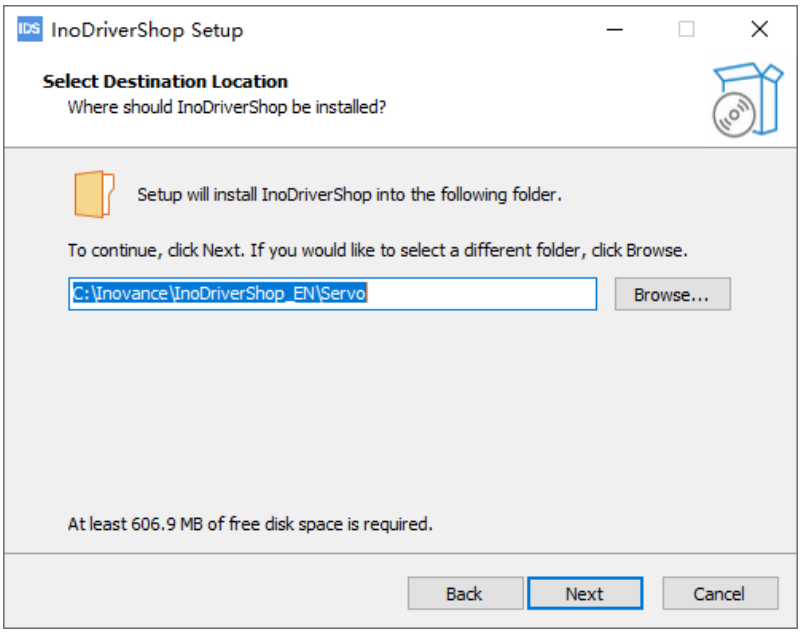


4. Click **Accept**.

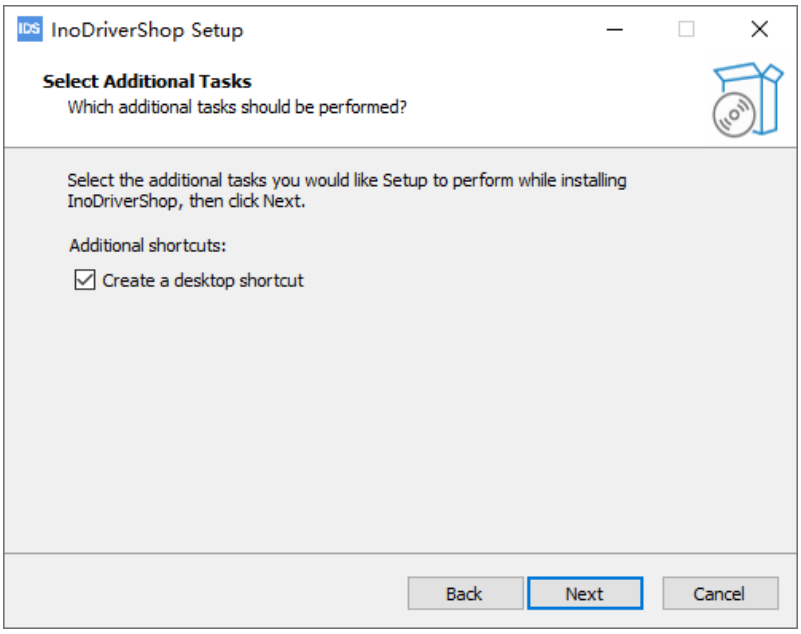


5. You can select the directory for installation as needed through the Browse button. The default directory for installation is "C:\Inovance\InoDriverShop\Servo".
   In online upgrade, InoDriverShop will be upgraded directly in the original directory.

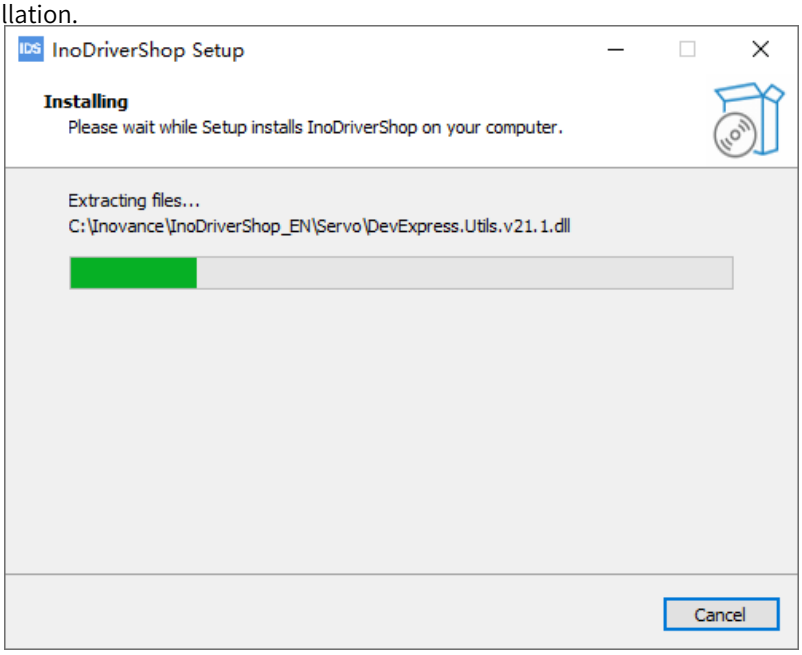
   After selecting the directory for installation, click Next.



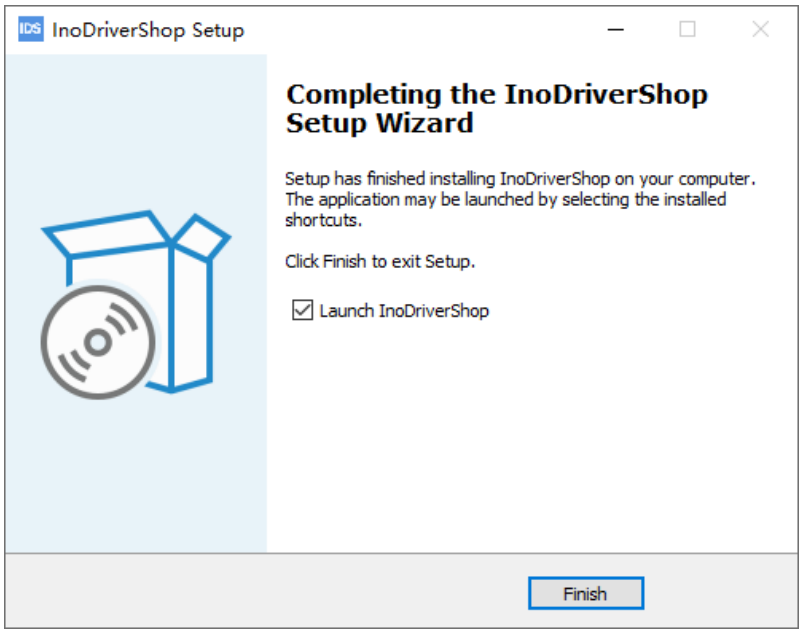
6. Create a desktop shortcut.



7. Start the installation.



8. Installation is completed.



7.2.3 Connection

Connecting the SV680F-INT drive.

1. Start InoDriverShop.

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

2. Create a project.

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

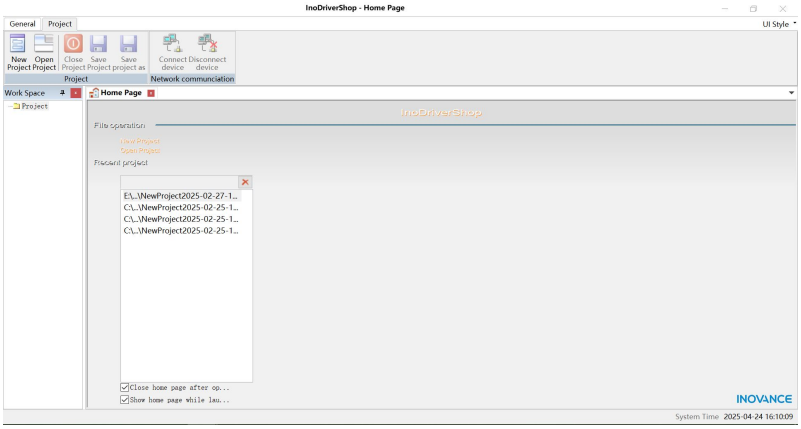


Figure 7-13 Software startup interface

Note

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

b. Open the Project Guide interface.

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



Figure 7-14 Project Guide interface

c. Click Next page to create a project.

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

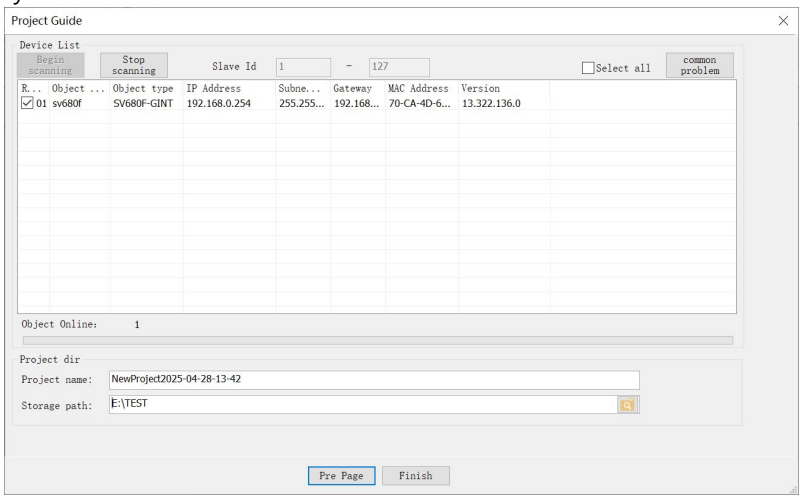


Figure 7-15 Scan interface

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

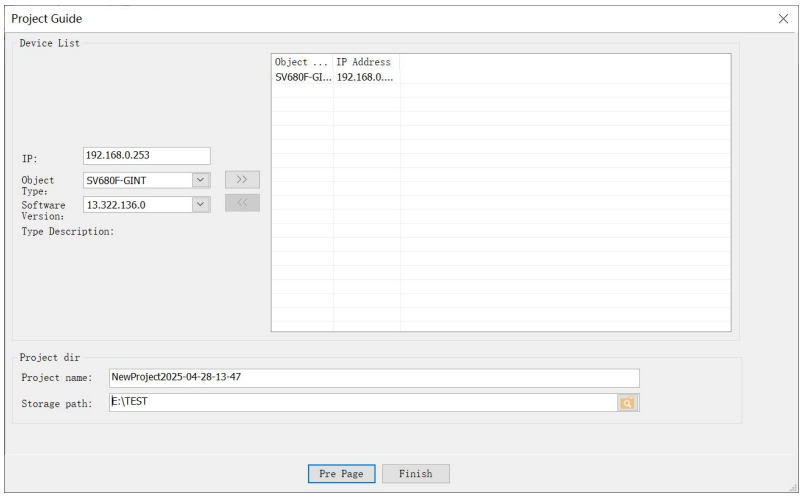


Figure 7-16 Project Guide interface for offline device

Note

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

d. The project has been created.

3. The main interface is shown as follows.

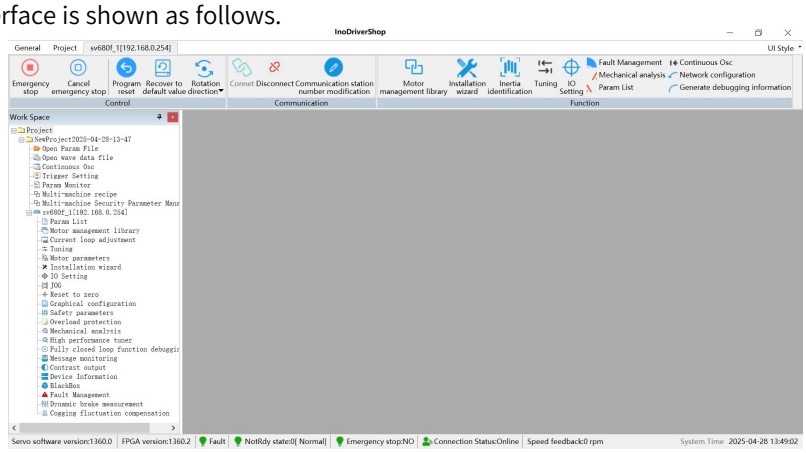


Figure 7-17 Main interface

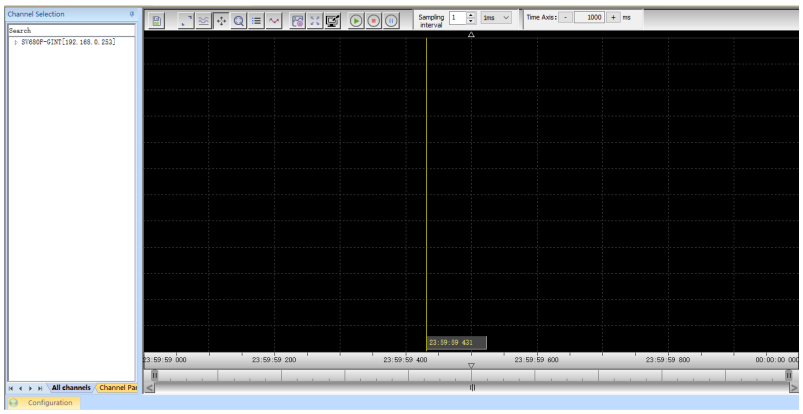
Note

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

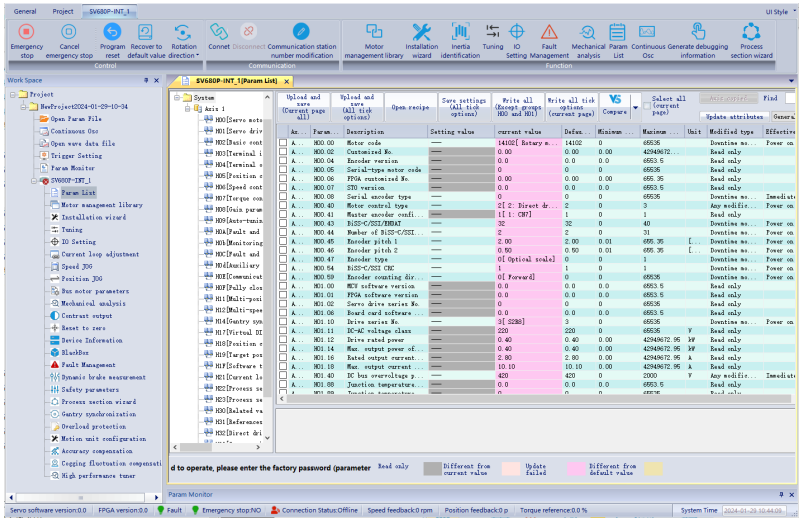
7.2.4 Common Functions

InoDriverShop features the following functions:

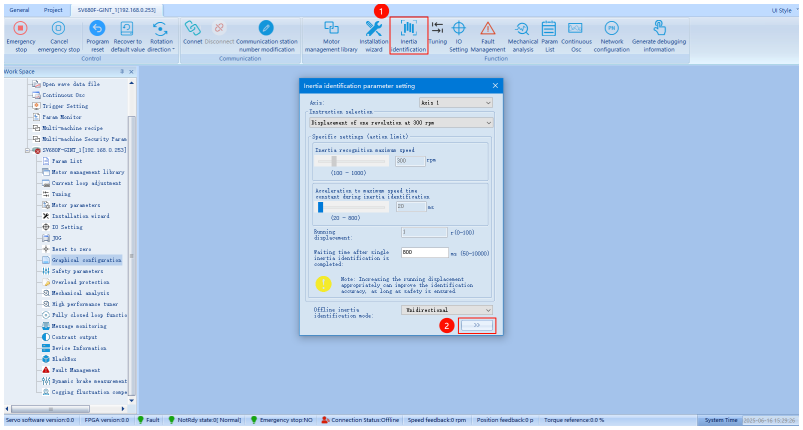
- Oscilloscope: Detects and saves the instantaneous data during operation. Double-click **Continuous Osc** in the workspace to open the continuous oscillator view.



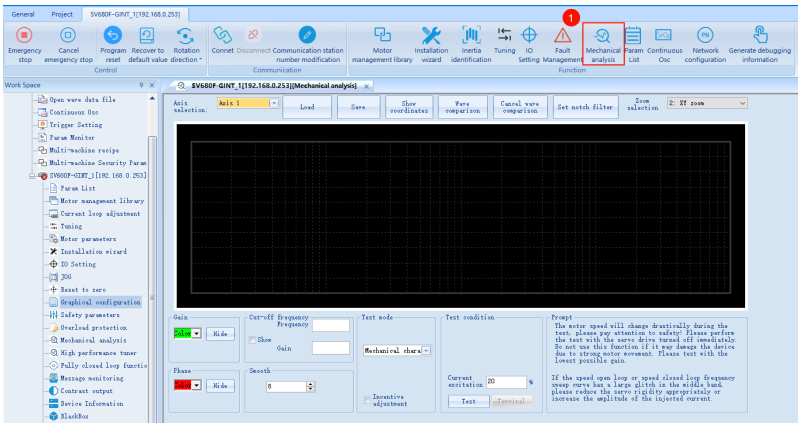
- Parameter management: Reads and downloads parameters in batches. Double-click **Parameter List** in the workspace to open the parameter list view. The current values of drive parameters are displayed in the parameter list. You can edit the parameter values and write them to the drive as needed.



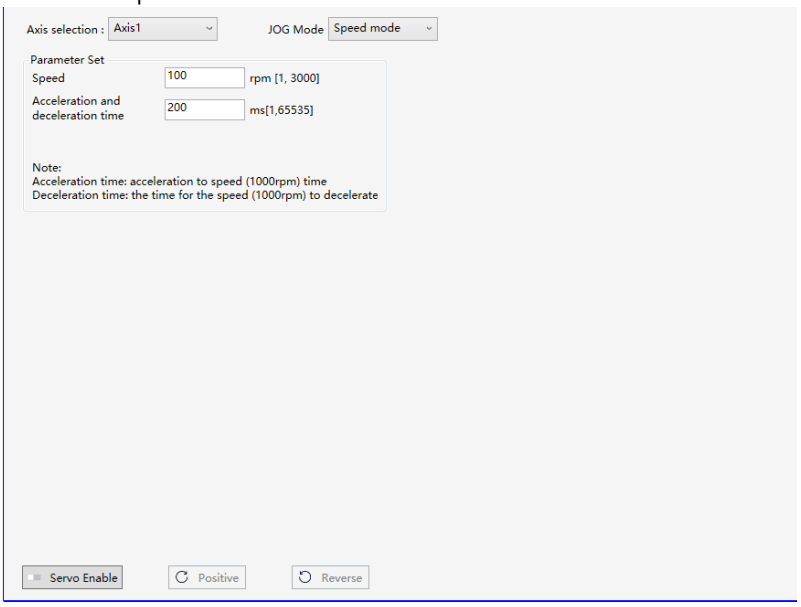
- Inertia auto-tuning: Generates the load inertia ratio automatically. Select the target axis to be operated through the drop-down list and configure the inertia auto-tuning parameters. After setting the inertia auto-tuning parameters, click the bottom button to enter the inertia auto-tuning interface.



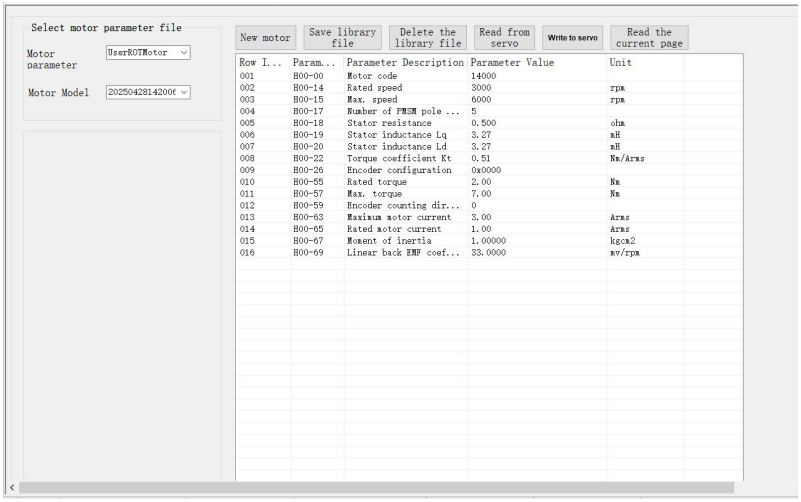
- Mechanical characteristic analysis: Analyzes the resonance frequency of the mechanical system.



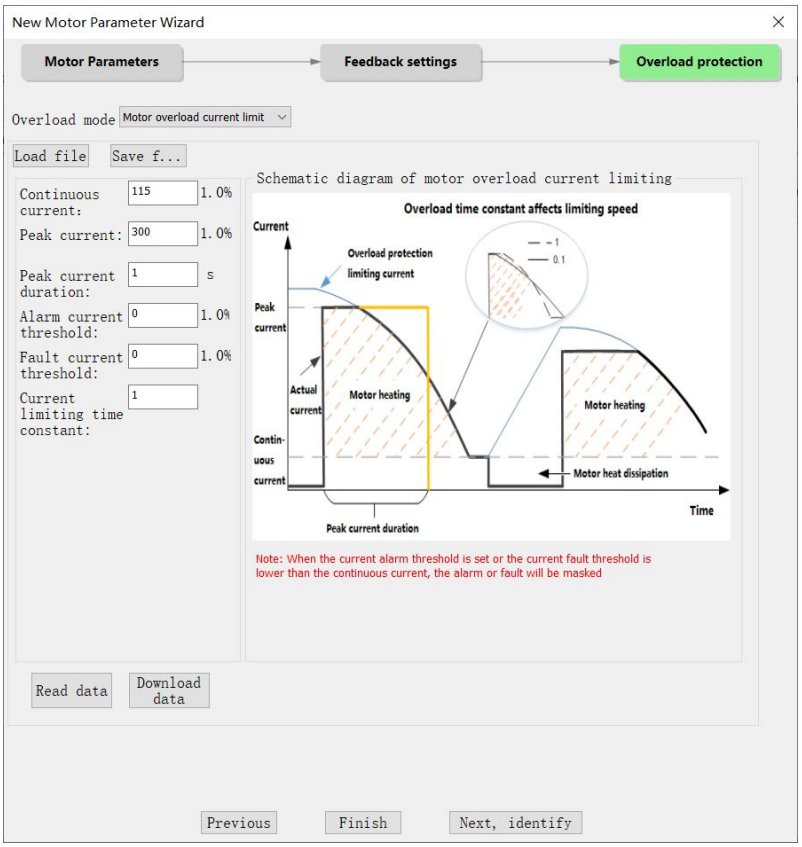
- JOG: Defines the position reference to run the motor. Select the target axis in the drop-down list, and configure and enable parameters.



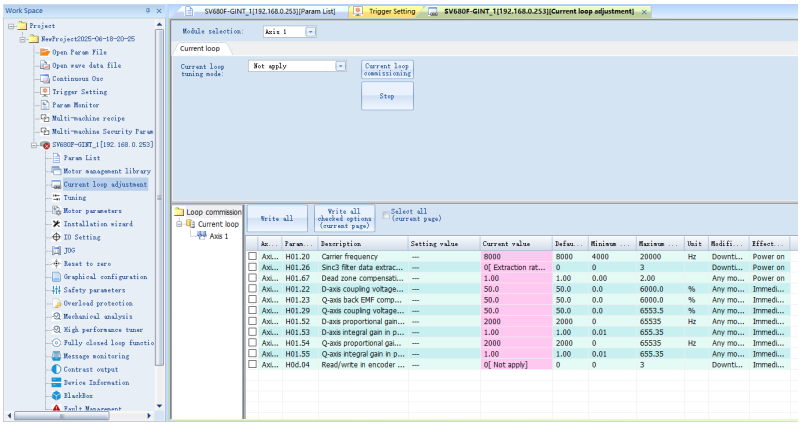
- Gain tuning: Adjusts the stiffness level and monitors the motion data.
- Motor Management Library: Save and manage users' motor parameters.



- Overload curve: Select the motor overload protection method.



- Current loop adjustment: Commission the current loop.



8 Commissioning and Operation

8.1 Commissioning Objects

The types of motors supported by the SV680F-INT drive include the following:

Motor type	Component type	Compatibility	Remarks
ROT motor	Motor temperature detection	Switching PTC	-
	Position feedback	Inovance communication encoder	20-bit, 23-bit, 26-bit
		ABZ incremental encoder (TTL signal)	The maximum supported frequency before AB orthogonalization is 4MHz
		BiSS-C encoder	Max. data length 32 bits
		EnDat 2.2 encoder	H0A.35 must be set to 1, otherwise an error will be reported.
		SSI encoder	Max. data length 32 bits

8.2 Commissioning Flowchart

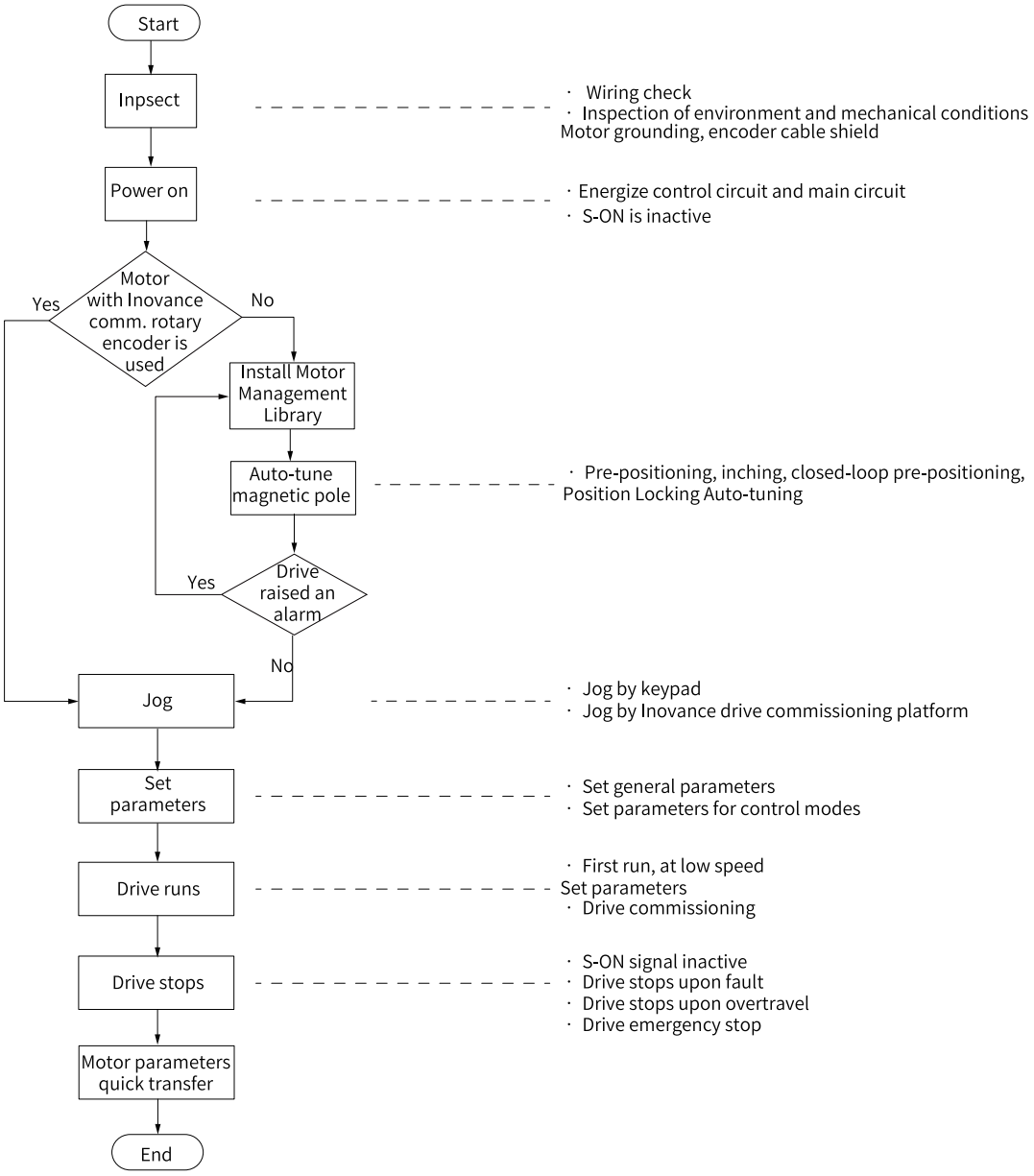


Figure 8-1 Commissioning flowchart of the drive

8.3 Pre-operation Inspection

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

Table 8–1 Checklist before operation

No.	Item	Yes
	Wiring	
1	The power input terminals (L1C, L2C, L1, L2, L3, R, S, T) of the servo drive are connected properly.	□
2	The main circuit cables (U, V, W) of the motor are connected to the U/V/W terminals of the drive correctly.	□

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

8.4 Power-on

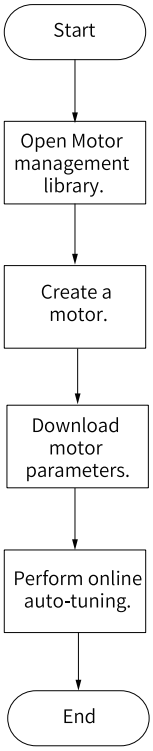
Switching on the input power supply

The control circuit power input terminals are L1C and L2C, and the main circuit power input terminals are L1, L2 and L3/R, S and T. When the main circuit power supply is single-phase 200 VAC to 240 VAC, use any two terminals of L1, L2 and L3.

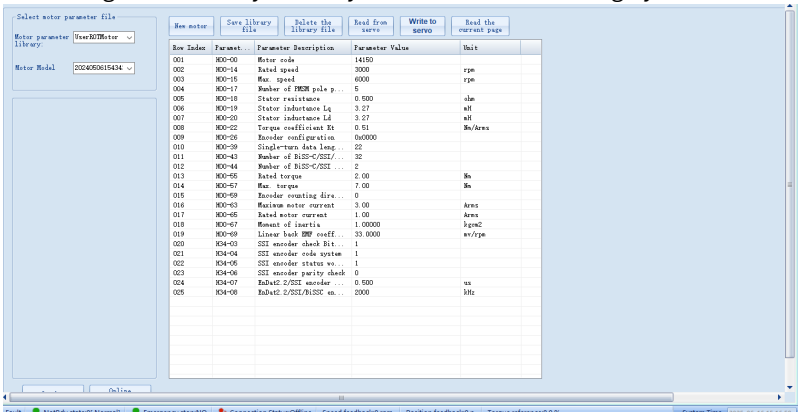
After the power supply is switched on, if the bus voltage indicator is in the normal state and the keypad displays "reset" → “nr.z” → "ry" in sequence, the servo drive is ready to run and waits for the S-ON signal. If the keypad keeps displaying "nr.z" or a fault code, eliminate the fault according to *“7.1.2 Panel Display” on page 100*.

8.5 Installation of Motor management library

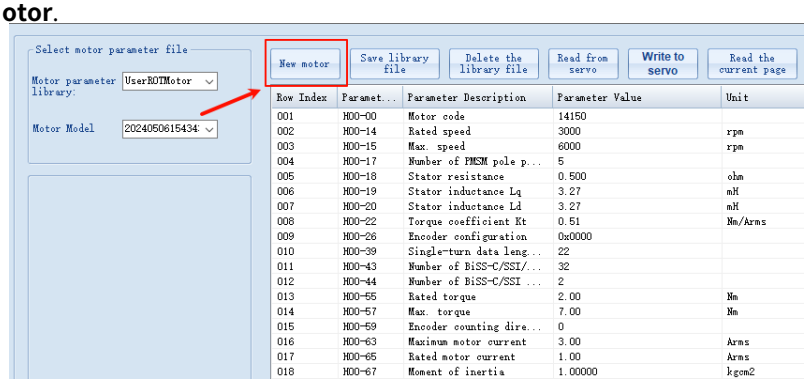
New motor matching



1. Open InoDriverShop, create an SV680F-INT project, and click Motor Management Library in the left panel. The motor management library allows you to create and manage your own motor library.



2. Select **New Motor**.



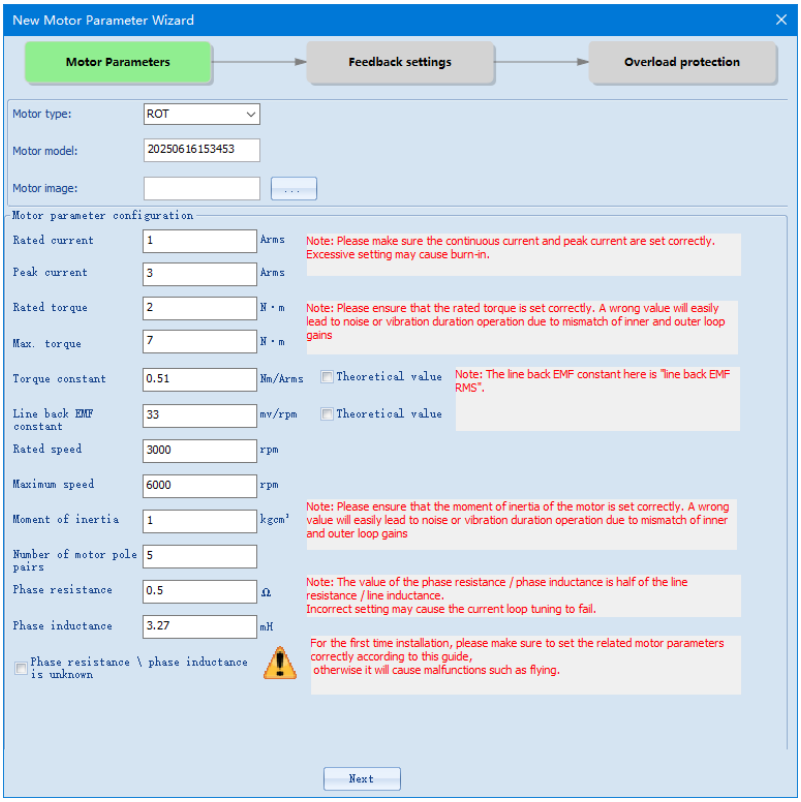
3. Create motor parameters.

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

Note

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

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

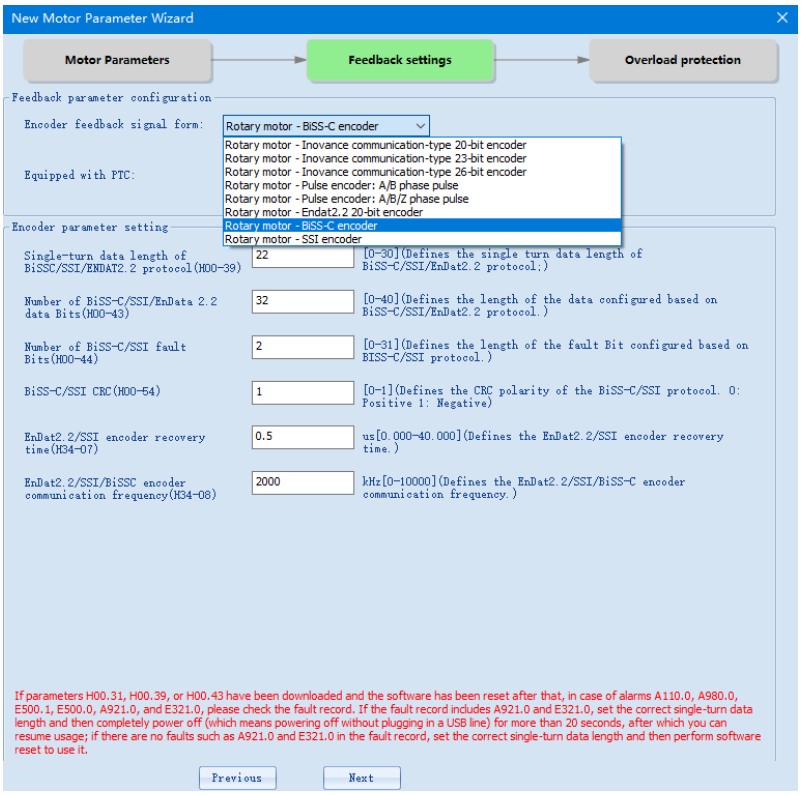


b. Select the correct encoder and configure the correct parameters according to the corresponding encoder manual.

Note

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

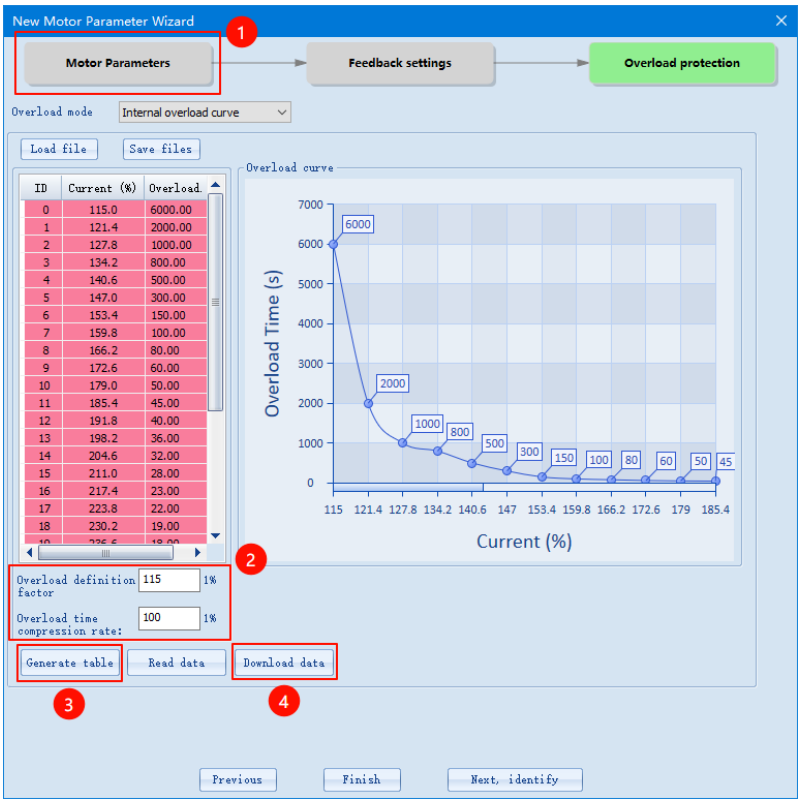
- The servo position information is incorrect, resulting in mal-function of the motor.
- Motor runaway: Such as motor runaway, stall, and overspeed
- The motor does not show the above symptoms, but the servo reports motor overtemperature protection (E630.0), motor runaway (E234.0), and motor overspeed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



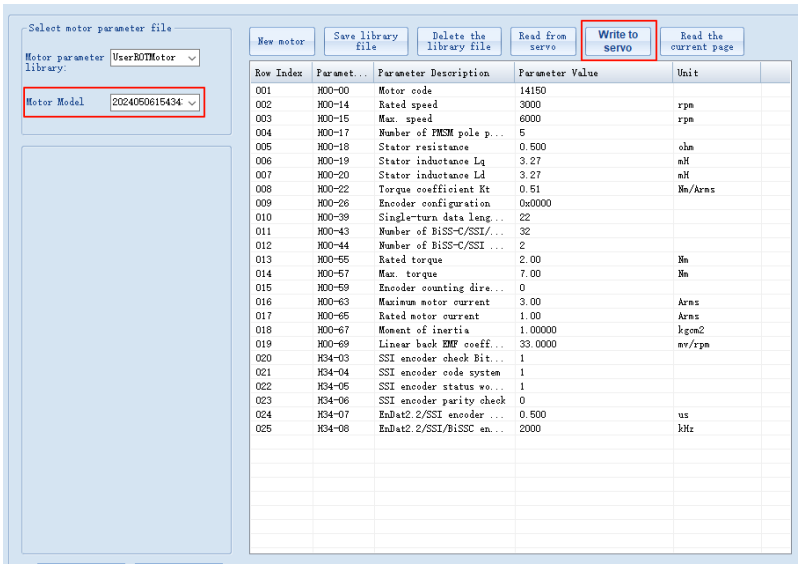
Note

- ABZ incremental encoder (TTL signal): Note that it may have a Z signal.
- BiSS-C encoder:
  - The BiSS-C encoder generally has a data bit and an error bit. You can obtain their data lengths in the corresponding encoder user guide. For the linear motor, you only need to set the total length. For the rotary motor, you need to set the total length and single-turn data length. The data length of the error bit is usually 2 bits.
  - You can obtain the communication frequency and recovery time from the encoder user guide.
  - CRC is used.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).
- SSI encoder:
  - The SSI encoder generally has a data bit and an error bit. You can obtain their data lengths in the corresponding encoder user guide. For the linear motor, you only need to set the total length. For the rotary motor, you need to set the total length and single-turn data length.
  - Parity check is used.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).
- EnDat2.2 encoder:
  - You need to set the data length for the EnDat2.2 encoder. For the linear motor, you only need to set the total length. For the rotary motor, you need to set the total length and single-turn data length.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).

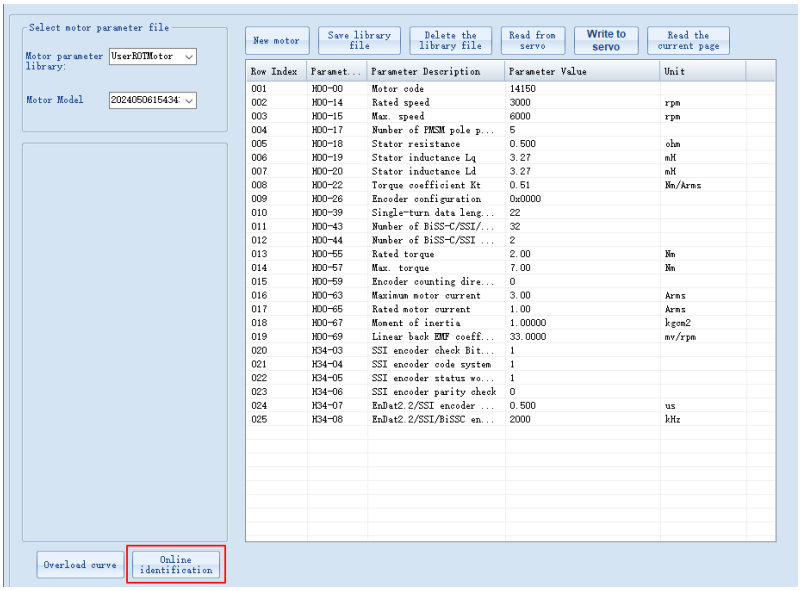
c. Select the overload protection mode and click **Done**. For details of overload protection settings, see *" Motor overload protection" on page 127*.



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



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



Motor overload protection

The SV680F-INT provides three kinds of motor overload protection methods: internal overload curve download, overload curve download and motor overload current limit.

Method 1: Internal overload curve

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

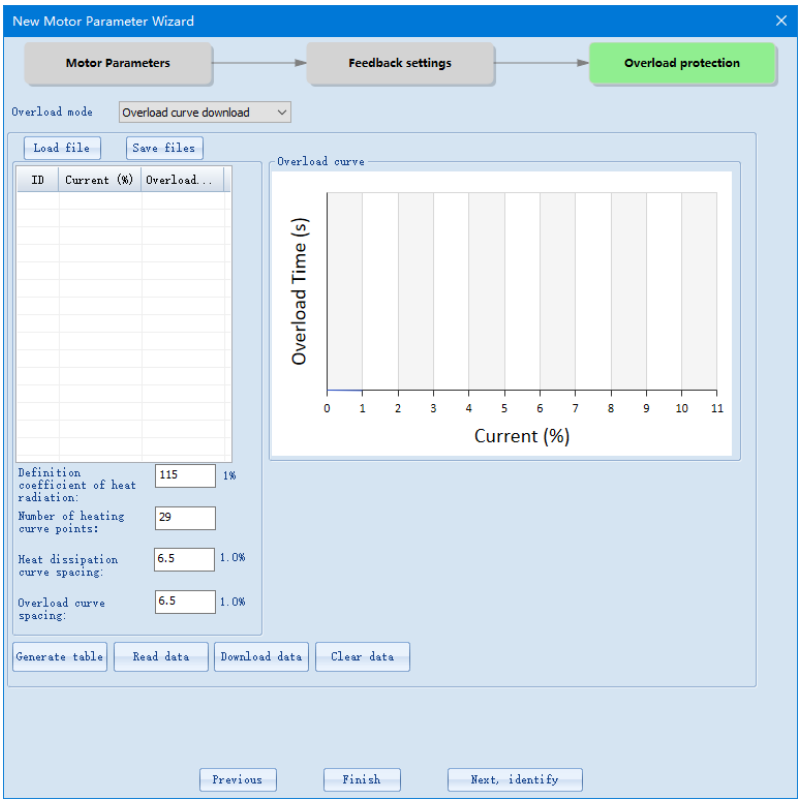
The overload thermal limit coefficient is a current value (the empirical value is about 115%) around which the motor keeps running continuously. The motor can finally stay at a constant temperature due to balance between heating and heat dissipation , that is, if the motor current is higher than this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

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



Method 2

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



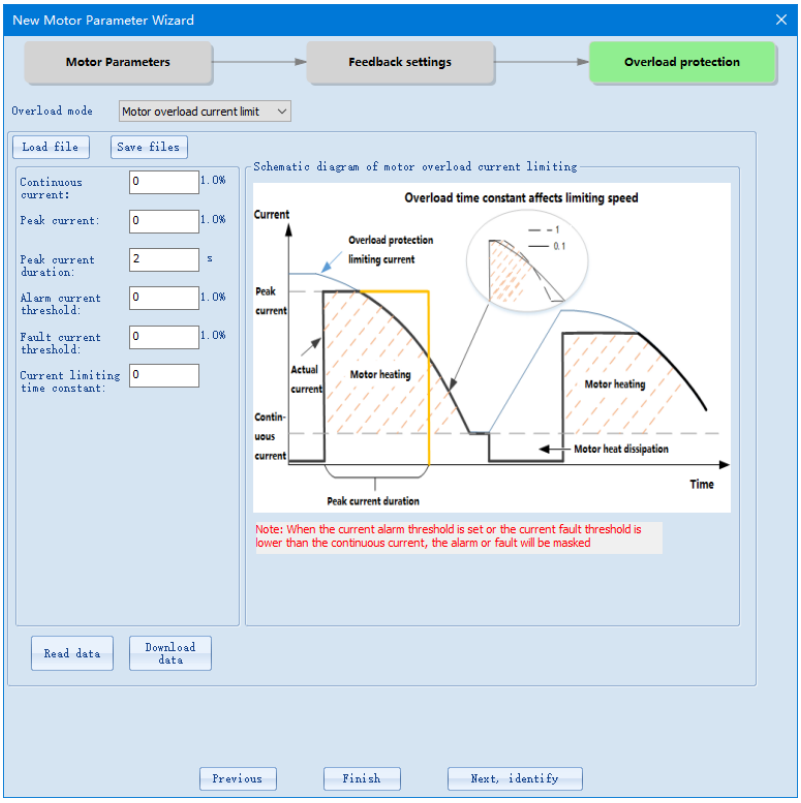
Method 3

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

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

Note

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



8.6 Auto-tuning of Magnetic Pole

Overview

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

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

Method	Operation range	Applicable motor	Applicable encoder	Load capacity
Pre-positioning	Large	All	All	Weak
Inching	Small	All	All	Medium
Position locking	Tiny	All	All	Strong
Closed-loop pre-positioning	Large	All	All	Strong
Voltage injection	Tiny	Iron core motor	All	Weak

Installation Method	Characteristics	Applicable Occasion	Advantages and disadvantages
Pre-positioning	Dynamic auto-tuning	An occasion where the motor is allowed to move over a range of two electrical cycles.	Advantages: Extensive applications.
			Disadvantages: • The motor may move violently (overshoot may occur within the travel range). • Disturbance is not allowed.
Closed-loop pre-positioning		An occasion where the motor is allowed to move within two electrical cycles. Auto-tuning can be performed at the hard limit.	Advantages: Extensive applications.
			Disadvantages: Long operation distance.
Inching		Applications with light load (within half rated load) or no load.	Advantages: The moving range of the motor cannot be observed by naked eyes (within hundreds of pulses, which is related to the setpoint).
			Disadvantages: Disturbance is not allowed.
Position locking	Quasi-static auto-tuning	With load, Z axis, external disturbance. During auto-tuning, 100P movement (encoder unit) is allowed.	Advantages: Barely observable movement and strong disturbance resistance. An alarm can be triggered in case of mechanical interference.
			Disadvantages: For specific motors or applications, you may need to fine tune the default auto-tuning parameters.
Voltage injection	Static auto-tuning	Suitable for motors with brake or locked shaft.	Advantages: It allows auto-tuning in braking or locked shaft state, and there is no operation in the auto-tuning process. Disadvantages: The auto-tuning process is noisy, and the motor will operate if the shaft is not locked.

Note

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

Auto-tuning state

The states are different when you match different encoders.

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

The auto-tuning state is as follows:

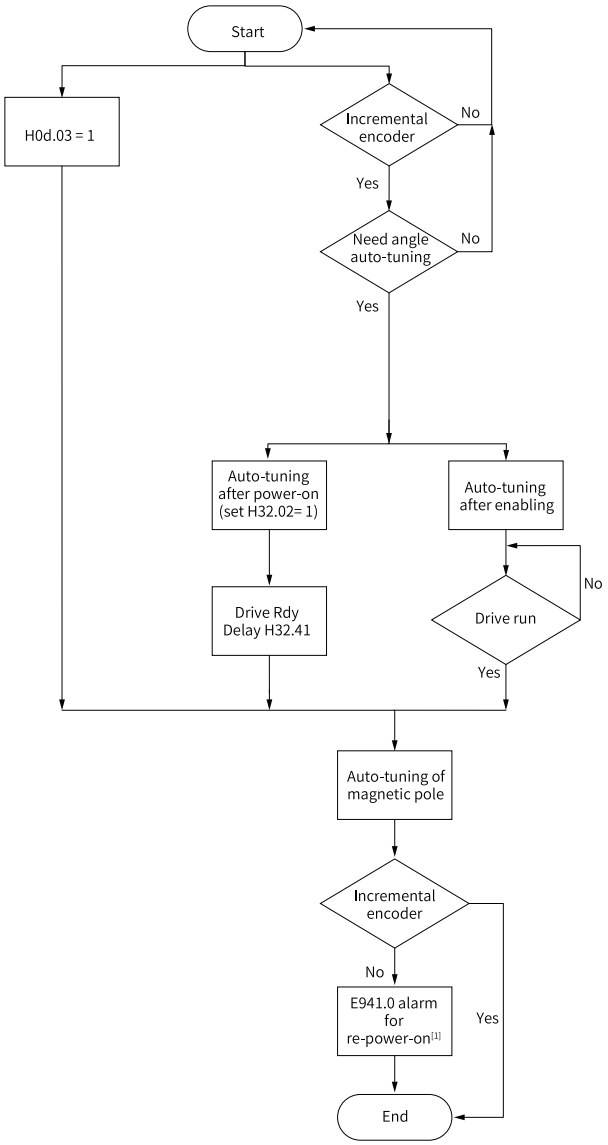


Figure 8-2 Flow chart of magnetic pole auto-tuning state

Note

- [1]: Motors with an Inovance absolute encoder must be completely powered off and then on. Complete power-off: The USB cable and control power are disconnected.After the angle auto-tuning of the Inovance encoder is done, wait for the parameter to be written, and then perform power-off (H0d.04 restored to 0 or 3).
- You are not notified by default if the incremental encoder is powered on without angle auto-tuning. You can change that through parameter H32.04. Bit0: none, bit1: A602.9 alarm Set bit1, then bit1 takes effect. Only bit0 takes effect when both are set. After angle auto-tuning, the alarm bit or alarm is automatically reset.

8.6.1 Auto-tuning Steps

Steps without a Hall sensor

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

The flow chart is as follows:

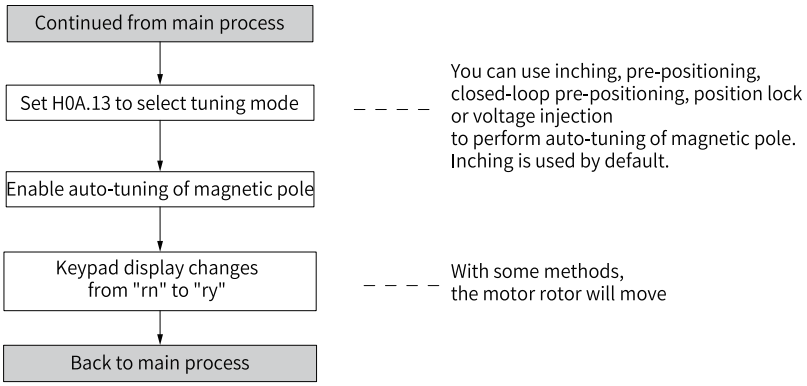


Figure 8-3 Magnetic pole auto-tuning without a Hall sensor

8.6.2 Pre-positioning Auto-tuning

For the use of pre-positioning auto-tuning, see *" Steps without a Hall sensor" on page 132*.

During pre-positioning auto-tuning, the drive controls the motor to reciprocate several times, and the motor is finally positioned near the electrical angle.

Table 8–2 Pre-positioning Auto-tuning

Motor action	Max. movement range	Completion
Move quickly from the power-on position to the pre-positioning 0° electrical angle, and then try to move in a smaller range. (Avoid mechanical interference)	The motor may move violently in a large range, up to the distance between N and S.	If the status displayed on the drive screen changes from "rn" to "ry", it means that the auto-tuning is successful. The auto-tuning takes about 10s.

Related Parameters:

Parameter	Communication Address	Name	Option Description	Default	Unit	Change Mode	Page
H0A.13	0x0A0D	Angle auto-tuning mode	0: pre-positioning 1: Inching 2: Voltage injection 8: Closed-loop pre-positioning 9: Position locking	0	-	At stop	" H0A_en.13" on page 563
H0d.03	0x0D03	Encoder initial angle auto-tuning	0: No operation 1: Angle auto-tuning enabled 2: Phase sequence auto-tuning enabled	0	-	At stop	-

8.6.3 Inching Auto-tuning

For the use of inching auto-tuning, see " Steps without a Hall sensor" on page 132.

During inching auto-tuning, the motor mover move left and right in a small range, and you will hear the sound of current. If the state display on the the drive changes from "rn" to "ry", it means that the auto-tuning is successful and you can perform further commissioning. If E602 is displayed in the auto-tuning process, it indicates that the auto-tuning failed.

Related Parameters:

Parameter	Communication Address	Name	Description	Default	Unit	Change Mode	Page
H0A.13	0x0A0D	Angle auto-tuning mode	0: pre-positioning 1: Inching 2: Voltage injection 8: Closed-loop pre-positioning 9: Position locking	0	-	At stop	" H0A_en.13" on page 563
H0d.03	0x0D03	Encoder initial angle auto-tuning	0: No operation 1: Angle auto-tuning enabled 2: Phase sequence auto-tuning enabled	0	-	At stop	-
H32.10	0x320A	Max. reference current in angle auto-tuning through inching	10.0% to 300.0%	100.0	%	At stop	" H32_en.10" on page 761

Parameter	Communication Address	Name	Description	Default	Unit	Change Mode	Page
H32.13	0x320D	Motor operation threshold (ROT/DDR) in angle auto-tuning through inching	0.001deg to 20.000deg	0.200	deg	At stop	" H32_en.13" on page 761
H32.14	0x320E	Motor standstill threshold (ROT/DDR) in angle auto-tuning through inching	0.1[mm/s]/[rpm] to 100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	" H32_en.14" on page 761

- When angle auto-tuning is performed through inching, ensure that the phase sequence of the motor is correct.
- If the auto-tuning fails, see the specific fault subcode "Table 8–3" on page 134 to troubleshoot.

Table 8–3 Related fault codes:

Fault Code	Name	Description
E602.0	Locked-rotor	• Check for locked-rotor. • Check the connection of the power cable. • If locked rotor is reported when the motor operates, check the motor operation evaluation threshold and reduce it if necessary.
E602.3	Large encoder jitter during angle auto-tuning	When the encoder resolution is low and there is ripple, the motor standstill conditions are not met. Check the static speed feedback ripple of the encoder, and increase the standstill evaluation threshold appropriately.
E602.6	Angle auto-tuning does not converge	• Check if the bench is affected by other vibrating components. Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. • Check whether the angle gain is set too large.

8.6.4 Closed-loop Pre-positioning Auto-tuning

For the use of closed loop pre-positioning auto-tuning, see " Steps without a Hall sensor" on page 132.

Closed-loop pre-positioning is similar to pre-positioning. The drive controls the motor to move left and right in a range to determine the initial electrical angle of the motor, and closed-loop control is introduced to ensure smooth operation. This auto-tuning method features high load capacity. It is immune to the characteristics of the motor and encoder, and can provide accurate results.

If the mechanical limit is encountered during auto-tuning, the motor will automatically return and complete the auto-tuning.

Related parameters:

Parameter	Communication Address	Name	Description	Default	Unit	Change Mode	Page
H0A.13	0x0A0D	Angle auto-tuning mode	0: pre-positioning 1: Inching 2: Voltage injection 8: Closed-loop pre-positioning 9: Position locking	0	-	At stop	"H0A_en.13" on page 563
H0d.03	0x0D03	Encoder initial angle auto-tuning	0: No operation 1: Angle auto-tuning enabled 2: Phase sequence auto-tuning enabled	0	-	At stop	-
H32.20	0x3214	Max. reference current in angle auto-tuning through pre-positioning (closed-loop)	10.0% to 300.0%	100.0	%	At stop	"H32_en.20" on page 761
H32.22	0x3216	Electrical angle reference in angle auto-tuning through pre-positioning (closed-loop)	0.0deg to 360.0deg	0.0	deg	At stop	"H32_en.22" on page 761
H32.23	0x3217	Electrical angle reference change range in angle auto-tuning through pre-positioning (closed-loop)	10.0deg to 170.0deg	90.0	deg	At stop	"H32_en.23" on page 762
H32.24	0x3218	Motor stop threshold (ROT/DDR) in angle auto-tuning through pre-positioning (closed-loop)	0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	"H32_en.24" on page 762
H32.26	0x321A	Damping in angle auto-tuning through pre-positioning (closed-loop)	0.00[N/(m/s)]/[N·m/rpm]–655.35[N/(m/s)]/[N·m/rpm]	0.00	[N/(m/s)]/[N·m/rpm]	At stop	"H32_en.26" on page 762

Note

If the auto-tuning fails, see the specific fault subcode "Table 8–4" on page 136 to troubleshoot.

Table 8–4 Related fault codes:

Fault Code	Name	Description
E602.0	Locked-rotor	• Check for locked-rotor. • Check the connection of the power cable.
E602.1	Angle auto-tuning overtravel	The movement exceeds 1 polar distance during auto-tuning. • Check for external disturbance. • If the auto-tuning current is too large or the rising slope is too large or the damping of the auto-tuning speed loop is too small, the overshoot of the motor will lead to overtravel.
E602.2	Wrong U/V/W phase sequence detected in angle auto-tuning	• First adjust phase sequence through phase sequence auto-tuning, and then carry out closed-loop pre-positioning auto-tuning again. • Adjust the phase sequence manually.
E602.3	Large encoder jitter during angle auto-tuning	When the encoder resolution is low and there is ripple, the motor stop evaluation conditions cannot not be met. Check the static speed feedback ripple of the encoder, and increase the motor stop evaluation threshold appropriately.
E602.4	Auto-tuning failed. Auto-tuning timeout.	The single-step overtravel of left and right movement exceeds 30s. • Check for locked-rotor. • Check the connection of the power cable. • If the motor moves slowly and gives an alarm, increase the auto-tuning current or reduce the damping of the auto-tuning speed loop. • If the motor stops after moving for a certain distance and then a timeout alarm is raised, increase the motor stop evaluation threshold appropriately.

8.6.5 Position Locking Auto-tuning

For the use of position locking auto-tuning, see *" Steps without a Hall sensor" on page 132*.

This auto-tuning feature barely observable movement and strong disturbance resistance. Moreover, the magnetic pole position can be correctly identified regardless of any mechanical interference and no alarm is raised.

Related parameters:

Parameter	Communication Address	Name	Description	Default	Unit	Change Mode	Page
H0A.13	0x0A0D	Angle auto-tuning mode	0: pre-positioning 1: Inching 2: Voltage injection 8: Closed-loop pre-positioning 9: Position locking	0	-	At stop	*" H0A_en.13" on page 563*
H0d.03	0x0D03	Encoder initial angle auto-tuning	0: No operation 1: Angle auto-tuning enabled 2: Phase sequence auto-tuning enabled	0	-	At stop	-

Parameter	Communication Address	Name	Description	Default	Unit	Change Mode	Page
H32.30	0x321E	Max. reference current in angle auto-tuning through position lock	10.0% to 300.0%	100.0	%	At stop	"H32_en.30" on page 762
H32.33	0x3221	Motor operation threshold (ROT/DDR) in angle auto-tuning through position lock	0.001deg to 20.000deg	0.200	deg	At stop	"H32_en.33" on page 763
H32.34	0x3222	Motor standstill threshold (ROT/DDR) in angle auto-tuning through position lock	0.1[mm/s]/[rpm] to 100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	"H32_en.34" on page 763
H32.37	0x3225	Angle gain in angle auto-tuning through position lock	0deg/(p/s)–10000deg/(p/s)	1000	deg/(p/s)	At stop	"H32_en.37" on page 763
H32.38	0x3226	Inertia ratio in angle auto-tuning through position lock	0.00 to 120.00	0.00	-	At stop	"H32_en.38" on page 763
H32.39	0x3227	Gain class in angle auto-tuning through position lock	4level to 31level	16	level	At stop	"H32_en.39" on page 764

Note

- Position lock is an angle auto-tuning method with position closed loop. The position closed loop mode ensures that the movement of auto-tuning is much smaller than other angle auto-tuning methods.
- However, you need to set the auto-tuning gain parameters due to the position closed loop regulator.
- Set the auto-tuning inertia ratio and auto-tuning gain level according to the actual applications.
- If you do not know the load inertia or loop gain level during the first installation of the motor, it is recommended to use other auto-tuning methods to complete inertia auto-tuning and basic gain auto-tuning before switching to the position locking method.

Table 8–5 Related fault codes:

Fault Code	Name	Description
E602.0	Locked-rotor	• Check for locked-rotor. • Check the connection of the power cable. • If locked rotor is reported when the motor operates, check the motor operation evaluation threshold and reduce it if necessary.
E602.1	Angle auto-tuning overtravel	Large movement during auto-tuning. • Set a reasonable auto-tuning inertia ratio and appropriately increase the auto-tuning gain level. • Contact the manufacturer technical personnel.

Fault Code	Name	Description
E602.3	Large encoder jitter during angle auto-tuning	When the encoder resolution is low and there is ripple, the motor standstill conditions are not met. Check the static speed feedback ripple of the encoder, and increase the standstill evaluation threshold appropriately.
E602.6	Angle auto-tuning does not converge	• Check if the bench is affected by other vibrating components. Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. • Check whether the angle gain is set too large.

8.6.6 Voltage Injection Auto-tuning

For details on the voltage injection method, see *" Steps without a Hall sensor" on page 132*.

This method can support auto-tuning in the state of locked shaft or external brake. When the method is adopted in the state of locked shaft or external brake, the motor does not rotate at all during the auto-tuning process (when the method is adopted in non-locked shaft state, the motor will operate slightly during the auto-tuning process), and there will be a sizzling sound of current injection during the auto-tuning process.

If the state display on the the drive changes from "rn" to "ry", it means that the auto-tuning is successful and you can perform further commissioning. If E602 is displayed in the auto-tuning process, it indicates that the auto-tuning failed.

Related Parameters:

Parameter	Communication Address	Name	Description	Default	Unit	Change Mode	Page
H0A.13	0x0A0D	Angle auto-tuning mode	0: pre-positioning 1: Inching 2: Voltage injection 8: Closed-loop pre-positioning 9: Position locking	0	-	At stop	*" H0A_en.13" on page 563*
H0d.03	0x0D03	Encoder initial angle auto-tuning	0: No operation 1: Angle auto-tuning enabled 2: Phase sequence auto-tuning enabled	0	-	At stop	-

Note

- When angle auto-tuning is performed through voltage injection, ensure that the phase sequence of the motor is correct.
- Voltage injection is only applicable to motors with iron cores.

Table 8–6 Related fault codes:

Fault Code	Name	Description
E602.1	Angle auto-tuning overtravel	The movement range of the auto-tuning process exceeds 10 ° electrical angle. • Check for external disturbance. • The resistor damping is small, and the operation range of the auto-tuning process is large. It is recommended to lock the motor shaft or increase mechanical damping before auto-tuning.

8.7 Jog

Caution

When using the jog function, set the S-ON signal of the servo drive to OFF. Otherwise, this function cannot be used.

The jog function can be used in trial run to check whether the motor rotates properly, without abnormal vibration or noise generated during rotation.

This operation can be performed through keypad speed mode jogging, keypad position mode jogging, software speed mode jogging and DI jogging.

Note

The acceleration and deceleration time constants of speed and position references can be set through H06.12 during jogging.

Using the keypad (speed control mode)

- Commissioning Steps

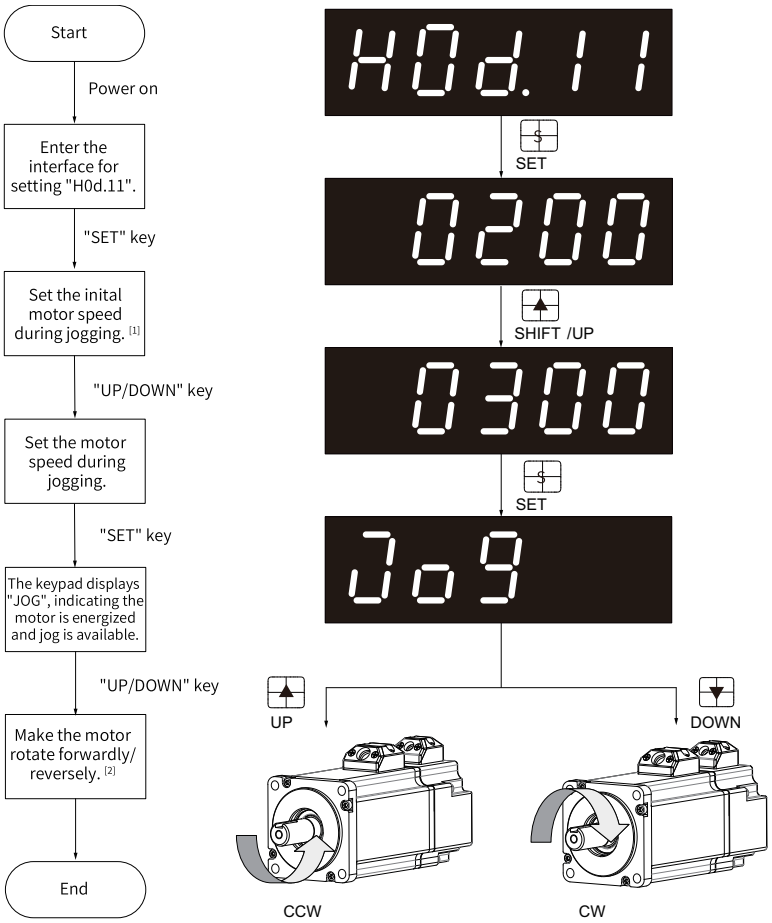


Figure 8-4 Procedure for setting the jog function

Note

- [1]: Press the UP or DOWN key to increase or decrease the jog speed. After exiting from the jog mode, the motor reverts to the initial speed.
- [2]: If magnetic pole auto-tuning is not performed after the incremental encoder motor is powered on, the auto-tuning will be automatically carried out at this time. After auto-tuning, press key UP or DOWN to enable the motor to rotate in forward or reverse direction. After you release the key, the motor stops running immediately.

- Procedure:

  1. Enter the jog mode by setting H0d.11 through the keypad.

     The keypad displays the default jog speed at this moment.
  2. Press the SET key and adjust the jog speed through the UP/DOWN key and press the SET key to enter the jog state.

     The keypad displays "JOG" at this moment, and the motor is energized.
  3. Hold the UP/DOWN key down to make the motor jog forwardly or reversely.
  4. Press the MODE key to exit the jog mode and return to the upper-level menu.

     The setpoint of H06.04 returns to the default value.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H06.04	0x0604	DI jog speed reference	0 rpm to 10000 rpm	150	rpm	Real-time	"H06_en.04" on page 524

Jogging through the software tool

Steps:

1. Open the Speed JOG interface in the software tool.
2. Set the jog speed.
3. After switching the servo status to ON, press the forward/reverse arrow displayed on the interface to switch between forward and reverse jog.

Jogging through the DI

Note

Note: The jog function can be activated through the DI in any control mode.

Steps:

1. Assign FunIN.18 and FunIN.19 to two external Dis through H03 parameters..
2. Set H06.04.
3. Make the motor jog forwardly or reversely through changing the DI level status.

☆ Related parameters:

Code	Name	Function Name	Description
FunIN.18	JOGCMD+	Forward jog	Active: Input based on command Inactive: Command input stopped
FunIN.19	JOGCMD–	Reverse jog	Active: Input in reverse to the command Inactive: Command input stopped

Using the keypad (position control mode)

Procedure:

1. Enter the jog mode by setting H0d.08 through the keypad.
   The keypad displays the default jog speed at this moment.
2. Press the SET key and adjust the jog speed through the UP/DOWN key and press the SET key to enter the jog state.
3. The keypad displays "JOG-P" at this moment, and the motor is energized.
4. Hold the UP/DOWN key down to make the motor jog forwardly or reversely.
   Press the MODE key to exit the jog mode and return to the upper-level menu.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H06.12	0x060C	Acceleration ramp time of jog speed	0 ms–65535 ms	10	ms	Real-time	"H06_en.12" on page 526

8.8 Setting parameters

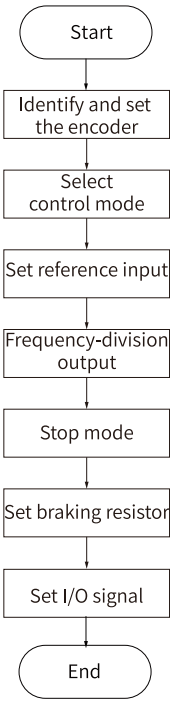


Figure 8-5 General Parameter Setting Flowchart

Identify and set the encoder.

Check whether parameter H00.00 (motor code) agrees with the motor.

Set H02.02 to change the direction of rotation directly.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H00.00	0x0000	Motor SN	20002: Rotary motor-pulse encoder 14000: Rotary motor-Inovance 20-bit encoder 14101: Rotary motor-Inovance 23-bit encoder 14102: Rotary motor-Inovance 26-bit encoder 14140: Rotary motor-Endat2.2 encoder 14150: Rotary motor-SSI encoder 14160: Rotary motor-BiSS-C encoder	14102	-	At stop	"H00_en.00" on page 487

The change of H02.02 does not affect the pulse output form or the sign (+/-) of monitoring parameter values.

The direction of "forward drive" in overtravel prevention is the same as that defined by H02.02.

Stop mode

The stop modes include Brake setting, Servo stop mode at S-ON OFF, Stop mode at No.2 fault, Stop mode at overtravel, and Stop mode at No.1 fault.

1. Select whether to use the brake in **Brake setting**.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H02.16	0x0210	Brake enable switch	0: OFF 1: ON	0	-	Real-time	"H02_en.16" on page 498

2. Select the stop mode for stop at S-ON OFF.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H02.05	0x0205	Stop mode at S-ON OFF	-5: Stop in PN communication state (ramp-to-stop/quick stop/coast-to-stop), keeping dynamic braking state -4: Stop based on ramp 2, keeping dynamic braking state -3: Stop at zero speed, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Dynamic braking stop, keeping de-energized state 3: Stop in PN communication state (ramp-to-stop/quick stop/coast-to-stop), keeping de-energized state	3	-	Real-time	"H02_en.05" on page 495

3. Select the stop mode at No.2 fault.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H02.06	0x0206	Stop mode at No. 2 fault	-5: Stop at zero speed, keeping dynamic braking state -4: Stop at emergency stop torque, keeping dynamic braking state -3: Stop based on ramp 2, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Stop based on ramp 2, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state	2	-	Real-time	"H02_en.06" on page 496

4. Select the stop mode at overtravel.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H02.07	0x0207	Stop mode at overtravel	1: Stop at zero speed, keeping position lock state 4: Stop at ramp 2, keeping position lock state 7: Not respond to overtravel	1	-	At stop	"H02_en.07" on page 496

5. Select the stop mode at No.1 fault.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H02.08	0x0208	Stop mode at No.1 fault	0: Coast to stop, keeping de-energized state 1: Dynamic braking stop, keeping de-energized state 2: Dynamic braking stop, keeping dynamic braking state	2	-	At stop	"H02_en.08" on page 497

Brake setting

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

Caution

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

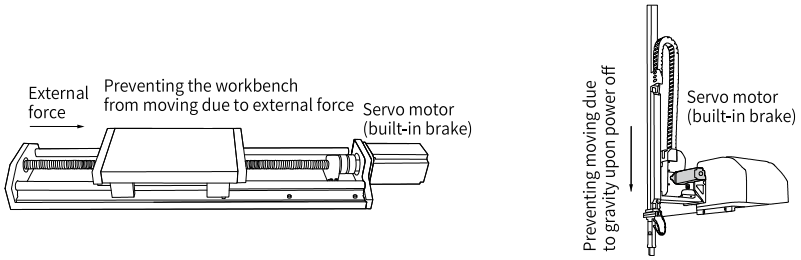


Figure 8-6 Application of the brake

Table 8–7 Brake specifications

Motor Model	Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated power (W)	Coil Resistance (Ω)±7%	Exciting Current (A)	Release Time (ms)	Apply Time (ms)	Backlash (°)
MS1H1-05B/10B MS1H4-10B	0.32	24	6.1	94.4	0.25	⩽ 20	⩽ 40	⩽ 1.5
MS1H1-20B/40B MS1H4-20B/40B	1.5		7.6	75.79	0.32	⩽ 20	⩽ 60	⩽ 1.5
MS1H1-75B/10C MS1H4-75B/10C	3.2		10	57.6	0.42	⩽ 40	⩽ 60	⩽ 1
MS1H2-10C/15C/ 20C/25C	8		17.6	32.73	0.73	⩽ 40	⩽ 100	⩽ 1
MS1H2-30C/40C/ 50C	16		24	24	1	⩽ 60	⩽ 120	⩽ 1
MS1H3-85B/13C/ 18C	16		24	24	1	⩽ 60	⩽ 120	⩽ 1
MS1H3-29C/44C/ 55C/75C	50		31	18.58	1.29	⩽ 100	⩽ 200	⩽ 1

Note

- Do not use a holding brake for braking.
- The release time and operation time of the brake depend on the discharge circuit. Be sure to confirm the operation delay of your equipment before use.
- You need to prepare the 24 VDC power supply yourself.

- Brake software setting
  For the servo motor with a brake, use BK+/BK– of CN8 on the servo drive and set H02.16 to 1.

  The operating sequences of the brake are different in the normal state and fault state.

  ☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H02.16	0x0210	Brake enable switch	0: OFF 1: ON	0	-	Real-time	"H02_en.16" on page 498

- Brake sequence in normal state
  The brake sequence in the normal state is further divided into the following two types:
  - Standstill: The actual motor speed is lower than 20 RPM.
  - Rotating: The motor speed is equal to or higher than 20 RPM.
- Brake sequence for servo motor at standstill
  If the servo enabling (S-ON) signal changes from ON to OFF, and the present motor speed is lower than 20 RPM, the servo drive acts according to the brake time sequence in the static state of the motor.

Caution

- After the brake output signal changes from "OFF" to "ON", do not input a position/speed/torque reference within the time defined by H02.09. Otherwise, reference loss or an operation error may occur.
- When the motor is used to drive a vertical axis, the motion part may move slightly under the influence of gravity or external force. If the S-ON signal is switched off, the brake output is set to "OFF" immediately when the motor is at standstill. However, within the time defined by H02.10, the motor is still energized, preventing the load from moving under the influence of gravity or external force.

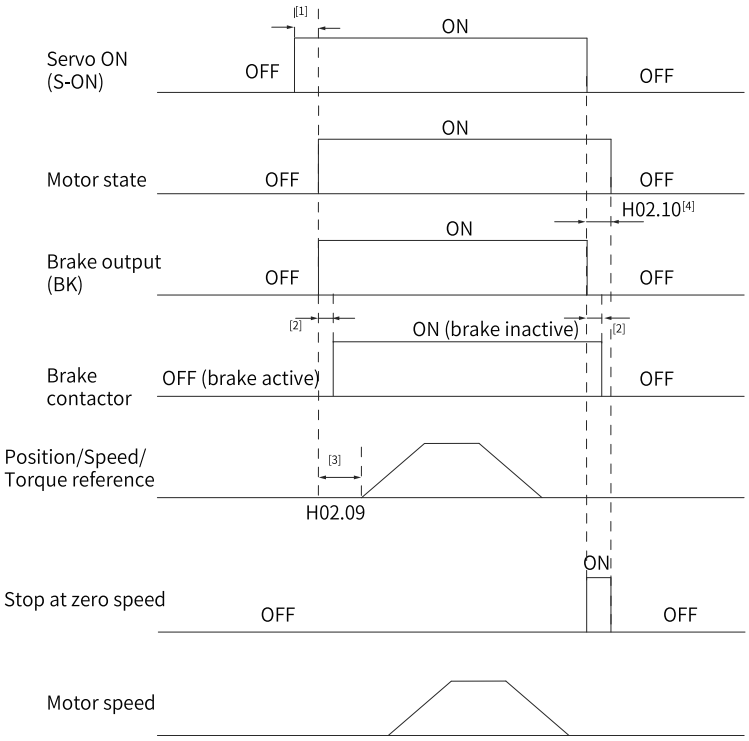


Figure 8-7 Brake sequence for motor at standstill

Note

- [1]: When the S-ON signal is switched on, the brake output is set to "ON" at a delay of about 80 ms, with motor being energized at the same time.
- [2]: For delay of brake contactor actions, see *"Table 8–7 Brake specifications" on page 145*.
- [3]: The interval time, starting from the moment when brake output is set to "ON" to the moment when a command is input, must be higher than the setpoint of H02.09.
- [4]: When the S-ON signal is switched off with motor at standstill (motor speed lower than 30 rpm), the brake output is set to "OFF". You can set in H02.10 the delay of the motor in entering the de-energized state after the brake output is set to "OFF".

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H02.09	0x0209	Delay from brake output ON to command received	0 ms–500 ms	250	ms	Real-time	*" H02_ en.09" on page 497*
H02.10	0x020A	Delay from brake output OFF to motor de-energized	50 ms–1000 ms	150	ms	Real-time	*" H02_ en.10" on page 497*

- Brake sequence for motor in the rotation state

  If the S-ON signal changes from ON to OFF, and the present motor speed is equal to or higher than 20 RPM, the servo drive acts according to the brake time sequence in motor rotating state.

Caution

- When the S-ON signal is switched on, do not input a position/speed/torque reference within the time defined by H02.09. Otherwise, reference loss or an operation error may occur.
- If the S-ON signal is switched off when the motor is still rotating, the motor enters the "Stop at zero speed" state, but the brake output can be set to "OFF" only when one of the following conditions is met:
  - The motor has decelerated to the value defined by H02.11, but the time defined by H02.12 is not reached.
  - The time defined by H02.12 has been reached, but the motor speed is still higher than the value defined by H02.11.
- The motor is still energized within 50 ms after the brake output changes from "ON" to "OFF". This is to prevent the motion parts from moving under the influence of gravity or external force.

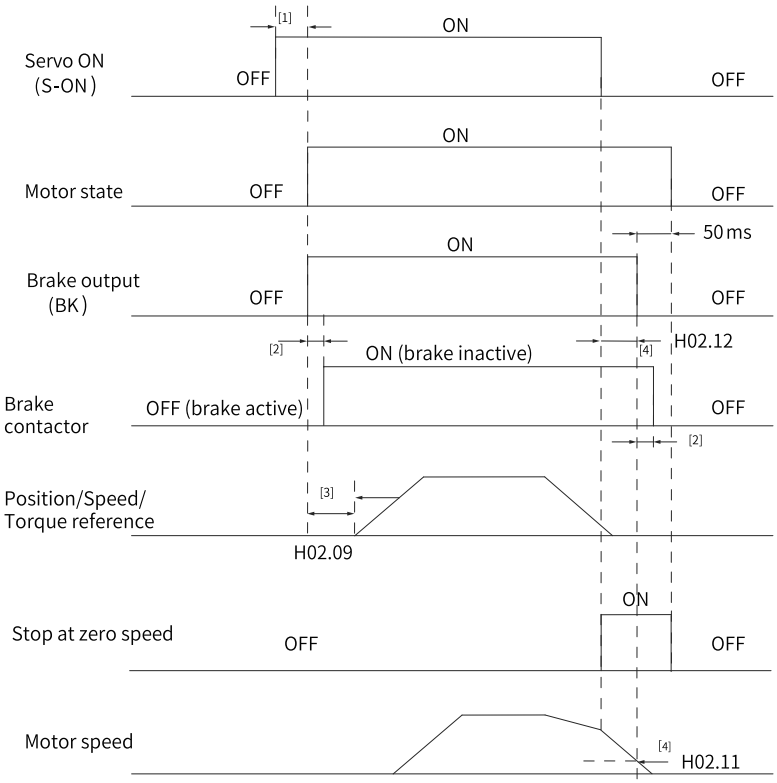


Figure 8-8 Brake sequence for a rotating motor

Note

- [1]: When the S-ON signal is switched on, the brake output is set to "ON" at a delay of about 80 ms, with motor being energized at the same time.
- [2]: For delay of brake contactor actions, see *"Table 8-7 Brake specifications" on page 145*.
- [3]: The interval time, starting from the moment when brake output is set to "ON" to the moment when a command is input, must be higher than the setpoint of H02.09.
- [4]: When the motor is rotating and S-ON is OFF, the motor enters a non-energized state when the brake outputs OFF after the delay set in H02.12 or the speed feedback is less than H02.11.

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H02.11	0x020B	Motor speed threshold at brake output OFF in rotation state	20 rpm to 3000 rpm	30	rpm	Real-time	"H02_en.11" on page 498
H02.12	0x020C	Delay from S-ON OFF to brake output OFF in rotation state	1 ms–65535 ms	500	ms	Real-time	"H02_en.12" on page 498

- Brake sequence in the fault state
  Servo drive faults can be classified into No. 1 faults and No. 2 faults based on the stop mode. See Section "Troubleshooting" of "SV680F-INT Series Servo Drive Function Guide" for details. The brake sequences in the fault state are further divided into the following two types:
  - In case of No. 1 faults:
    The condition for brake output is the same as the brake sequence for the motor in the rotation state. Which is to say: The brake output can be set to "OFF" only when any one of the following conditions is met:
    - The motor has decelerated to the value defined by H02.11, but the time defined by H02.12 is not reached.
    - The time defined by H02.12 has been reached, but the motor speed is still higher than the value defined by H02.11.
  - In case of No. 2 faults:
    When a No. 2 fault occurs and the brake is enabled, the stop mode is forced to "Stop at zero speed, keeping dynamic braking status".

    In this case, the servo motor stops at zero speed first. When the actual motor speed is lower than 20 RPM, the brake output signal immediately becomes OFF, but the motor is still in the energized state within the time defined by H02.10.

Input/Output signal setting

The input/output signal setting is the same as "DI/DO setting mode selection".

See "22.3 DIDO Function Assignment" on page 938 for details.

8.9 Drive Operational

Switch on the S-ON signal.

The model F drive is operational, and the keypad displays "44rn".

Since there is no command input at this moment, the motor does not rotate and stays locked. After a command is input, the motor starts rotating.

Table 8–8 Operation of the servo drive

No.	Item	Yes
1	During initial operation, set a proper command to make the motor run at low speed and check whether the motor rotates properly.	☐
2	Observe whether the motor rotating direction is correct. If the direction of rotation is opposite to the expected direction, check the reference signal input and the reference direction setting signal.	☐
3	If the motor rotates in the correct direction, you can view the actual speed in H0b.00 and the average load rate in H0b.12 through the keypad or the software tool.	☐
4	After checking preceding conditions, adjust related parameters to make the motor operate as desired.	☐
5	Adjust the drive according to section "Adjustment" in the function guide.	☐

Power-on sequence diagram

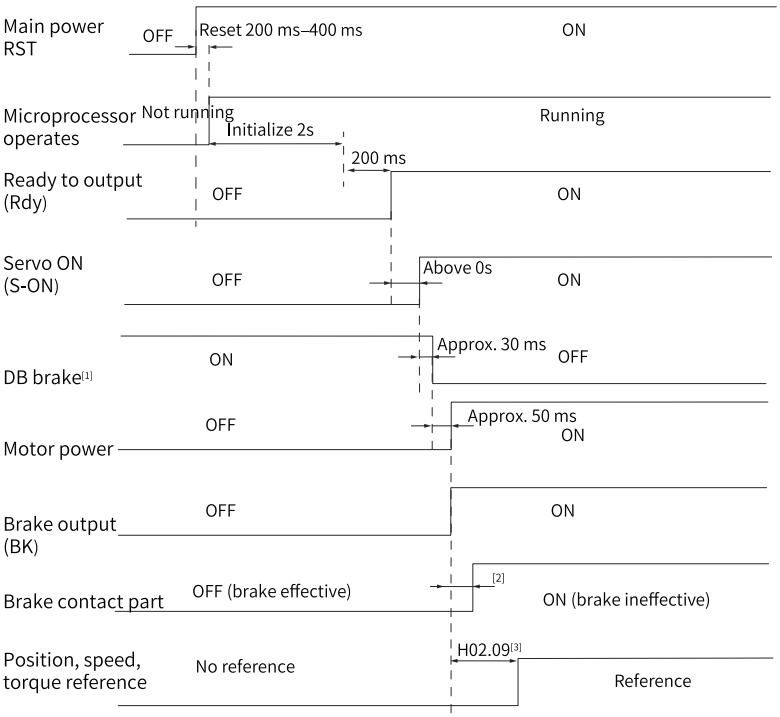


Figure 8-9 Power-on sequence diagram

Note

- [1] The dynamic brake is included in the standard configuration.
- [2] For the delay of brake contactor operation, see the technical data of the motor for details.
- [3] If the brake is not used, H02.09 is invalid.

Sequence diagram for stop at alarm or fault

- No. 1 fault: Coast to stop, keeping de-energized status

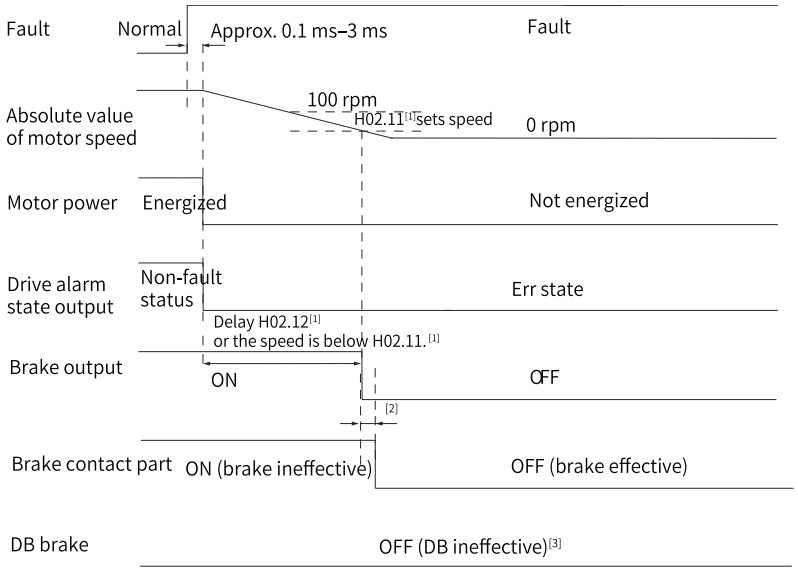


Figure 8-10 Sequence of "Coast to stop, keeping de-energized state" at No. 1 fault

Note

- [1] If the brake is not used, H02.11 and H02.12 are ineffective.
- [2] For the delay of brake contactor operation, see the technical data of the motor for details.
- [3] The dynamic brake is included in the standard configuration.

- No. 1 fault (without brake): Dynamic braking stop, keeping de-energized status

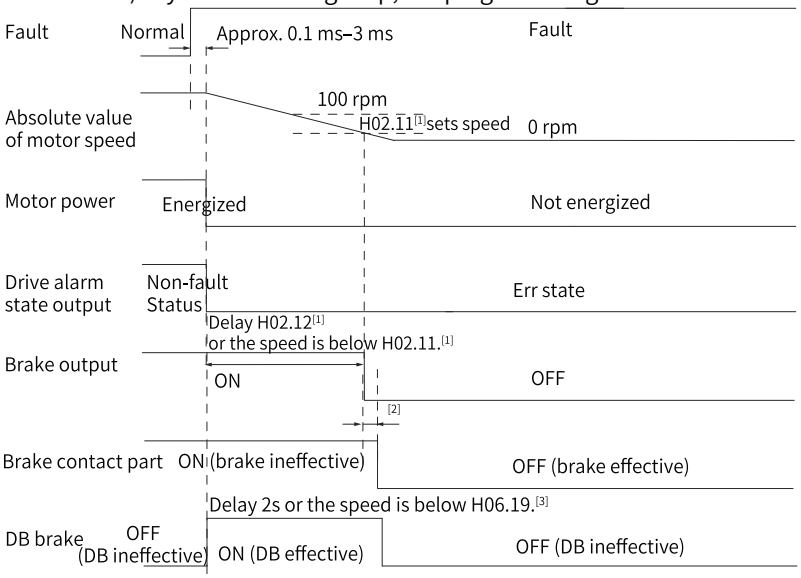


Figure 8-11 Sequence of "Dynamic braking stop, keeping de-energized state" at No. 1 fault

Note

- [1] If the brake is not used, H02.11 and H02.12 are ineffective.
- [2] For the delay of brake contactor operation, see the technical data of the motor for details.
- [3] The dynamic brake is included in the standard configuration.

- No. 1 fault: Dynamic braking stop, keeping dynamic braking state

Figure 8-12 Sequence of "Dynamic braking stop, keeping dynamic braking state" at No. 1 fault

Note

- [1] If the brake is not used, H02.11 and H02.12 are ineffective.
- [2] For the delay of brake contactor operation, see the technical data of the motor for details.
- [3] The dynamic brake is included in the standard configuration.

- No. 2 fault (without brake): Coast to stop, keeping de-energized state

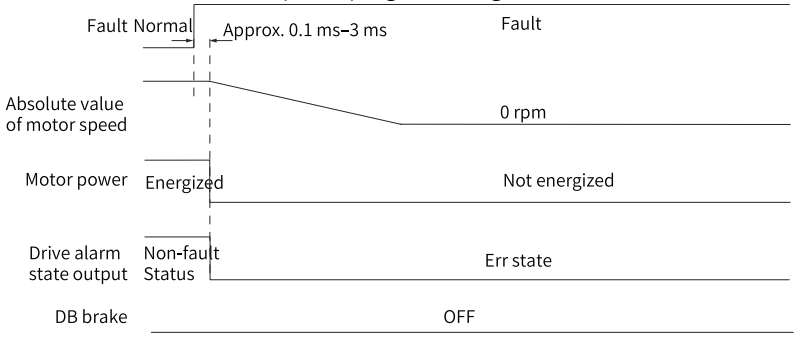


Figure 8-13 Sequence of "Coast to stop, keeping de-energized state" at No. 2 fault

- No. 2 fault (without brake): Stop at zero speed, keeping de-energized status

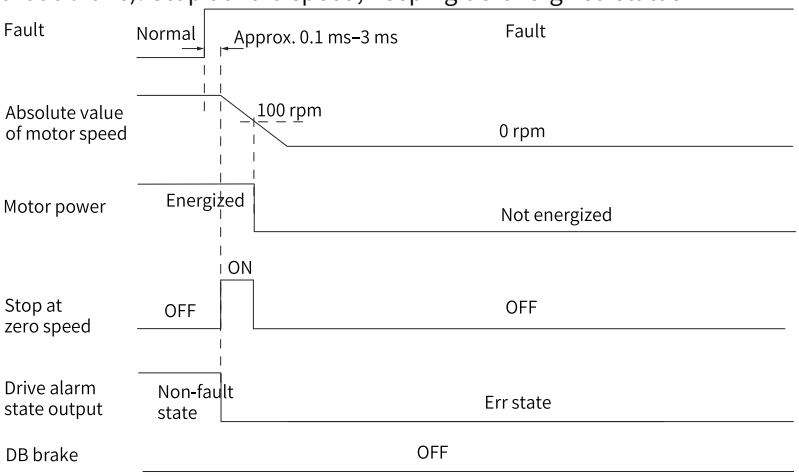


Figure 8-14 Sequence of "Stop at zero speed, keeping de-energized state" at No. 2 fault (without brake)

- No. 2 fault (without brake): Stop at zero speed, keeping dynamic braking state

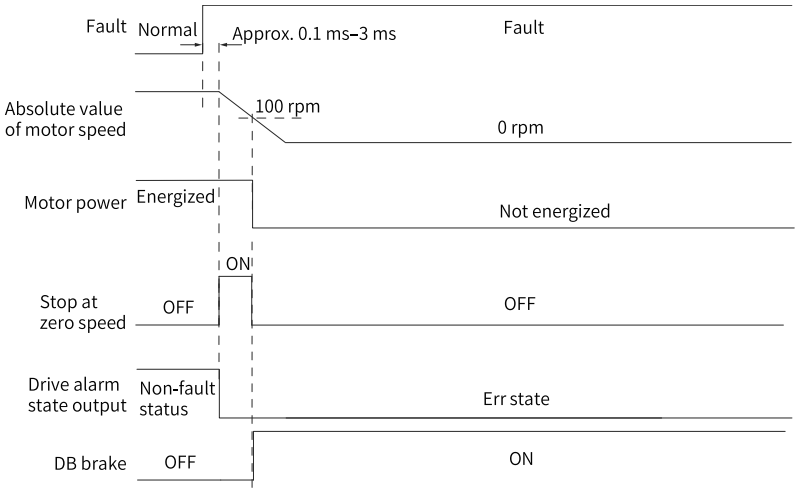


Figure 8-15 Sequence of "Stop at zero speed, keeping dynamic braking state" at No. 2 fault (without brake)

- No. 2 fault (without brake): Dynamic braking stop, keeping dynamic braking state

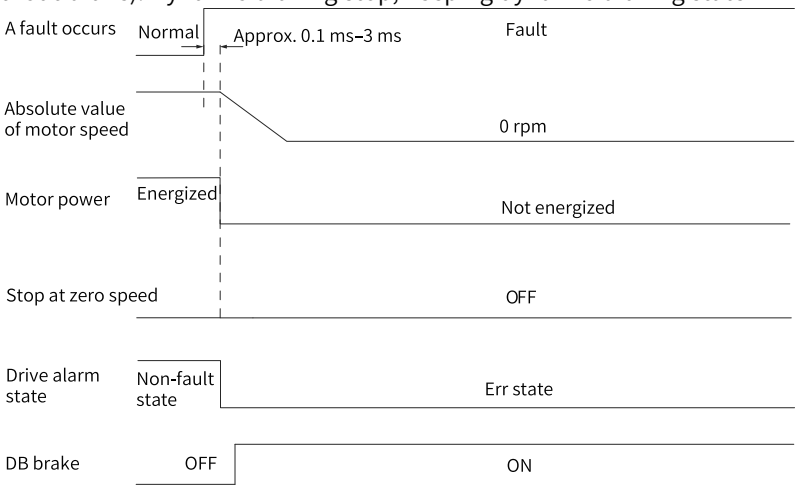


Figure 8-16 Sequence of "Dynamic braking stop, keeping dynamic braking state" at No. 2 fault (without brake)

- No. 2 fault (without brake): Dynamic braking stop, keeping de-energized state

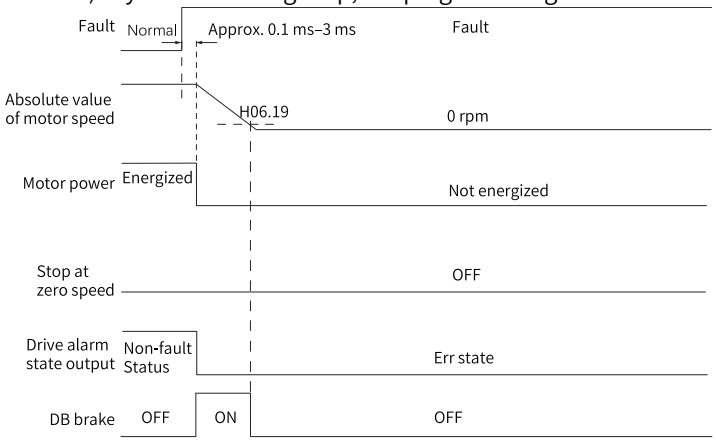


Figure 8-17 Sequence of "Dynamic braking stop, keeping de-energized state" at No. 2 fault (without brake)

- No. 2 fault (with brake): Stop at zero speed, keeping dynamic braking status

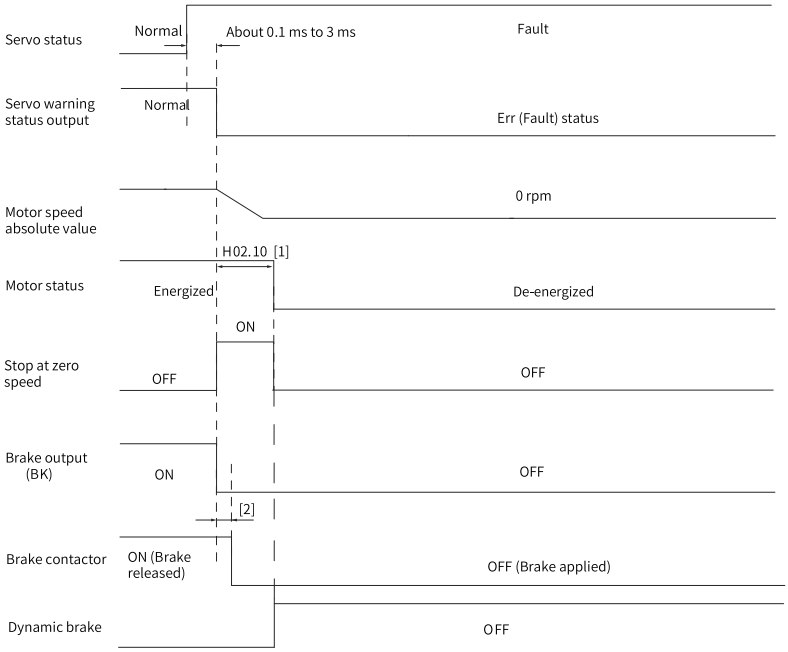


Figure 8-18 Sequence of "Stop at zero speed, keeping dynamic braking state" at No. 2 fault (with brake)

Note

- [1] If the brake is not used, H02.10 is invalid.
- [2] For the delay of brake contactor operation, see the technical data of the motor for details.

- When A900.0 (DI emergency braking), A950.0 (Positive limit switch alarm), and A952.0 (Negative limit switch alarm) occur, the servo drive stops according to *"Figure 8–19 Sequence for alarms that cause stop" on page 155*.
- Alarms that cause stop: Stop at zero speed, keeping position lock status

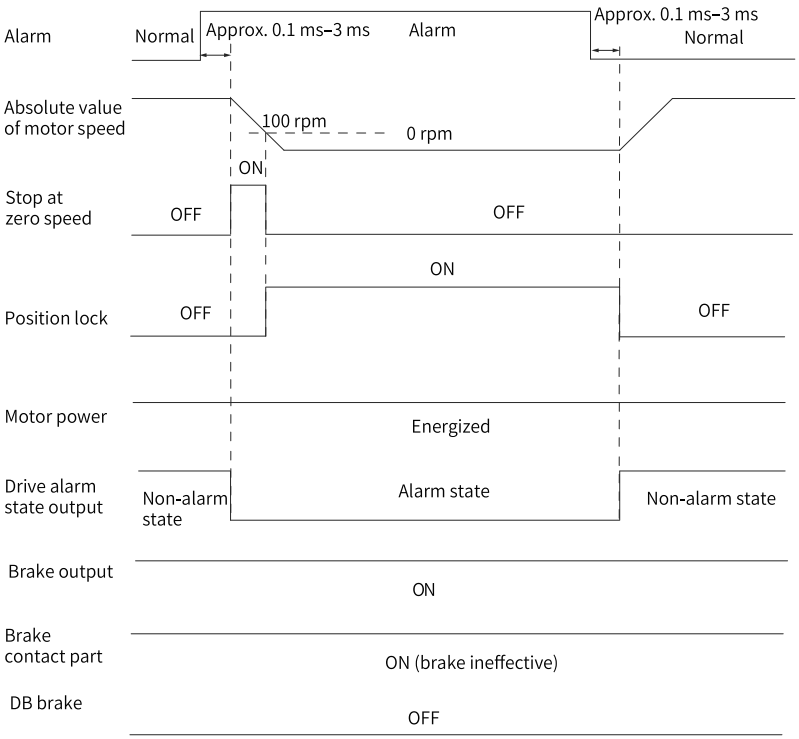


Figure 8-19 Sequence for alarms that cause stop

Other alarms do not affect the operation state of the drive. The sequence diagram for these alarms is shown in *"Figure 8–20 Sequence for alarms that do not cause stop" on page 155*.

- Alarms that do not cause stop

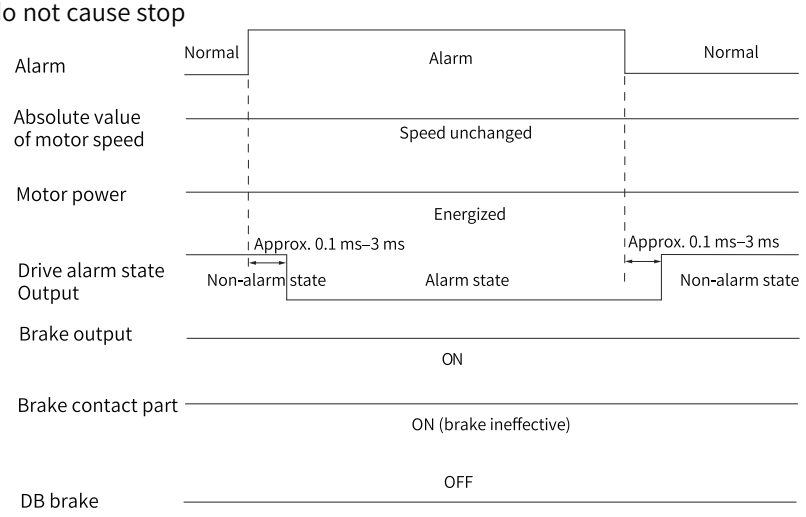


Figure 8-20 Sequence for alarms that do not cause stop

- Fault reset

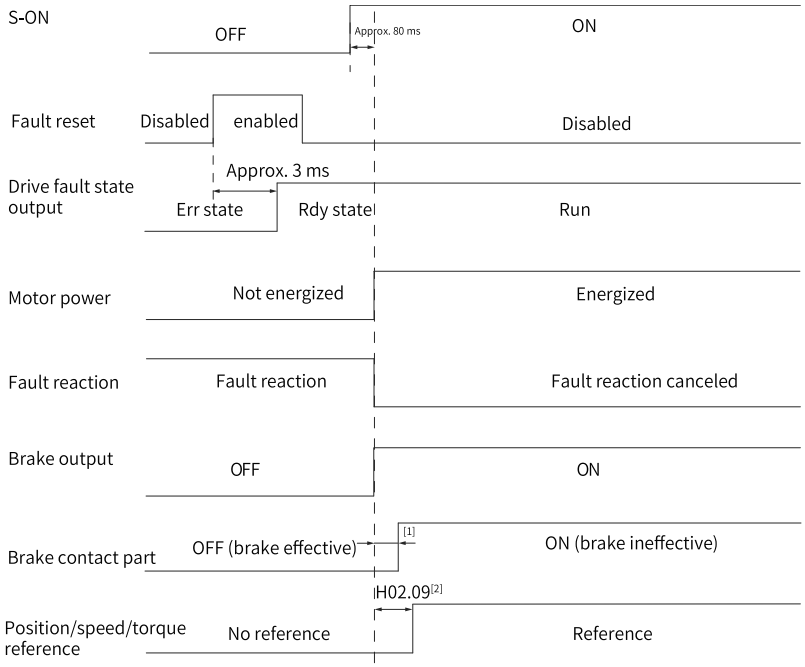


Figure 8-21 Sequence for fault reset

Note

- [1] For the delay of brake contactor operation, see the technical data of the motor for details.
- [2] If the brake is not used, H02.09 is invalid.

8.10 Drive stops

Five type of stop modes are available for the servo drive: coast to stop, stop at zero speed, ramp to stop, stop at emergency-stop torque, and dynamic braking stop, along with three kinds of stop status: de-energized, position lock, and dynamic braking. See the following table for details.

Table 8–9 Comparison of the stop modes

Stop Mode	Description	Feature
Coast to stop	The motor is de-energized and coasts to 0 RPM. The deceleration time is affected by the mechanical inertia and mechanical friction.	This mode features smooth and slow deceleration with small mechanical shock.
Stop at zero speed	The motor decelerates to 0 rpm immediately and stops.	Features quick deceleration with obvious mechanical shock.
Ramp to stop	The motor decelerates to 0 rpm smoothly upon position/speed/ torque reference input.	Features smooth and controllable deceleration with small mechanical shock.
Stop at emergency-stop torque	The servo drive outputs reverse braking torque to stop the motor.	Features quick deceleration with obvious mechanical shock.
Dynamic braking	The motor is in the dynamic braking status.	Features quick deceleration with obvious mechanical shock.

Table 8–10 Comparison of the stop status

Stop Status	Description
De-energized	The motor is de-energized and the motor shaft can be rotated freely after the motor stops rotating.
Position Lock	The motor shaft is locked and cannot be rotated freely after the motor stops rotating.
DB state	The motor is de-energized and the motor shaft cannot be rotated freely after the motor stops rotating.

The stop events can be divided into the following types: stop at S-ON OFF, stop at fault, stop at overtravel, emergency stop, quick stop, and halt. See the following descriptions for details.

Stop at S-ON OFF

Deactivate the S-ON signal through communication to make the drive stop according to the stop mode at S-ON OFF.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.05	0x0205	Stop mode at S-ON OFF	-5: Stop in PN communication state (ramp-to-stop/quick stop/coast-to-stop), keeping dynamic braking state -4: Stop based on ramp 2, keeping dynamic braking state -3: Stop at zero speed, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Dynamic braking stop, keeping de-energized state 3: Stop in PN communication state (ramp-to-stop/quick stop/coast-to-stop), keeping de-energized state	3	-	Real-time	"H02_en.05" on page 495

Fault reaction

The stop mode varies according to the fault type. For fault classification, see section Description of Fault Codes in the parameter guide.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.06	0x0206	Stop mode at No. 2 fault	-5: Stop at zero speed, keeping dynamic braking state -4: Stop at emergency stop torque, keeping dynamic braking state -3: Stop based on ramp 2, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Stop based on ramp 2, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state	2	-	Real-time	"H02_en.06" on page 496

Stop at overtravel

★ Definition of terms:

- "Overtravel": The mechanical motion exceeds the designed range of safe movement.
- Stop at overtravel: When a motion part moves beyond the range of safe movement, the limit switch outputs a level change signal, and the servo drive forcibly stops the motor.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.07	0x0207	Stop mode at overtravel	1: Stop at zero speed, keeping position lock state 4: Stop at ramp 2, keeping position lock state 7: Not respond to overtravel	1	-	At stop	"H02_en.07" on page 496

When overtravel occurs on a motor used to drive a vertical axis, the workpiece may fall. To prevent the risk of falling, set H02.07 (Stop mode at overtravel) to 1. When the workpiece moves linearly, install the limit switch to prevent mechanical damage. When overtravel occurs, input a reverse running command to make the motor (workpiece) run in the opposite direction.

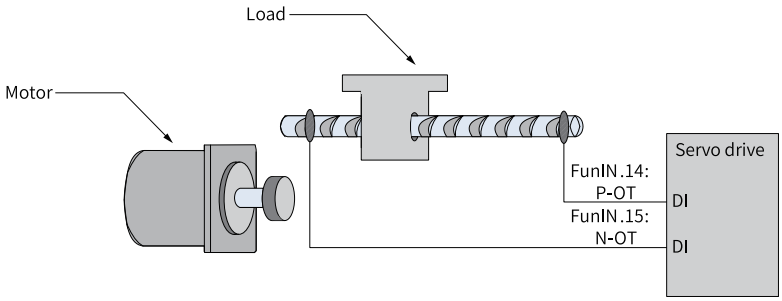


Figure 8-22 Installation of limit switches

To use the limit switches, assign FunIN.14 (P-OT, positive limit switch) and FunIN.15 (N-OT, negative limit switch) to two DIs of the servo drive and set the active logic of these DIs. This is to enable the servo drive to receive the level signals input from the limit switches. The servo drive determines whether to enable the limit switch function based on the state of the DI terminal level.

☆ Related parameters:

Code	Name	Function Name	Function
FunIN.14	P-OT	Positive limit switch	When the machine moves beyond the specified range, overtravel prevention applies. Inactive: Forward drive permitted Active: Forward drive inhibited
FunIN.15	N-OT	Negative limit switch	When the machine moves beyond the specified range, overtravel prevention applies. Inactive: Reverse drive permitted Active: Reverse drive inhibited

Emergency stop

The servo drive supports two emergency stop modes:

- Using DI function 34: FunIN.34 (EmergencyStop)
  ☆ Related parameters:

Code	Name	Function Name	Function
FunIN.34	Emergency-Stop	Braking	Inactive: Current operating state unaffected Active: The servo drive stops according to the stop mode defined by H02.18 or 605Ah.

- Using the auxiliary function: emergency stop (H0d.05)
  When H0D-05 is enabled, the servo drive will stop in the stop mode defined by H02.05 regardless of the running status.

  When emergency stop is enabled, the motor stops according to the mode specified by the parameter H02.18.

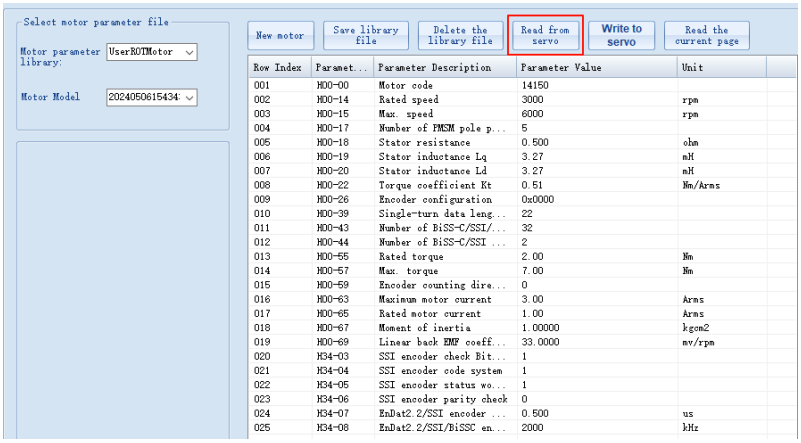
☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0d.05	0x0D05	Emergency stop	0: No operation 1: Emergency stop	0	-	Real-time	"H0d_en.05" on page 596
H02.05	0x0205	Stop mode at S-ON OFF	-5: Stop in PN communication state (ramp-to-stop/quick stop/coast-to-stop), keeping dynamic braking state -4: Stop based on ramp 2, keeping dynamic braking state -3: Stop at zero speed, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Dynamic braking stop, keeping de-energized state 3: Stop in PN communication state (ramp-to-stop/quick stop/coast-to-stop), keeping de-energized state	3	-	Real-time	"H02_en.05" on page 495
H02.15	0x020F	LED Alarm Display	0: Output alarm information immediately 1: Not output alarm information	0	-	Real-time	"H02_en.15" on page 498
H02.18	0x0212	DI emergency stop mode	0: Coast to stop, keeping de-energized state 1: Ramp 1 stop, keeping de-energized state 2: Ramp 2 stop, keeping de-energized stat 3: Stop at emergency stop torque, keeping de-energized state	2	-	Real-time	"H02_en.18" on page 499

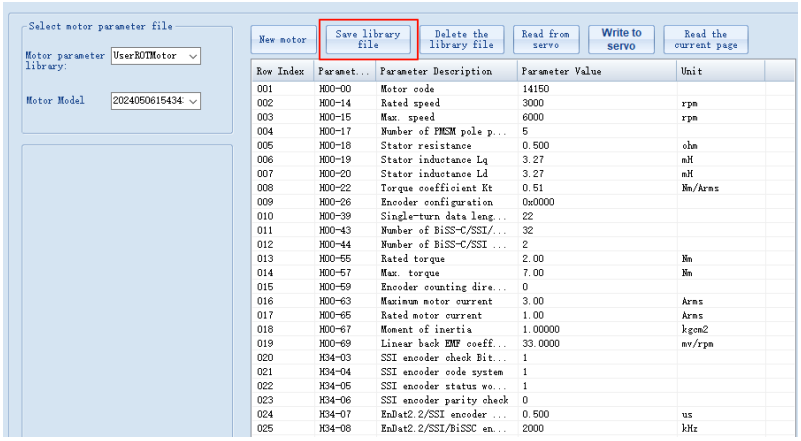
8.11 Quick Transfer of Motor Parameters

If you want to import the motor parameters from a drive to another which will connect to a motor of the same type, do the following:

1. On the **Motor Management Library** page, connect the old drive and click **Read from Drive**.



2. After parameters are read, click Save Library File to save the parameters.



3. Connect the new drive. Click User Motor Library from the motor parameter library on the left. Select the library file saved in step 2 in the motor model, and click Write to Drive.
4. Click Online Auto-tuning. Select the angle auto-tuning interface and perform the auto-tuning.

9 Adjustment

9.1 Overview

The servo drive must drive the motor as quick and accurate as possible to follow the commands from the host controller or internal setting. Gain adjustment needs to be performed to meet such requirement.

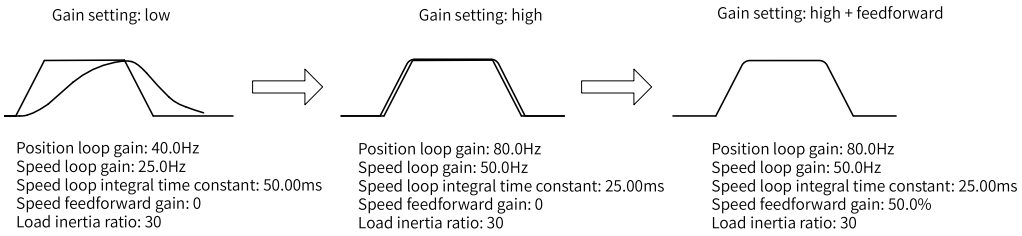


Figure 9-1 Example of gain tuning

The gain is defined by a combination of multiple parameters that affect each other. Such parameters include the position loop gain, speed loop gain, filter and load moment of inertia ratio. The values of these parameters must be balanced against each other during gain tuning.

Note

Before gain tuning, perform a trial run through jogging to ensure the motor operates properly.

The following figure shows the general flowchart for gain tuning.

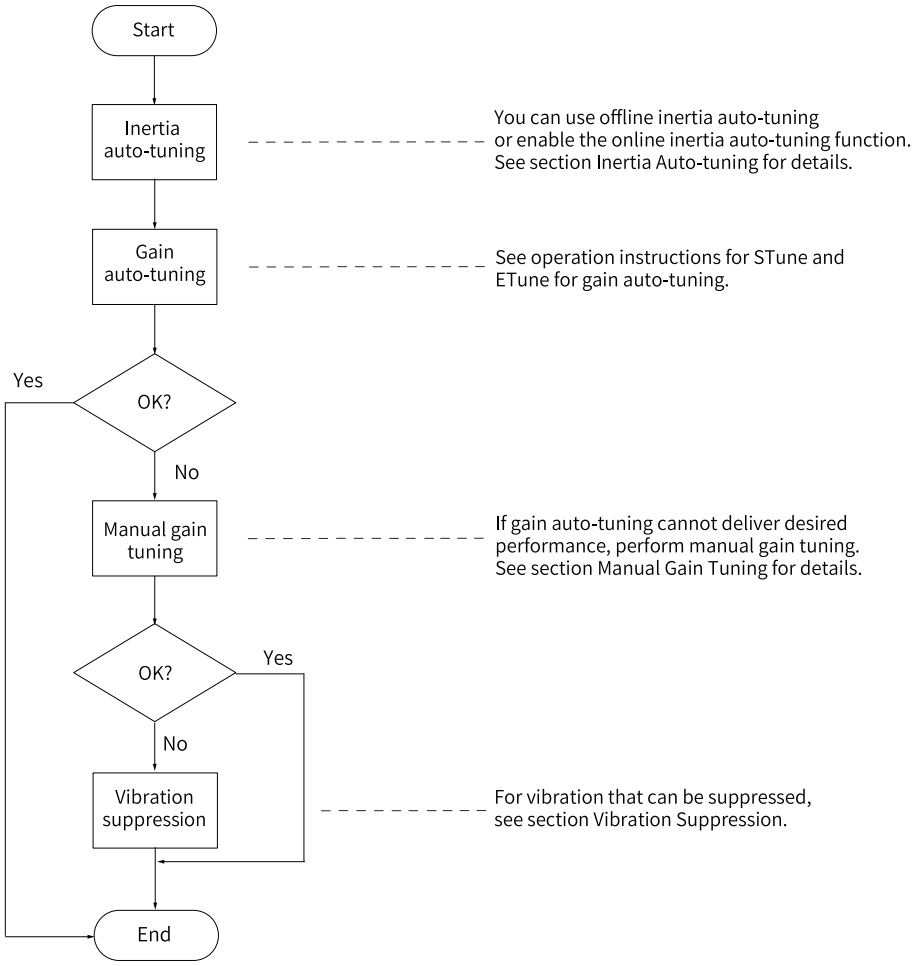


Figure 9-2 Steps

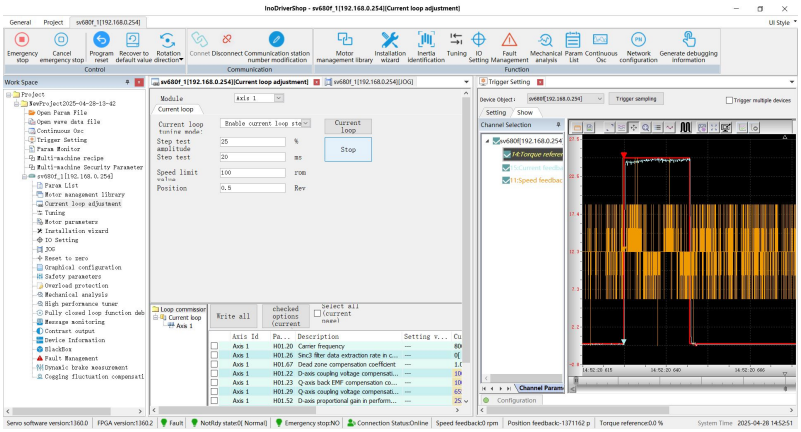
9.2 Current Loop Adjustment

Current loop parameter adjustment

As the innermost loop of the servo control system, the response and stability of the current loop play a vital role in the performance of the whole system.

To facilitate users to quickly commission the gain parameters of the current loop and ensure the high bandwidth and fast response of the current loop, the current loop adjustment control is provided in InoDriverShop.

This module integrates the **Current Loop Adjustment** window" and the **Trigger Setting Observation** window. The window functions are interrelated. After you select the commissioning mode and click Start, the drive completes the relevant test adjustment by itself, and the **Trigger Setting** window also collects the relevant waveforms synchronously.

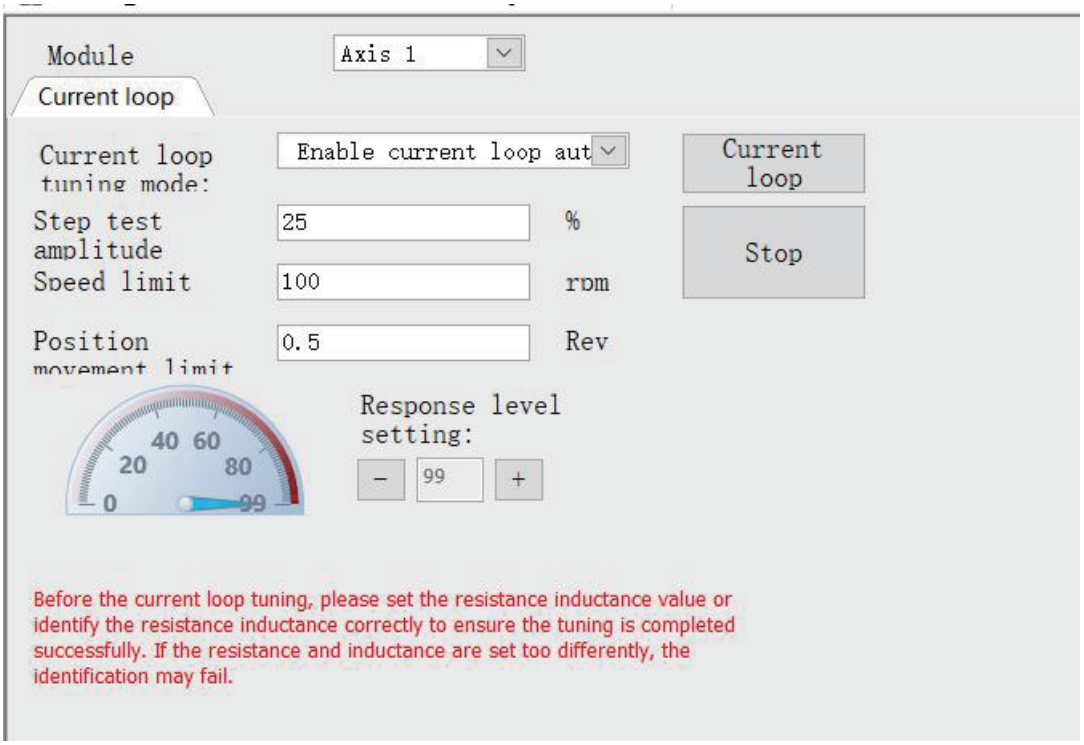


Current loop tuning provides three modes, which are described below.

1. **Current loop auto-tuning**

   This mode provides a static way to automatically tune the current loop. After starting, the drive can adjust the related gain parameters of the current loop by itself.

   You can set the response level. The larger the response level, the stronger the responsiveness and the higher the bandwidth of the final adjusted current loop.



Note

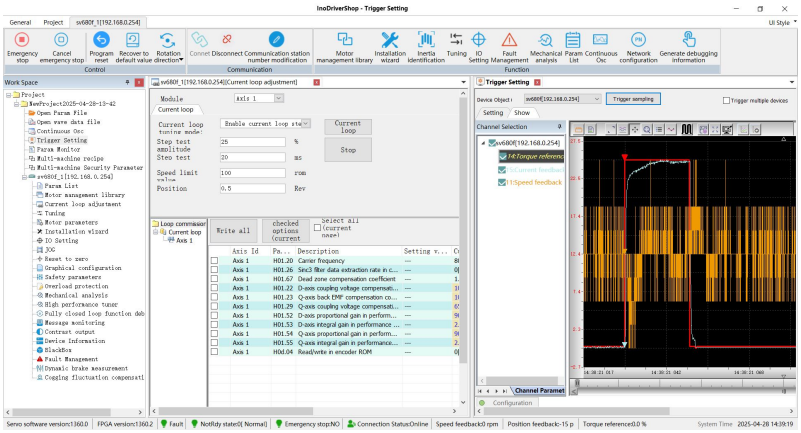
Over-high current loop response may also excite current loop control noise. In actual use,you should set the response level as needed to obtain the balance between current loop responsiveness and noise.

Related parameters	Description
Auto-tuning step test amplitude	Auto-tuning excitation signal amplitude
Speed limit value	The maximum speed that can be achieved by stable current excitation

Related parameters	Description
Position movement limit value	Maximum distance that can be achieved by stable current excitation
Response level setting	Expected current loop response level setting

2. **Static step test**

   This mode provides a static current loop step response observation mode, which enables you to manually adjust the related current loop gain parameters and then observe and verify the current loop response.



Related parameters	Description
Static step test amplitude	Step excitation signal amplitude
Step test duration	Step excitation signal duration
Speed limit value	The maximum speed that can be achieved by stable current excitation
Position movement limit value	Maximum distance that can be achieved by stable current excitation

3. **Step test**

   This mode provides a dynamic current loop step response observation mode, which is used in the same way as static step test. You can use this mode to manually adjust the relevant current loop gain parameters and then observe and verify the current loop response.

Note

In this mode, the motor will move a certain distance. You can restrict the movement by setting the speed limit value and the position movement limit value.

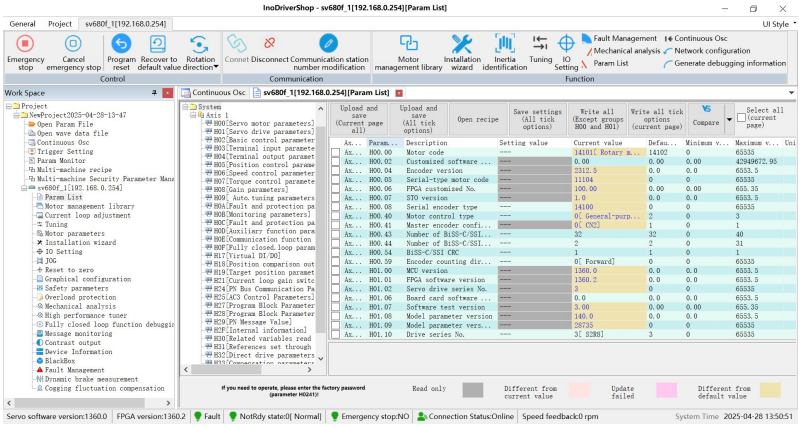
Current loop gain switching

Current loop gain switching is an advanced and supplementary mode of current loop commissioning. With this mode, you can cope with the current loop response deterioration or instability caused by the difference of inductance saturation characteristics of some motors.

When the controlled motor has inductance saturation characteristics in the normal working range, because the current loop gain is usually theoretically calculated and matched through inductance parameters, the large difference of inductance saturation may lead to poor or unstable current loop response under a single set of gains, and you can use the current loop gain switching to adjust it.

The drive provides 32 current loop gain switching coefficients which are not enabled by default. You can enable and use them as needed.

- Theoretically, the gain switching coefficients under different loads can be obtained directly from the inductance saturation characteristic curve provided by the motor manufacturer.
- In practical application, the gain coefficient can be adjusted manually according to the actual effect under different load rates.



9.3 Inertia Auto-tuning

The load inertia ratio (H08.15) is calculated through the following formula:

$$\text{Load inertia ratio} = \frac{\text{Total moment of inertia of mechanical load}}{\text{Moment of inertia of the motor}}$$

The inertia ratio is an important parameter of the servo system, and quick commissioning can be implemented with the correct setting of this parameter.

You can set the load inertia ratio manually or get the inertia ratio through inertia auto-tuning.

The following two inertia auto-tuning modes are available:

- Offline Inertia Auto-tuning
  To enable offline inertia auto-tuning, use H0d.02 (Offline inertia auto-tuning) and make the motor rotate and execute inertia auto-tuning through the keypad. Offline inertia auto-tuning does not involve the host controller
- Online Inertia Auto-tuning
  Send a command to the servo drive through the host controller to make motor act accordingly to finish inertia auto-tuning. Online inertia auto-tuning involves the host controller.

Note

The following requirements must be met to ensure correct calculation of the inertia ratio:

- The actual maximum speed of the motor is higher than 150 rpm.
- The acceleration rate during acceleration/deceleration of the motor is higher than 3000 rpm/s.
- The load torque is stable without dramatic changes.
- The actual inertia ratio does not exceed 120.
- Inertia auto-tuning may fail in case of a large backlash of the transmission mechanism.

9.3.1 Offline Inertia Auto-tuning

Check the following before performing offline inertia auto-tuning:

The motor must meet the following requirements:

- A travel distance of more than one revolutions in the forward/reverse direction is available between the mechanical limit switches.



Ensure limit switches are installed to the machine and a travel distance as described above is reserved to prevent overtravel during inertia auto-tuning.

- The required number of revolutions (H09.09) is fulfilled.
  View the values of H09.06 (Maximum speed of inertia auto-tuning), H09.07 (Time constant for accelerating to the maximum speed during inertia auto-tuning), and H09.09 (Number of revolutions per inertia auto-tuning) to ensure the travel distance that starts from the stop position is larger than the value of H09.09. Otherwise, decrease the value of H09.06 or H09.07 until this requirement is met.

To preform offline inertia auto-tuning:

1. Switch off the S-ON signal.
2. In parameter display mode, switch to H0d.02 and press SET to enable offline inertia auto-tuning.
3. Press the UP/DOWN key to perform offline inertia auto-tuning.
4. To make the motor stop at zero speed, release the UP/DOWN key. Pressing the UP/DOWN key again starts a new inertia auto-tuning. The initial direction of operation is determined by the UP/DOWN key. For applications allowing unidirectional operations only, set H09.05 to 1.
5. Wait until the value displayed on the keypad is stabilized.
6. Hold the SET key down until the operating panel displays "SAVE".
7. Press the MODE key to exit.

For applications requiring large load inertia, set H08.15 (Load moment of inertia) to the approximate value, preventing intense system vibration caused by a low initial inertia.

The offline inertia auto-tuning flowchart is shown as follows.

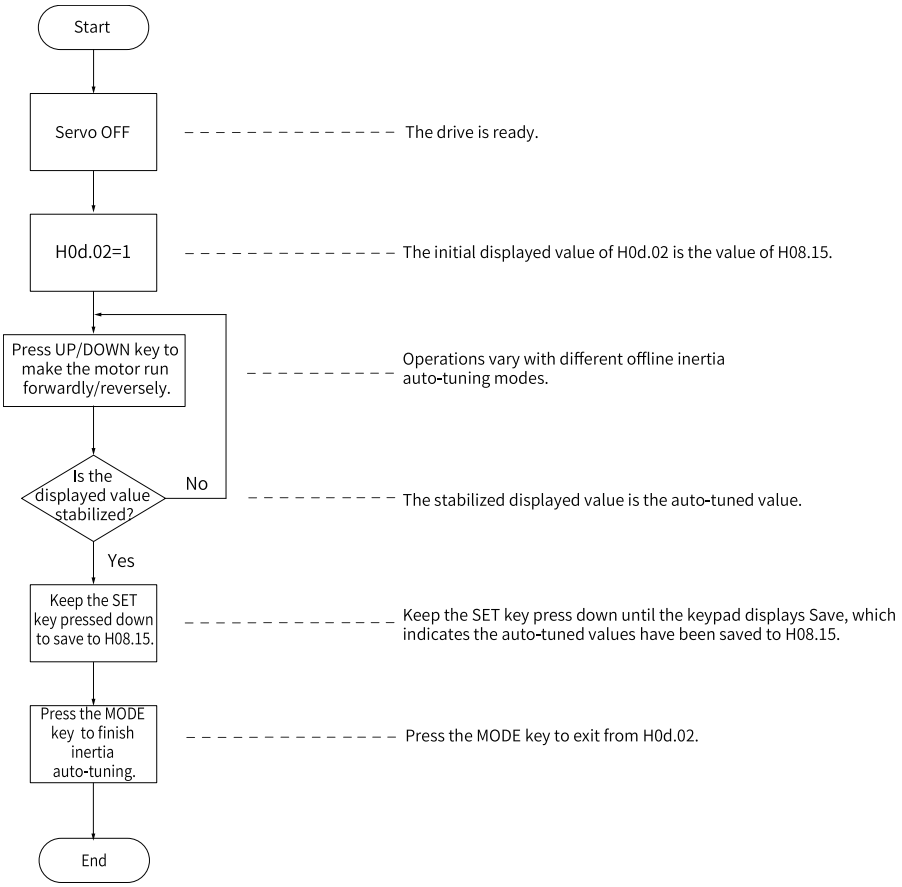


Figure 9-3 Offline inertia auto-tuning flowchart

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.05	0x0905	Offline inertia auto-tuning mode	0: Bi-directional 1: Unidirectional	0	-	At stop	" H09_en.05" on page 549
H09.06	0x0906	Max. speed of inertia auto-tuning	100[mm/s]/[rpm]–1000[mm/s]/[rpm]	500	[mm/s]/[rpm]	At stop	" H09_en.06" on page 549
H09.07	0x0907	Time constant for accelerating to max. speed during inertia auto-tuning	10 ms–5000 ms	125	ms	At stop	" H09_en.07" on page 549
H09.08	0x0908	Interval time after an individual inertia auto-tuning	50 ms–10000 ms	800	ms	At stop	" H09_en.08" on page 550
H09.09	0x0909	Motor rotating distance per inertia auto-tuning	0.00[mm]/[Rev]–100.00[mm]/[Rev]	1.00	[mm]/[Rev]	Real-time	" H09_en.09" on page 550
H0d.02	0x0D02	Inertia auto-tuning enable	0 to 65	0	-	Real-time	" H0d_en.02" on page 595

9.3.2 Online Inertia Auto-tuning

The servo drive supports online inertia auto-tuning. The online inertia auto-tuning flowchart is shown as follows.

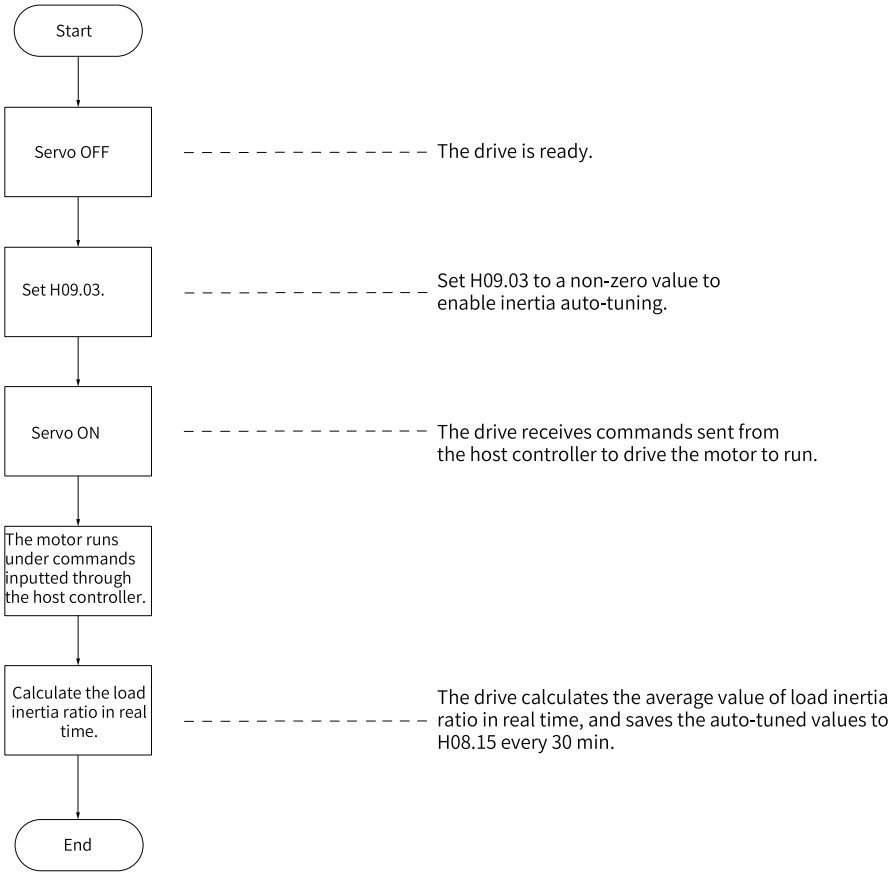


Figure 9-4 Online inertia auto-tuning flowchart

Note

H09.03 defines the real-time updating speed of the load inertia ratio (H08.15).

- H09.03 = 1: Applicable to cases where the actual load inertia ratio rarely changes, such as the machine tool and wood carving machine.
- H09.03 = 2: Applicable to cases where the load inertia ratio changes slowly.
- H09.03 = 3: Applicable to cases where the actual inertia ratio changes rapidly, such as handling manipulators.

☆Related parameter

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H09.03	2009-04h	Online inertia auto-tuning mode	0: Disabled 1: Enabled, changing slowly 2: Enabled, changing normally 3: Enabled, changing quickly	0	-	Real-time

9.4 Gain Auto-tuning

9.4.1 STune

Overview

STune performs gain auto-tuning based on the set stiffness level to fulfill the needs for rapidity and stability.

STune (mode 4) is turned on by default and will be turned off automatically after the drive operates as commanded for 5 min.

STune is intended to be used in applications featuring slight load inertia change. For applications featuring dramatic inertia change or where inertia auto-tuning is unavailable (due to low operating speed or low acceleration rate), turn off STune after initial power-on.

Note

In STune modes 3, 4 and 6, you need to perform load inertia auto-tuning through online inertia auto-tuning and ensure the following conditions are met:

- The load inertia changes quickly.
- The load torque changes quickly.
- Low speed operation (less than 100 rpm for ROT).
- Acceleration/Deceleration is slow (lower than 1000 rpm per second).
- The acceleration/deceleration torque is lower than the unbalanced load/viscous friction torque.

If the conditions for online inertia auto-tuning cannot be fulfilled, set the correct inertia ratio manually.

Description of ITune operation

- **Operation flowchart**

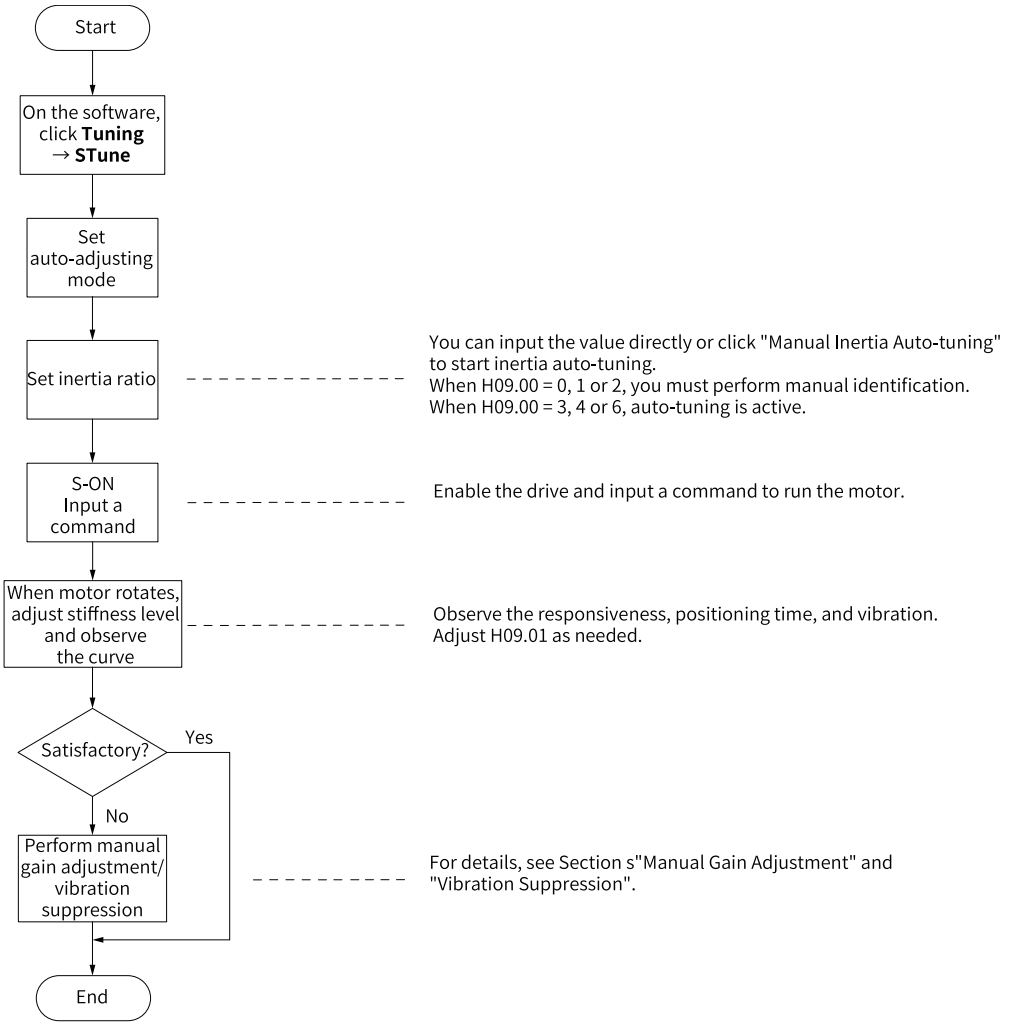


Figure 9-5 Operation flowchart

- **Description**

  You can set the gain auto-tuning mode through the keypad or the software tool.

  1. Select the gain auto-tuning mode.

     - In modes 0, 1 and 2 shown in the following table, you need to set the inertia ratio before stiffness tuning. If the inertia is unknown, adjust the inertia manually. If vibration occurs on the machine, decrease the stiffness level before adjusting the inertia manually.
     - In modes 3, 4, and 6 shown in the following table, you can perform adjustment through the wizard-type interface directly, without the need for setting an inertia ratio.

Mode	Name	Function
0	Inactive	The gains need to be adjusted manually.
1	Standard stiffness level mode	Gains are set automatically based on the set stiffness level.
2	Positioning mode	Gains are set automatically based on the set stiffness level. This mode is applicable to occasions requiring quick positioning.
3	Interpolation mode + Inertia auto-tuning	Gains are set automatically based on the set stiffness level. In this mode, inertia is auto-tuned and vibration is suppressed automatically. This mode is applicable to multi-axis interpolation.

Mode	Name	Function
4	Normal mode + Inertia auto-tuning	Gains are set automatically based on the set stiffness level. The inertia is auto-tuned and vibration is suppressed automatically.
6	Quick positioning mode + Inertia auto-tuning	Gains are set automatically based on the set stiffness level. Inertia is auto-tuned and vibration is suppressed automatically. This mode is applicable to occasions requiring quick positioning.

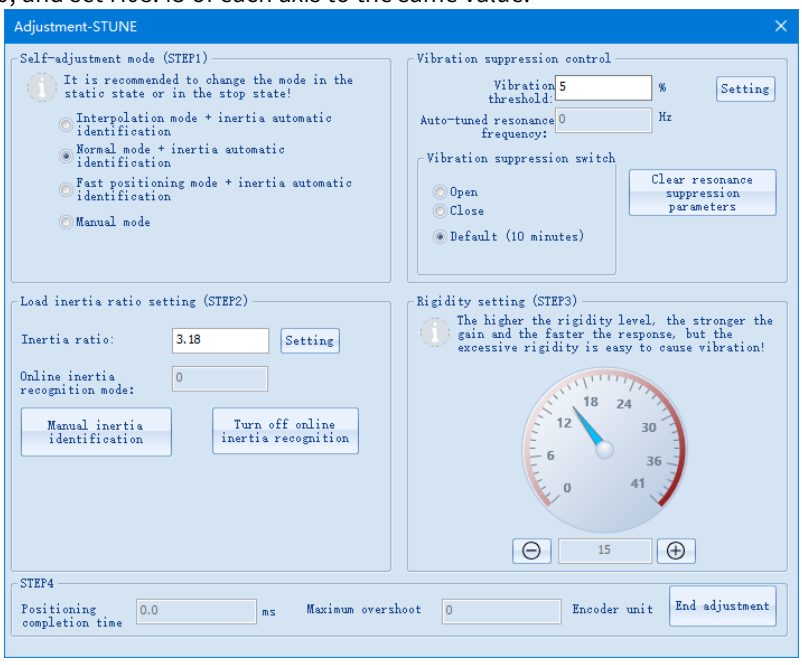
2. Adjust the stiffness level gradually during operation of the load. The present stiffness level value will be written to the drive automatically. Keep monitoring the operating waveform after increasing the stiffness level (increase by one level at a time) until desired performance is achieved.
3. In STune modes 3, 4, and 6, when the speed keeps higher than 100 r/min for more than 5 min, H09.00 returns to 0 automatically. In this case, the drive will exit from the STune mode.

   After tuning, you can set H09.00 to 0 to exit the STune mode.

   To modify the STune time, set H09.37.
4. In STune modes 3, 4, and 6, resonance will be suppressed automatically. If the performance of automatic resonance suppression is inadequate, set H09.58 to 1 to clear resonance suppression parameters, reduce the stiffness level, and perform STune again.
5. For multi-axis trajectories, perform single-axis commissioning first to determine the highest response of each axis and modify the response of each axis manually to ensure position responses of different axes are consistent.

   In STune modes 3 and 4, determine the minimum value of H08.02 (Position loop gain). Then set H09.00 of each axis to 0 and set H08.02 of each axis to the same value.

   In STune mode 6, determine the minimum value of H08.43 (Model gain). Then set H09.00 of each axis to 0, and set H08.43 of each axis to the same value.



Note

To ensure a stable operation of STune modes 3 and 4, gain parameters will be adjusted along with the inertia ratio when the inertia ratio is higher than 13. In multi-axis trajectories, responses may be inconsistent under the same stiffness level.

Remarks

Load inertia ratio range

- In scenarios requiring high response, the inertia ratio must be lower than 500% and should not exceed 1000%.
  - For belt pulley or gear rack requiring not high rigidity and accuracy, the inertia ratio should not exceed 1000%.
  - For lead screw or cardan shaft requiring high rigidity and accuracy, the inertia ratio should not exceed 500%.
  - In scenarios where high positioning accuracy or response is required, the inertia ratio should not exceed 200%.
- In scenarios requiring a certain accuracy and dynamic response, the inertia ratio should not exceed 3000%.
- When the inertia ratio exceeds 3000%, it is hard to adjust and the trajectory control cannot be performed. It is only applicable to mechanisms for point-to-point control and rotary motion but the acceleration/deceleration time should be large.

Rigidity meter setting

The setting range of H09.01 (Stiffness level selection) is 0–41. The level 0 indicates the weakest stiffness and lowest gain and level 41 indicates the strongest stiffness and highest gain.

The following table lists the stiffness levels for different load types for your reference.

Table 9–1 Reference of stiffness levels

Recommended Stiffness Level	Load Mechanisms
Level 8 to level 12	Large-scale machineries
Level 12 to level 18	Applications with low stiffness such as the conveyors
Above level 18	Applications with high stiffness such as the ball screws and direct-connected motors

The following 6 gain auto-tuning modes are available.

- Standard rigidity meter mode (H09.00 set to 1)
  The 1st gain parameters (H08.00 to H08.02 and H07.05) are automatically updated and saved based on the rigidity level set in H09.01.

Table 9–2 Parameters updated automatically in the standard mode

Parameter	Name
H08.00	Speed loop gain
H08.01	Speed loop integral time constant
H08.02	Position loop gain
H07.05	Torque reference filter time constant

- Positioning mode (H09.00 = 2)
  Based on *"Table 9–2" on page 173*, the 2nd gain parameters (H08.03 to H08.05 and H07.06) are also automatically updated and saved based on the rigidity level set in H09.01. In addition, the position loop gain in the 2nd gain parameters is two rigidity levels higher than that in the 1st gain parameters.

Table 9–3 Parameters updated automatically in the positioning mode

Parameter	Name	Description
H08.03	2nd speed loop gain	-
H08.04	2nd speed loop integral time constant	If H08.04 is set to remain at 512.00 ms, the 2nd speed loop integral action is invalid and only proportional control is used in the speed loop.
H08.05	2nd position loop gain	-
H07.06	2nd torque reference filter time constant	-

Speed feedforward parameters have an initial value, which can be modified by the user:

Table 9–4 Parameters with fixed values in the positioning mode

Parameter	Name
H08.19	Speed feedforward gain
H08.18	Time constant of speed feedforward filter

Gain switchover parameters also have an initial value, which can be modified by the user:

Gain switchover is activated automatically in the positioning mode.

Parameter	Name	Value	Description
H08.08	2nd gain mode setting	1	Switchover between the 1st gain set (H08.00...H08.02, H07.05) and 2nd gain set (H08.03...H08.05, H07.06) is active in the positioning mode. In other modes, the original setting is used.
H08.09	Gain switchover condition	10	In positioning mode, the gain switchover condition is that H08.09 is set to 10. In other modes, the original setting is used.
H08.10	Gain switchover delay	5.0 ms	In positioning mode, the gain switchover delay is 5.0 ms. In other modes, the original setting is used.
H08.11	Gain switchover level	50	In the positioning mode, the gain switchover level is 50. In other modes, the original setting is used.
H08.12	Gain switchover hysteresis	30	In the positioning mode, the gain switchover dead time is 30. In other modes, the original setting is used.

Note

In the gain auto-tuning mode, parameters updated along with H09.01 and those with fixed setpoints cannot be modified manually. To modify these parameters, set H09.00 (Gain auto-tuning mode) to 0 first.

- In STune mode 3, 4, or 6,

resonance suppression will be performed automatically. When the load changes or the mechanical structure is re-installed, the system resonance frequency changes accordingly. Set H09.58 to 1 (Enable) and enable the STune mode again after clearing resonance suppression parameters.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.18	0x0912	Frequency of the 3rd notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.18" on page 552
H09.19	0x0913	Width level of the 3rd notch	0 to 20	2	-	Real-time	"H09_en.19" on page 552
H09.20	0x0914	Depth level of the 3rd notch	0 to 99	0	-	Real-time	"H09_en.20" on page 552
H09.21	0x0915	Frequency of the 4th notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.21" on page 553
H09.22	0x0916	Width level of the 4th notch	0 to 20	2	-	Real-time	"H09_en.22" on page 553
H09.23	0x0917	Depth level of the 4th notch	0 to 99	0	-	Real-time	"H09_en.23" on page 553
H09.58	0x093A	STune resonance suppression reset selection	0: Disabled 1: Enabled	0	-	Real-time	"H09_en.58" on page 558

Note

- If H09.00 is set to 3, 4, or 6, the servo drive will suppress the vibration and perform inertia auto-tuning automatically within 10 min (or other time defined by H09-37) after power-on or stiffness level setting, and then the servo drive exits from automatic adjustment. The time can be adjusted by the vibration suppression switch (H09.37). If the inertia auto-tuning function is deactivated automatically, switching to modes 3, 4, or 6 will not activate inertia auto-tuning.
- Do not set H09.00 to 3, 4, 5 or 6 in applications with slow acceleration/deceleration, large vibration, and unstable mechanical couplings.
- In applications where the inertia does not change, set H09.03 (Online inertia auto-tuning mode) to 1 (Enabled, changing slowly). In applications where the inertia changes quickly, set H09.03 to 3 (Enabled, changing quickly).

Solutions to Common Faults

E661.0: STune failure

During STune operation, the gain drops to the lower limit. Position loop gain < 5; velocity loop gain < 5; model loop gain < 10.

- Set the notch manually when vibration cannot be suppressed automatically.

- Modify the electronic gear ratio to improve the command resolution, increase the command filter time constant in the parameter configuration interface.
- Increase the value of H09.11 as appropriate.
- Check whether the current of the machine fluctuates periodically.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.58	0x093A	STune resonance suppression reset selection	0: Disabled 1: Enabled	0	-	Real-time	"H09_en.58" on page 558

9.4.2 ETune

Overview

ETune is a wizard-type auto-adjustment function used to guide users to set corresponding curve trajectories and response parameters. After the curve trajectories and response parameters are set, the servo drive performs auto-tuning automatically to generate the optimal gain parameters. The auto-tuned parameters can be saved and exported as a recipe for use in other devices of the same model.

The ETune function is intended to be used in applications featuring slight load inertia change.

Description of ITune operation

- **Operation flowchart**

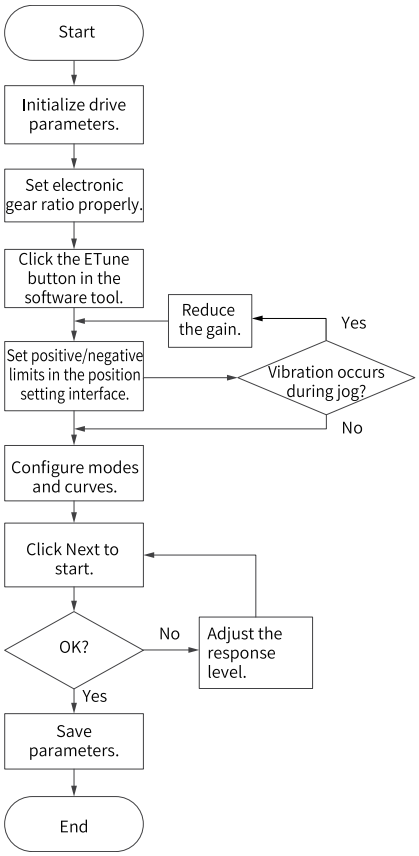
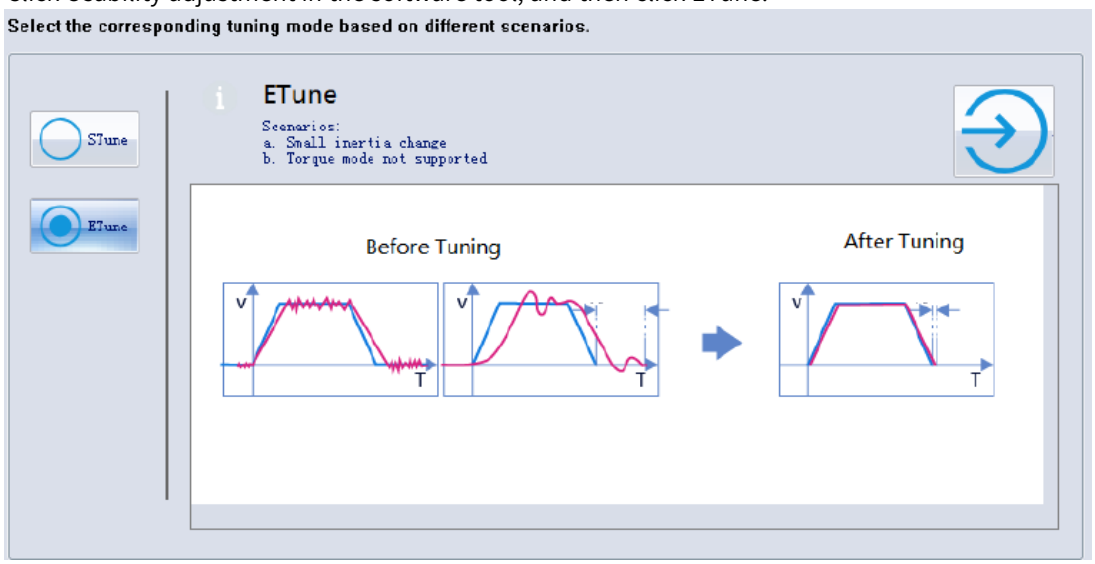


Figure 9-6 Operation flowchart

- **Description**

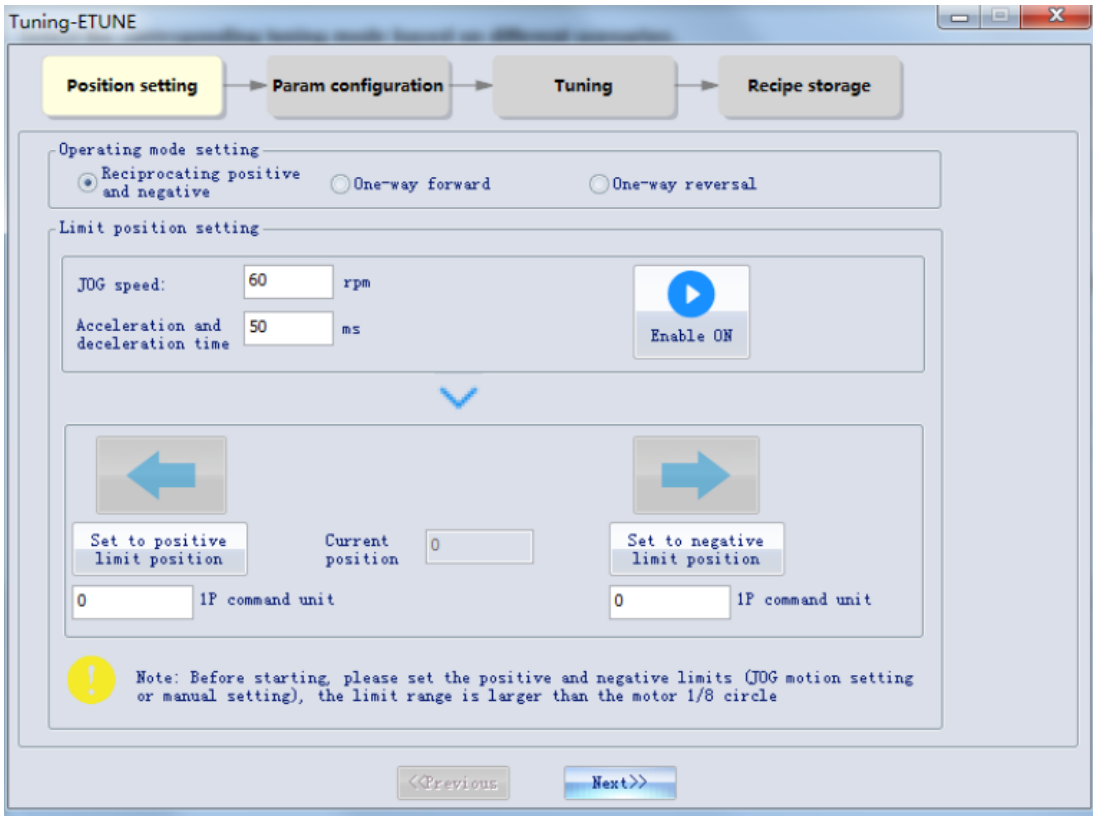
1. Click Usability adjustment in the software tool, and then click ETune.



2. Select any of the following three operation modes based on the operating direction allowed by the machine.

   - In the Reciprocating po... mode, the motor keeps reciprocating within the positive and negative position limits.

- In the One-way forward mode, the motor takes the difference between the positive and negative position limits as the maximum distance per action and keeps running in the forward direction.
- In the One-way forward mode, the motor takes the difference between the positive and negative position limits as the maximum distance per action and keeps running in the reverse direction.



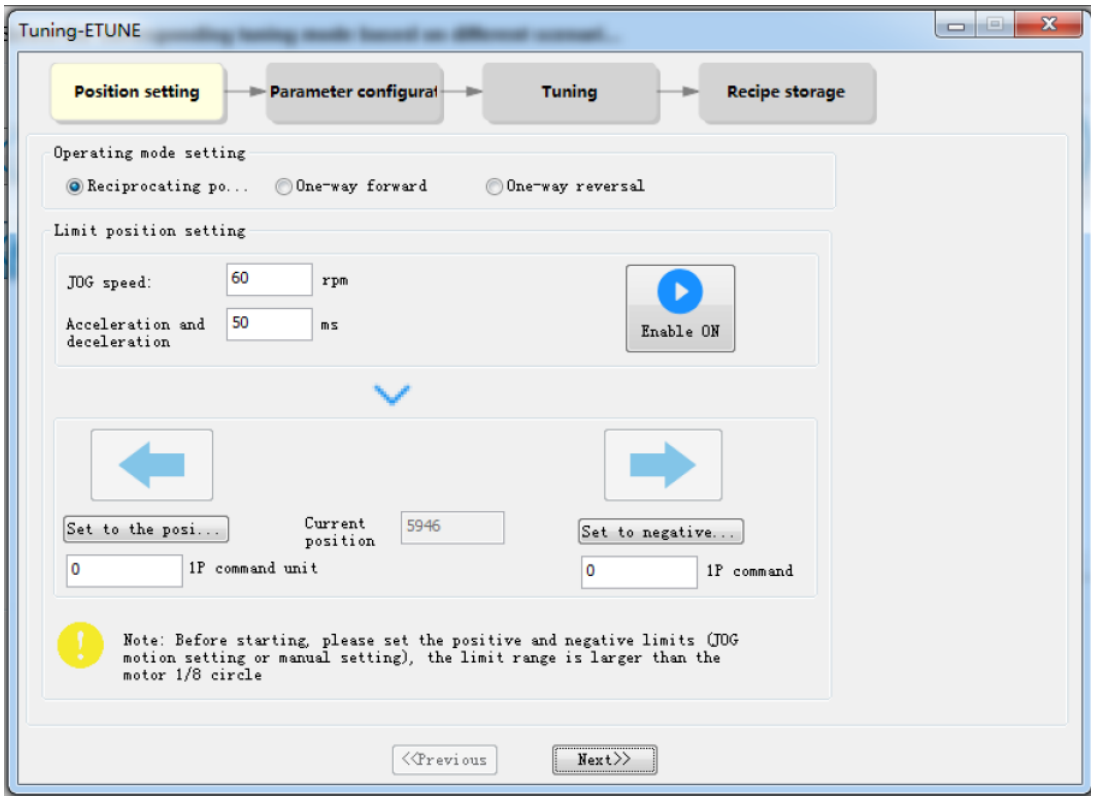
3. Designate the positive and negative limit positions allowed by the motor. The difference between the positive and negative limits defines the position reference pulses for the motor, which is also the value before multiplication/division by the electronic gear ratio.

   You can set the positive and negative position limits through the following two methods.

   - Method 1: Click "Enable ON", and then click ⬅ to make the motor move to the positive position limit. Next, click "Set to positive limit position". Follow the same procedure for setting the negative position limit, and click "Enable OFF" (the "Enable ON" button turns to "Enable OFF" after a click).
   - Method 2: Enter the positive and negative limits directly.

Note

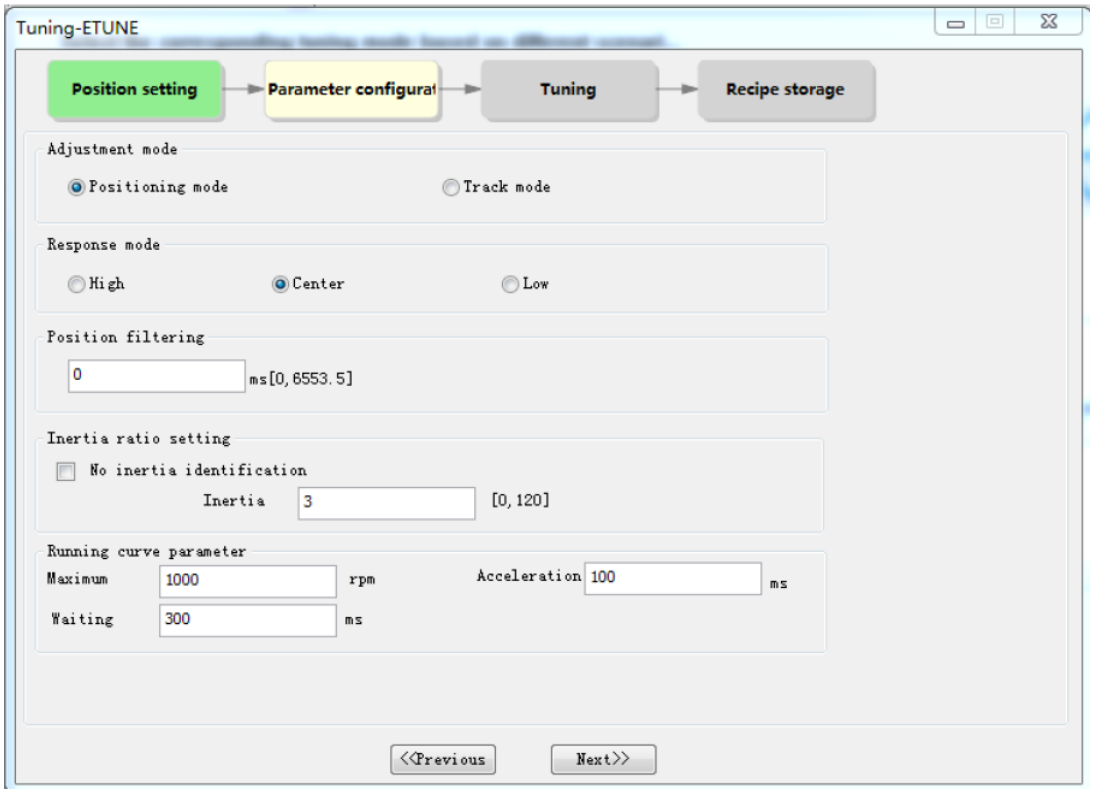
The difference between the positive and negative position limits must be larger than 1/8 of one revolution. The larger the value of the limit position, the better the adaptability of the auto-tuned parameters, but the longer will ETune adjustment take.



4. Click Next to switch to the mode parameter setting interface.

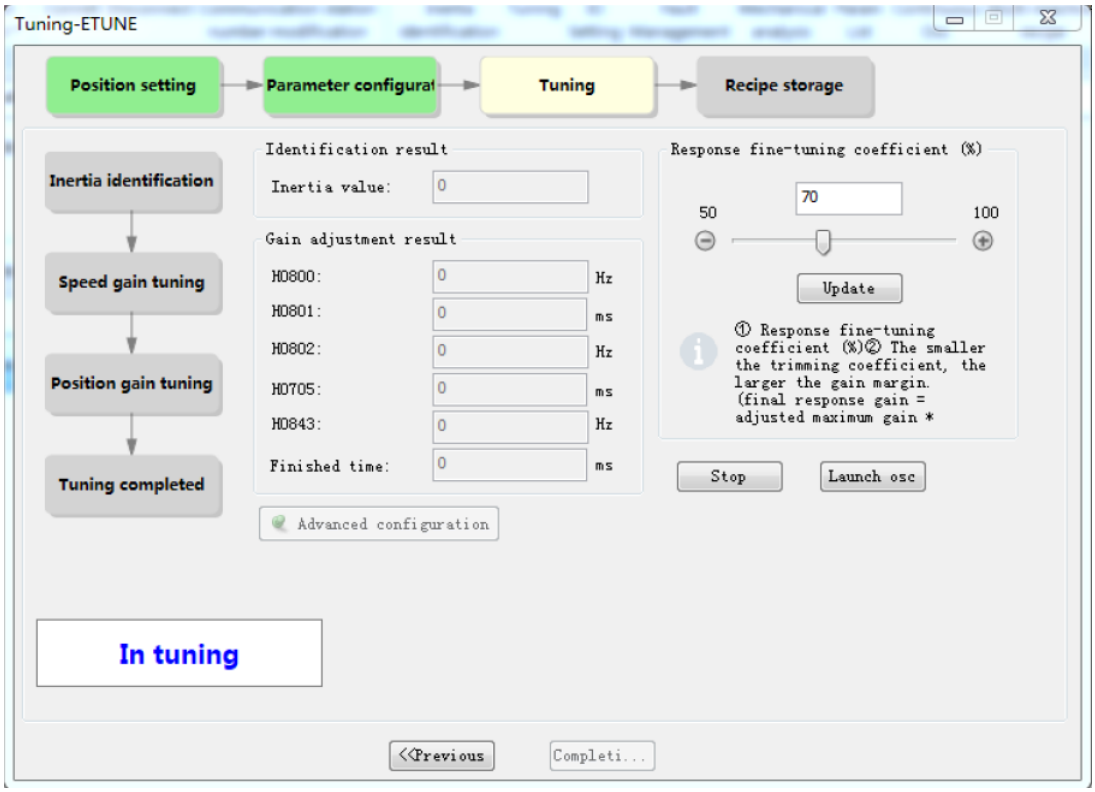
   The adjustment mode is divided into Positioning mode and Track mode.

   Auto-tuning of the inertia ratio is optional. If you choose not to perform inertia auto-tuning, set the correct inertia ratio (the inertia ratio can be modified directly). You can adjust the response level and position filter time constant based on the responsiveness needed and the position reference noise generated during operation. Then configure the motion profile by setting the maximum speed, acceleration/deceleration time and interval time for auto-tuning.

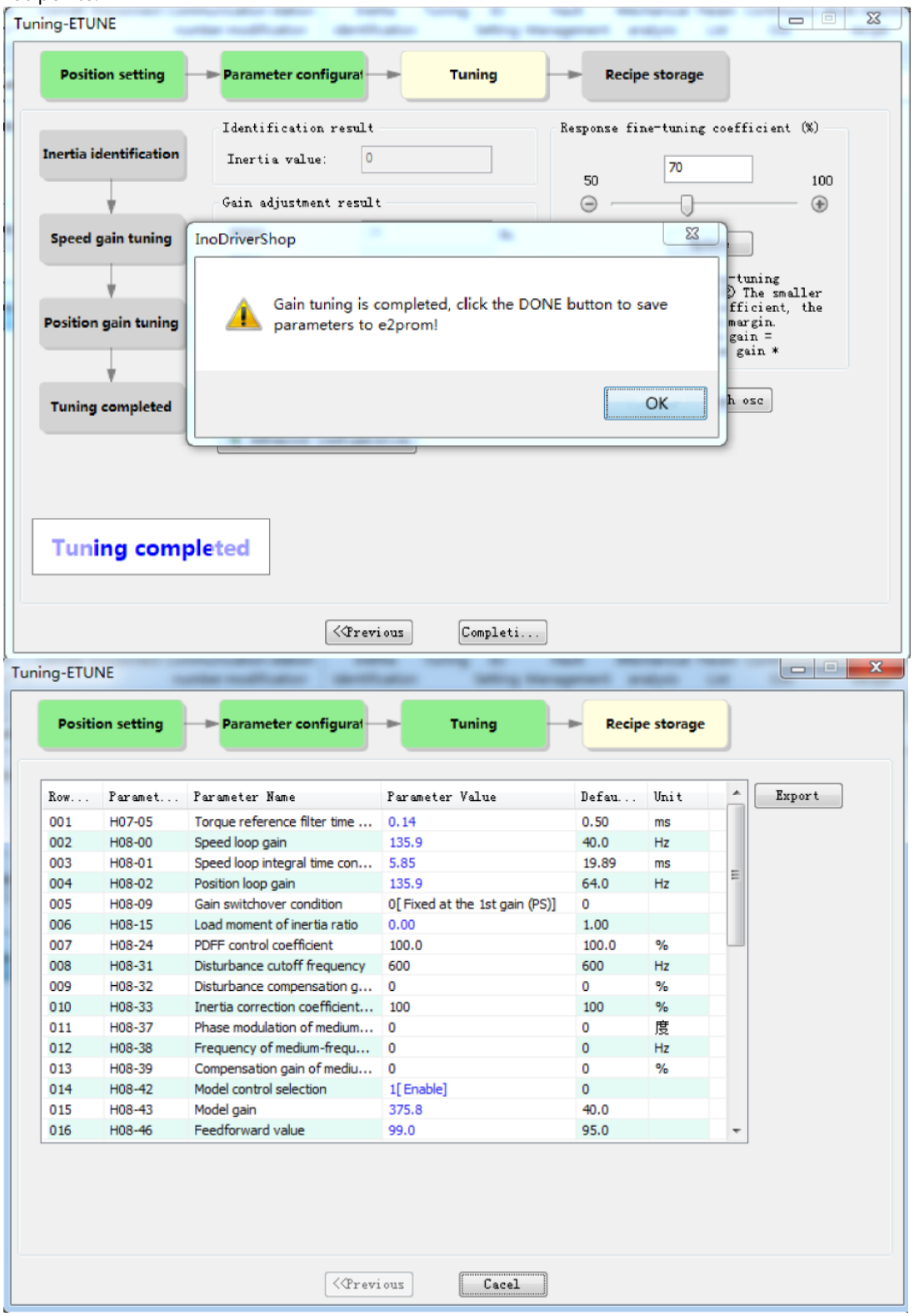


5. Click " Next " to start auto-tuning.

- If you choose to perform inertia auto-tuning, the drive starts inertia auto-tuning based on the set motion profile. After inertia auto-tuning is done, the drive starts gain auto-tuning.
- If you choose not to perform inertia auto-tuning on the start page, the drive starts gain auto-tuning directly after start.



6. During gain auto-tuning, if you modify the Response fine-tuning coefficient and click " Update ", gain auto-tuning will be continued based on the fine-tuning coefficient entered. After gain auto-tuning is done, you can click " Done " to save parameters to EEPROM and export parameters as a recipe file.



Precautions

- You can adjust the maximum speed and acceleration/deceleration time of the motion profile based on actual conditions. The acceleration/deceleration time can be increased properly because positioning will be quickened after auto-tuning.
- If the acceleration/deceleration time is too short, overload may occur. In this case, increase the acceleration/deceleration time properly.
- For vertical axes, take anti-drop measures beforehand and set the stop mode upon fault to "Stop at zero speed".
- For lead screw transmission, shorten the travel distance if the tuning duration is too long.

Solutions to Common Faults

Fault	Cause	Solution
E662.0: ETune failure	Check whether resonance that occurred during ETune operation cannot be suppressed.	• Set the notch manually when vibration cannot be suppressed automatically. • Modify the electronic gear ratio to improve the command resolution, increase the command filter time constant or in the parameter configuration interface. • Increase the value of H09.11 as appropriate. • Check whether the current of the machine fluctuates periodically. • Check whether the positioning threshold is too low. Increase the reference acceleration/ deceleration time.
A600.0: Inertia auto-tuning failure	• Continuous vibration occurs during auto-tuning. • The auto-tuned values fluctuate dramatically. • Mechanical couplings of the load are loose or eccentric. • An alarm occurs during auto-tuning and causes interruption. • The vibration cannot be suppressed if the load carries large inertia. In this case, increase the acceleration/deceleration time to ensure the motor current is unsaturated. • The position following-up is too poor. That is, the maximum speed of the motor is less than the speed setpoint of the inertia auto-tuning.	• Rectify the fault and perform inertia auto-tuning again. • For vibration that cannot be suppressed, enable vibration suppression. • Ensure mechanical couplings are connected securely. • Increase the maximum operating speed, reduce the acceleration/deceleration time, and shorten the stroke of the lead screw during ETune operation. • Ensure that the speed setpoint is less than the maximum speed of the motor.

9.5 Manual Gain Tuning

9.5.1 Basic Parameters

When gain auto-tuning cannot fulfill the application needs, perform manual gain tuning. to achieve better result.

The servo system consists of three control loops, which are position loop, speed loop, and current loop from external to internal. The basic control diagram is shown in the following figure.

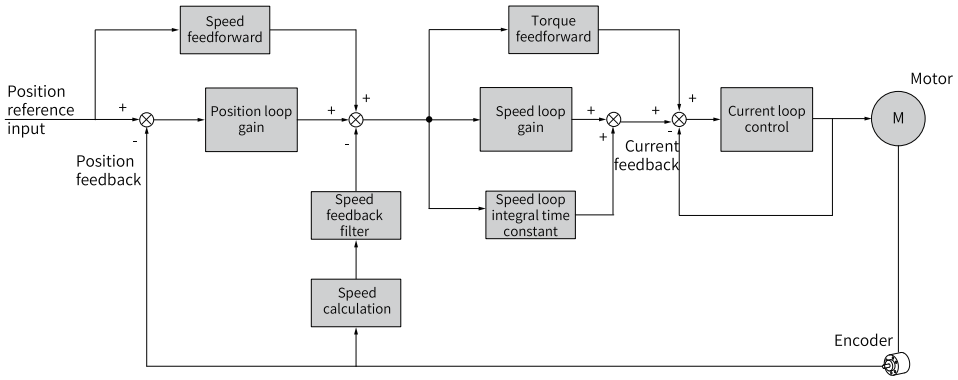


Figure 9-7 Basic control for manual gain tuning

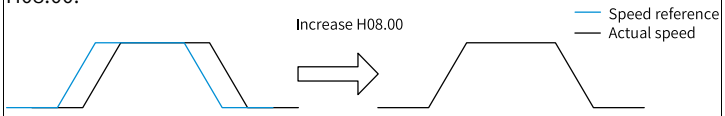
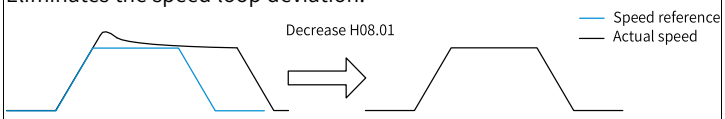
Caution

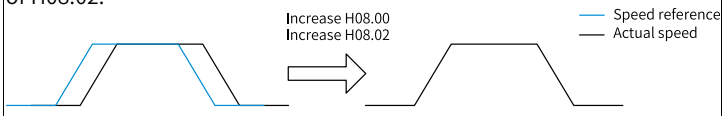
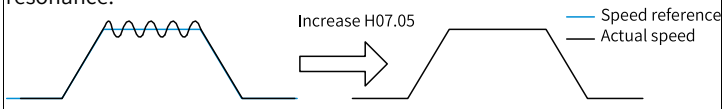
The response level of the inner loop must be higher than that of the outer loop. If it is not observed, the system may be unstable.

The current loop gain has been set with the highest level of responsiveness by default, avoiding the need for adjustment. you only need to adjust the position loop gain, speed loop gain and other auxiliary gains. When you choose a third party motor, the default current loop gain may not be suitable. You must perform auto-tuning for the current loop gain. For gain tuning in the position control mode, the position loop gain must be increased together with the speed loop gain, and the responsiveness of the former must be lower than the latter.

The following table describes how to adjust the basic gain parameters.

Table 9–5 Adjustment of gain parameters

Step	Parameter	Name	Description
1	H08.00	Speed loop gain	Function: Determines the maximum frequency of a variable speed reference that can be followed by the speed loop. When H08.15 (Load inertia ratio) is set correctly, the maximum frequency that can be followed by the speed loop is the setpoint of H08.00.  Note: • Increasing the setpoint without incurring extra noise or vibration shortens the positioning time, stabilizes the speed, and improves the follow-up behavior. • If noise occurs, decrease the setpoint. • If mechanical vibration occurs, enable mechanical resonance suppression. For details, see *" Vibration Suppression" on page 205*.
2	H08.01	Speed loop integral time constant	Function: Eliminates the speed loop deviation.  Note: Set H08.01 according to the following formula: 500 ⩽ H08.00 x H08.01 ⩽ 1000 For example, if H08.00 is set to 40.0 Hz, the setpoint of H08.01 must meet the following requirement: 12.50 ms ⩽ H08.01 ⩽ 25.00 ms Decreasing the setpoint strengthens the integral action and shortens the positioning time, but an excessively low setpoint may easily lead to mechanical vibration. An excessively high setpoint prevents the speed loop deviation from being cleared. When H08.01 is set to 512.00 ms, the integral is invalid.

Step	Parameter	Name	Description
3	H08.02	Position loop gain	Function: It sets the position reference maximum frequency followed by the position loop. The maximum follow-up frequency of the position loop equals the value of H08.02.  Note: To ensure system stability, the maximum follow-up frequency of the speed loop must be 3 to 5 times higher than that of the position loop. $3 \leqslant \frac{2 \times \pi \times H08.00}{H08.02} \leqslant 5$ For example, when H08.00 is set to 40.0 Hz, H08.02 must meet the following requirement: 50.2 Hz ⩽ H08.02 ⩽ 83.7 Hz Adjust the setting based on the positioning time. Increasing the setpoint shortens the positioning time and improves the anti-interference capacity of a motor at standstill. An excessively high setpoint may easily lead to system instability and oscillation.
4	H07.05	Torque reference filter time constant	Function: Eliminates the high-frequency noise and suppresses mechanical resonance.  Note: Ensure the cutoff frequency of the torque reference low-pass filter is 4 times higher than the maximum follow-up frequency of the speed loop, as shown in the following formula: $\frac{1000}{2 \times \pi \times H07.05} \geqslant (H08.00) \times 4$ For example, when H08.00 is set to 40.0 Hz, the setpoint of H07.05 must be lower than or equal to 1.00 ms. If vibration occurs after H08.00 is increased, adjust H07.05 to suppress the vibration. For details, see *" Vibration Suppression" on page 205*. An excessively high setpoint weakens the responsiveness of the current loop. To suppress vibration upon stop, increase the setpoint of H08.00 and decrease the setpoint of H07.05. If strong vibration occurs upon stop, decrease the setpoint of H07.05.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H07.05	0x0705	Torque reference filter time constant 1	0.00 ms–30.00 ms	0.50	ms	Real-time	"H07_en.05" on page 529
H08.00	0x0800	Speed loop gain	0.0 Hz–2000.0 Hz	40.0	Hz	Real-time	"H08_en.00" on page 534
H08.01	0x0801	Speed loop integral time constant	0.15 ms–512.00 ms	19.89	ms	Real-time	"H08_en.01" on page 535
H08.02	0x0802	Position loop gain	0.0 Hz–2000.0 Hz	64.0	Hz	Real-time	"H08_en.02" on page 535

9.5.2 Gain switchover

Gain switchover, which is active in the position control and speed control modes only, It is only effective in position and speed control modes. achieve the following purposes:

- Switching to the lower gain when the motor is at a standstill (servo ON) to suppress vibration
- Switching to the higher gain when the motor is at a standstill to shorten the positioning time
- Switching to the higher gain during operation of the motor to achieve better reference tracking performance
- Switching between different gain settings through an external signal to fit different conditions of the load devices

H08.08 = 0

When H08.08 is set to 0, the 1st gain (H08.00 to H08.02 and H07.05) is used, but you can switch between proportional control and proportional integral control through FunIN.3 (GAIN_SEL, gain switchover) for the speed loop.

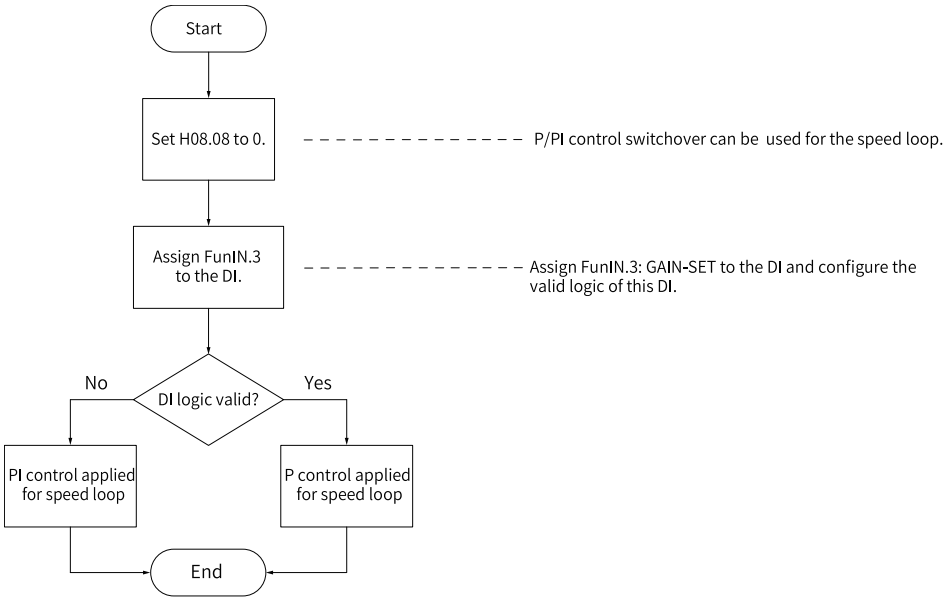


Figure 9-8 Gain switchover flowchart when H08.08 is set to 0

H08.08 = 1

You can switch between the 1st gain set (H08.00...H08.02, H07.05) and 2nd gain set (H08.03...H08.05, H07.06) based on the condition defined by H08.09.

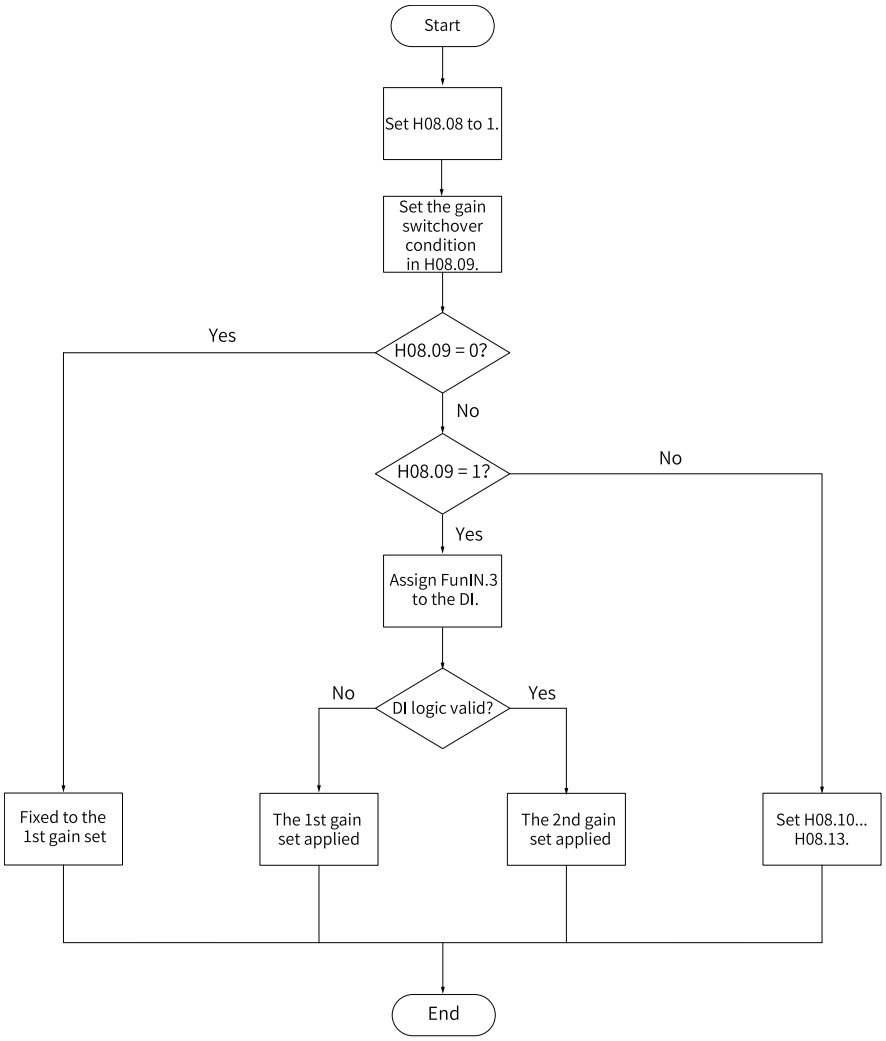
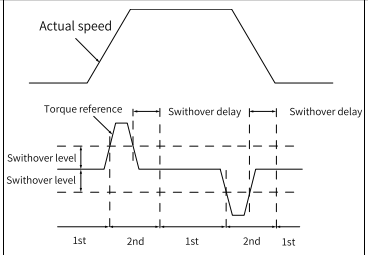
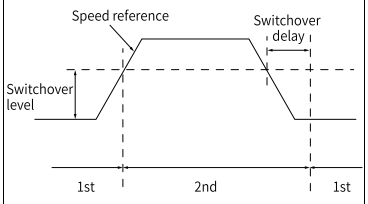
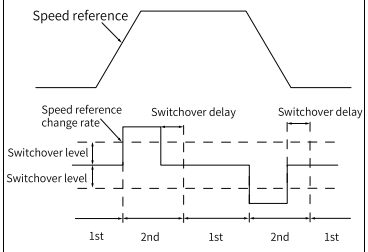
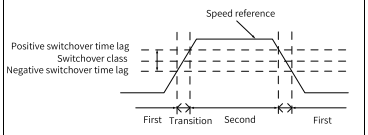
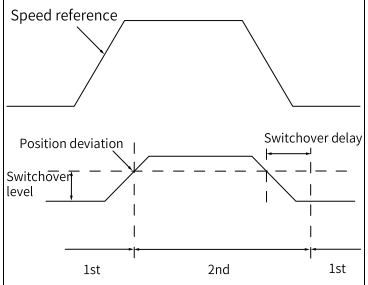
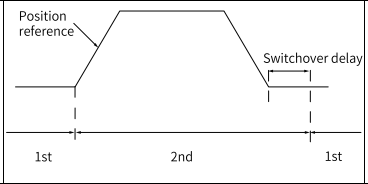
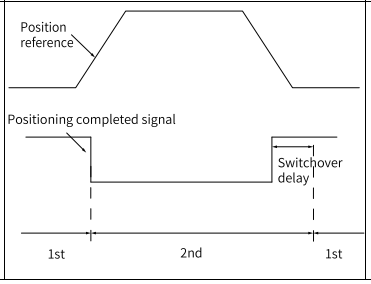


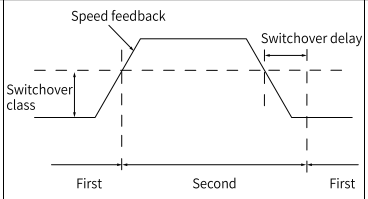
Figure 9-9 Gain switchover flowchart when H08.08 is set to 1

There are 10 2nd gain switchover modes. The following table describes the diagrams and related parameters of different conditions.

Table 9–6 Conditions for gain switchover

Gain Switchover Condition			Related parameters		
H08.09 Value	Condition	Diagram	Delay Time (H08.10)	Gain switchover level (H08.11)	Switchover Dead Time (H08.12)
0	Fixed to the 1st gain set	-	Inactive	Inactive	Inactive
1	DI (Func3) switchover	-	Inactive	Inactive	Inactive

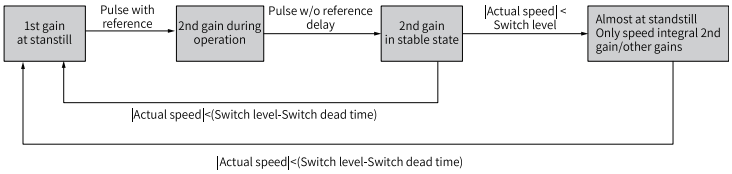
Gain Switchover Condition			Related parameters		
H08.09 Value	Condition	Diagram	Delay Time (H08.10)	Gain switchover level (H08.11)	Switchover Dead Time (H08.12)
2	torque reference		Active	Active (%)	Active (%)
3	Speed reference		Active	Active	Active
4	Speed reference change rate		Active	Active (10 rpm/s)	Inactive (10 rpm/s)
5	Speed reference high/low-speed threshold		Inactive	Active (rpm)	Active (rpm)
6	Position deviation		Active	Active (encoder unit)	Active (encoder unit)
7	Position reference		Active	Inactive	Inactive
8	Positioning uncompleted		Active	Inactive	Inactive

Gain Switchover Condition			Related parameters		
H08.09 Value	Condition	Diagram	Delay Time (H08.10)	Gain switchover level (H08.11)	Switchover Dead Time (H08.12)
9	Actual speed		Active	Active (rpm)	Active (rpm)
10	Position reference + Actual speed	See the following note for details.	Active	Active (rpm)	Active (rpm)

Caution

H08.10 (Gain switchover delay) is valid only during switching to the 1st gain.

Note



☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.09	0x0809	Gain switchover condition	0: Fixed to the 1st gain set (PS) 1: Switched as defined by Func3 of DI 2: Torque reference too large (PS) 3: Speed reference too large (PS) 4: Speed reference change rate too large (PS) 5: Speed reference low/high speed threshold (PS) 6: Position deviation too large (P) 7: Position reference available (P) 8: Positioning unfinished (P) 9: Actual speed (P) 10: Position reference + Actual speed (P)	0	-	Real-time	"H08_en.09" on page 536
H08.10	0x080A	Gain switchover delay	0.0 ms–1000.0 ms	5.0	ms	Real-time	"H08_en.10" on page 537

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.11	0x080B	Gain switchover level	0 to 20000	50	-	Real-time	"H08_en.11" on page 537
H08.12	0x080C	Gain switchover hysteresis	0 to 20000	30	-	Real-time	"H08_en.12" on page 537
H08.13	0x080D	Position gain switchover time	0.0 ms–1000.0 ms	3.0	ms	Real-time	"H08_en.13" on page 538

9.5.3 Position Reference Filter

Name	Function	Applicable Occasion	Impact of Excessive Filtering
Position reference filter	Filters the position references (encoder unit) divided or multiplied by the electronic gear ratio to smoothen the operation process of the motor and reduce shock to the machine.	• The acceleration/deceleration process is not performed on the position references sent from the host controller. • The pulse reference frequency is low. • The electronic gear ratio is larger than 10.	The response delay is prolonged.

9.5.4 Feedforward gain

Speed feedforward can be applied to the position control mode. The speed feedforward function can be used to improve the speed reference responsiveness and reduce the position deviation at fixed speed.

Speed feedforward

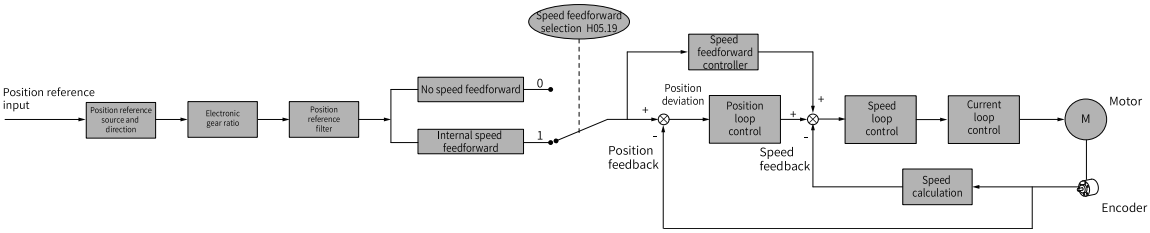


Figure 9-10 Operating procedure for speed feedforward control

Operating procedure for speed feedforward:

1. Set the speed feedforward signal source.
   Set H05.19 (Speed feedforward control) to a non-zero value to enable the speed feedforward function. The corresponding signal source will be selected as well.

Parameter	Name	Value	Remarks
H05.19	Speed feedforward control	0: No speed feedforward	-
		1: Internal speed feedforward	Defines the speed corresponding to the position reference (encoder unit) as the speed feedforward signal source.
		2: External speed feedforward (H05.72)	-
		3: Zero phase	-

2. Set speed feedforward parameters.
   Set the speed feedforward gain (H08.19) and speed feedforward filter time constant (H08.18).

   ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.18	0x0812	Time constant of speed feedforward filter	0.00 ms–64.00 ms	0.50	ms	Real-time	"H08_en.18" on page 538
H08.19	0x0813	Speed feedforward gain	0.0% to 100.0%	0.0	%	Real-time	"H08_en.19" on page 539

Zero phase control

Zero phase control is used to compensate for the position deviation generated upon start delay of the position reference, reducing the position deviation upon start/stop in the position control mode.

The loop calculation model is shown in the following figure.

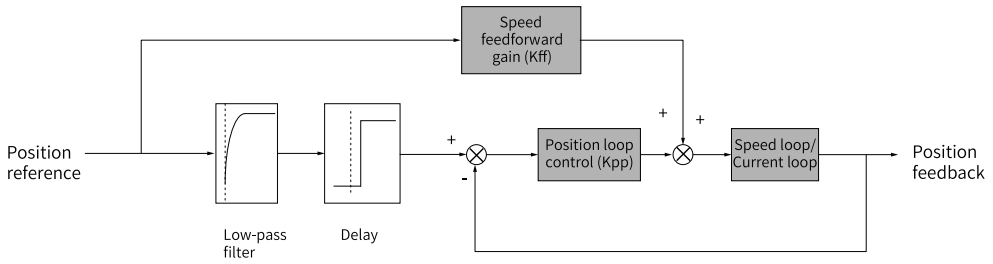


Figure 9-11 Zero phase control

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.04	0x0504	First-order low-pass filter time constant	0.0 ms–6553.5 ms	0.0	ms	At stop	"H05_en.04" on page 515
H05.19	0x0513	Speed feedforward control	0: No speed feedforward 1: Internal speed feedforward 2: H05.72 3: Zero phase	1	-	At stop	"H05_en.19" on page 516
H08.17	0x0811	Zero phase delay	0.0 ms–4.0 ms	0.0	ms	Real-time	"H08_en.17" on page 538

Torque feedforward

In the position control mode, torque feedforward can be used to improve torque reference responsiveness and reduce the position deviation during operation at constant acceleration/deceleration rate.

In the speed control mode, torque feedforward can be used to improve speed reference responsiveness and reduce the speed deviation during operation at constant speed.

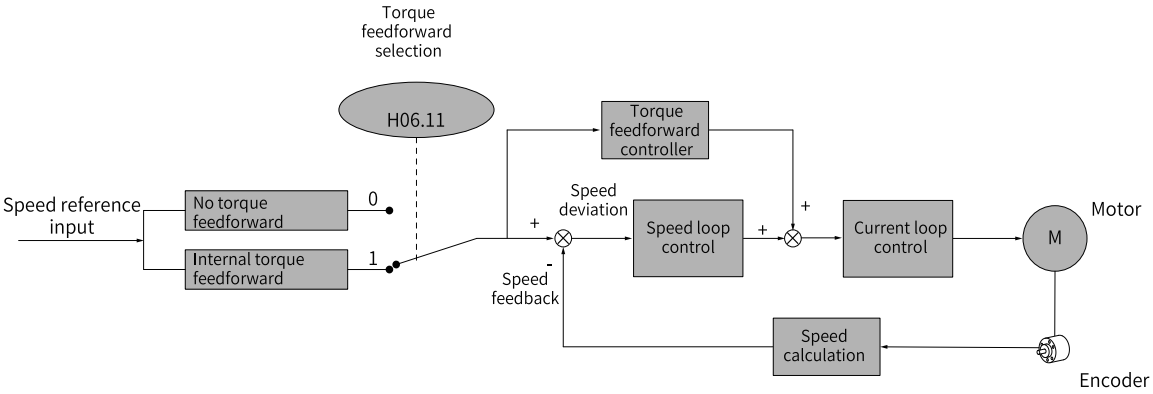


Figure 9-12 Operation diagram of torque feedforward control

The procedure for setting torque feedforward is as follows:

1. Set the torque feedforward signal source.
   Set H06.11 (Torque feedforward control) to 1 to enable the torque feedforward function. The corresponding signal source will be selected as well.

Parameter	Name	Value	Remarks
H06.11	Torque feedforward control	0: No torque feedforward	-
		1: Internal torque feedforward	Use the speed reference as the source of the torque feedforward signal. In the position control mode, the speed reference is outputted from the position controller.

2. Set torque feedforward parameters.

Parameter	Name	Description
H08.20	Torque feedforward filter time constant	Function: • Increasing the value of H08.21 improves the response but may cause overshoot during acceleration/ deceleration. • Decreasing the value of H08.20 suppresses overshoot during acceleration/deceleration. Increasing the value of H08.20 suppresses the noise. Note: • Keep H08.20 to the default value, and then gradually increase the value of H08.21 from 0 to a certain value at which torque feedforward achieves the desired effect. • Adjust H08.20 and H08.21 repeatedly until a balanced performance is achieved.
H08.21	Torque feedforward gain	See this section for details.

9.5.5 PDFF Control

The pseudo derivative feedback and feedforward (PDFF) control can be used to adjust speed loop control in the non-torque control modes.

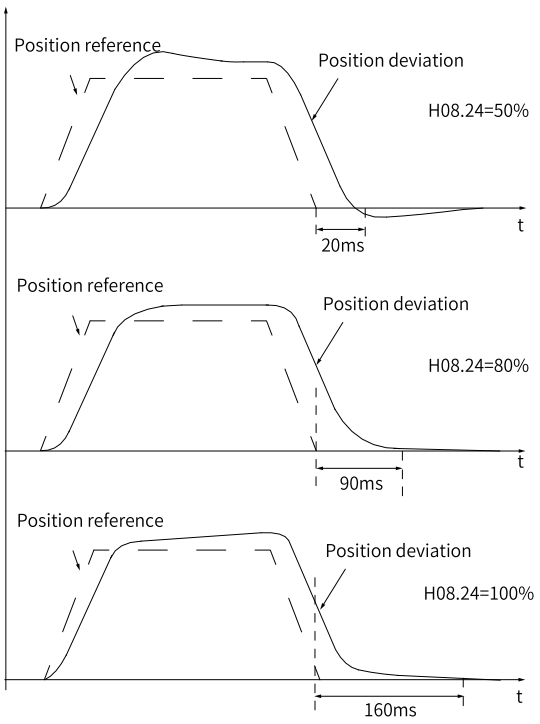


Figure 9-13 Example of PDFF control

Through adjusting the speed loop control method, PDFF control enhances the anti-disturbance capacity of the speed loop and improves the performance in following the speed references.

Parameter	Name	Description
H08.24	PDFF control coefficient	Function: • Defines the control method of the speed loop in the non-torque control modes. Note: • Setting H08.24 to an excessively low value slows down the responsiveness of the speed loop. • When the speed feedback overshoots, gradually decrease the setpoint of H08.24 from 100.0 to a certain value at which the PDFF control achieves the desired effect. • When H08.24 is set to 100.0, the speed loop control method does not change and the default proportional integral control is used.

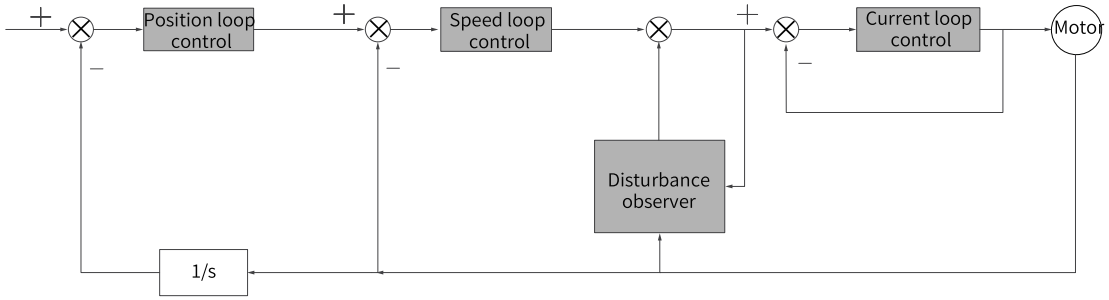
9.5.6 Torque disturbance observer

This function is intended to be used in the non-torque control modes.

Disturbance observer

The disturbance observer is used to observe external disturbance. You can set different cutoff frequencies and compensation values to observe and suppress the disturbance within the frequency range.

The following figure depicts the control block diagram for disturbance observer 1.



Note

1/s: Integral element

Parameter	Name	Description
H08.31	Disturbance cutoff frequency	The higher the cutoff frequency, the more easily will vibration occur.
H08.32	Disturbance compensation gain	Defines the compensation percentage for the observer.
H08.33	Disturbance observer inertia correction coefficient	H08.33 needs to be changed only when the inertia ratio does not reflect the actual condition. The acting inertia is the product of the set inertia and H08.33. It is recommended to use the default value of H08.33.

☆ Related parameters:

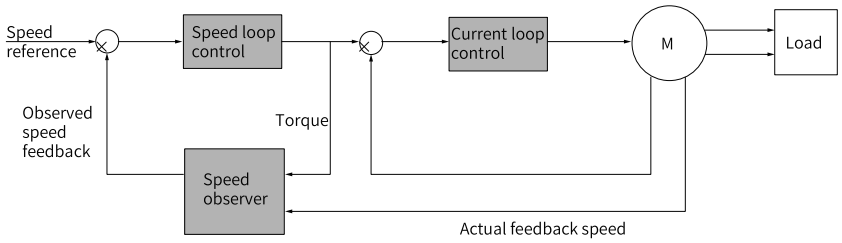
Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.31	0x081F	Disturbance cutoff frequency	1 Hz–4000 Hz	600	Hz	Real-time	"H08_en.31" on page 542
H08.32	0x0820	Disturbance compensation gain	0% to 100%	0	%	Real-time	"H08_en.32" on page 542
H08.33	0x0821	Disturbance observer inertia correction coefficient	1% to 1600%	100	%	Real-time	"H08_en.33" on page 542

9.5.7 Speed Observer

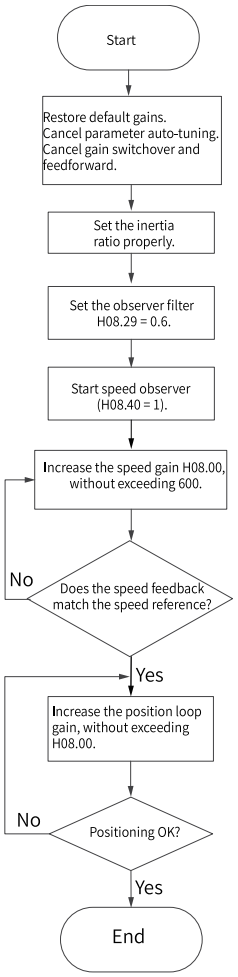
The speed observer, which facilitates quick positioning, applies in applications with slight load characteristic change and constant inertia.

It improves the responsiveness and filters high frequencies automatically, improving the gains and shortening the positioning time without incurring high-frequency vibration.

The block diagram for the speed observer is as follows.



Commissioning Steps



Note

- Before using the speed observer, set H08.15 (Load inertia ratio) to a proper value or perform inertia auto-tuning. A wrong inertia ratio can cause vibration.
- Setting H08.27, H08.28, or H08.29 to excessively low or high values can result in motor vibration.

Related parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.00	0x0800	Speed loop gain	0.0 Hz–2000.0 Hz	40.0	Hz	Real-time	"H08_en.00" on page 534
H08.27	0x081B	Speed observer cutoff frequency	50 Hz–600 Hz	170	Hz	Real-time	"H08_en.27" on page 541
H08.28	0x081C	Speed observer inertia correction coefficient	1% to 1600%	100	%	Real-time	"H08_en.28" on page 541

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.29	0x081D	Speed observer filter time	0.00 ms–10.00 ms	0.80	ms	Real-time	"H08_en.29" on page 542
H08.40	0x0828	Speed observer selection	0: Disabled 1: Enabled	0	-	Real-time	"H08_en.40" on page 543

9.5.8 Model Tracking

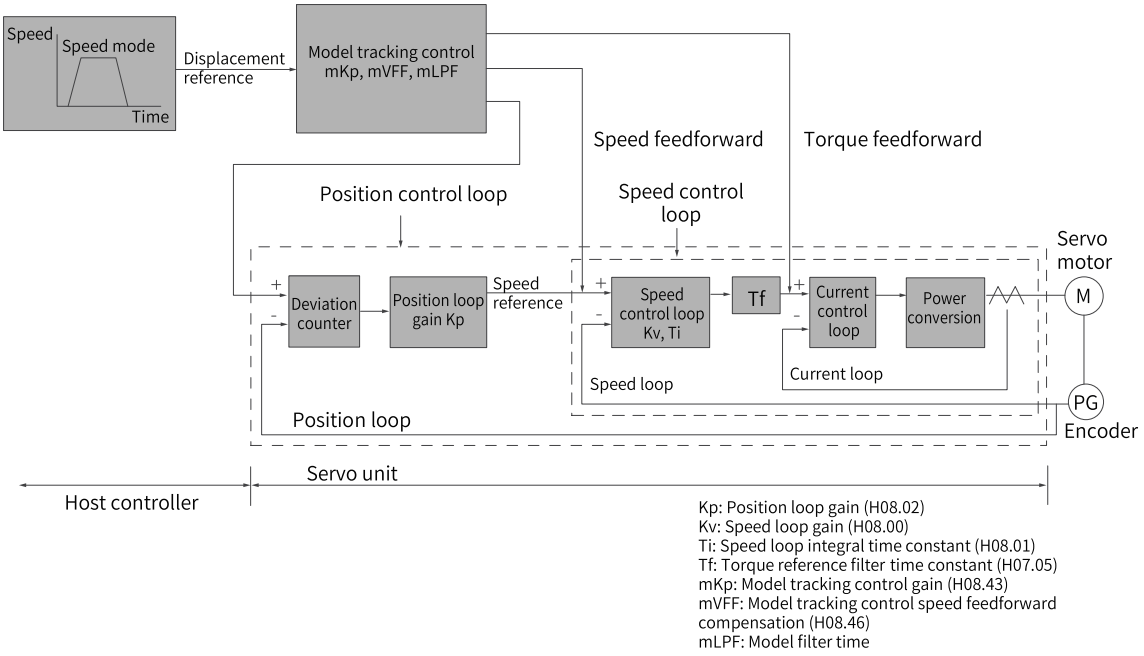
The model tracking control, which is only available in the position control mode, can be used to improve responsiveness and shorten the positioning time. It is only available in the position control mode.

Parameters used by model tracking are normally set automatically through ITune or ETune along with the gain parameters.

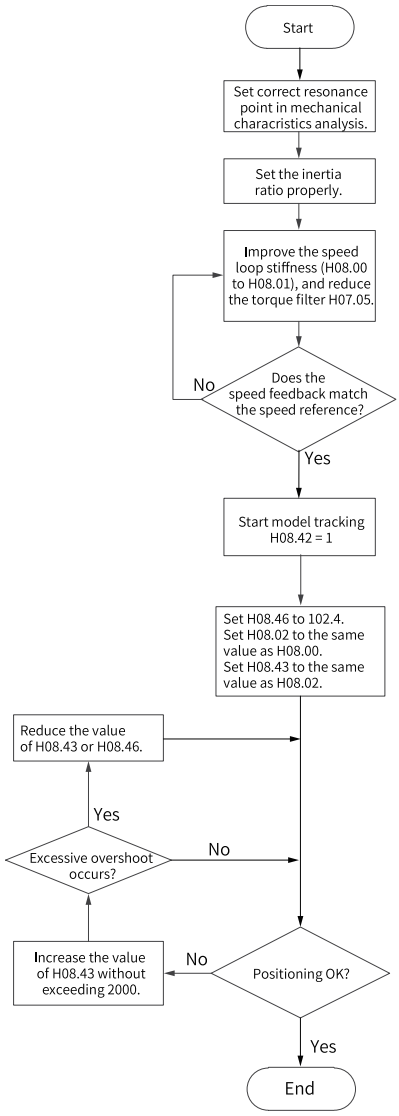
However, manual tuning is needed in the following situations:

- The auto-tuned values cannot deliver desired performance.
- Improving the responsiveness takes priority over the auto-tuned or customized values.
- User-defined gain parameters or model tracking control parameters are needed.

The block diagram for model tracking control is as follows.



Commissioning Steps



Note

Ensure the set inertia is accurate. Otherwise, motor vibration may occur.

Related parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H07.05	0x0705	Torque reference filter time constant 1	0.00 ms–30.00 ms	0.50	ms	Real-time	" *H07_en.05*" on *page 529*
H08.00	0x0800	Speed loop gain	0.0 Hz–2000.0 Hz	40.0	Hz	Real-time	" *H08_en.00*" on *page 534*
H08.01	0x0801	Speed loop integral time constant	0.15 ms–512.00 ms	19.89	ms	Real-time	" *H08_en.01*" on *page 535*

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.02	0x0802	Position loop gain	0.0 Hz–2000.0 Hz	64.0	Hz	Real-time	"H08_en.02" on page 535
H08.42	0x082A	Model control selection	0: Disabled 1: Enabled 2: Reserved	0	-	Real-time	"H08_en.42" on page 544
H08.43	0x082B	Model gain	0.1 to 2000.0	40.0	-	Real-time	"H08_en.43" on page 544
H08.46	0x082E	Feedforward value	0.0 to 102.4	95.0	-	Real-time	"H08_en.46" on page 544

9.5.9 Friction Compensation

Friction compensation is used to reduce the impact of the friction on the operating effect during mechanical transmission. Use different positive/negative compensation values according to the direction of operation.

Note

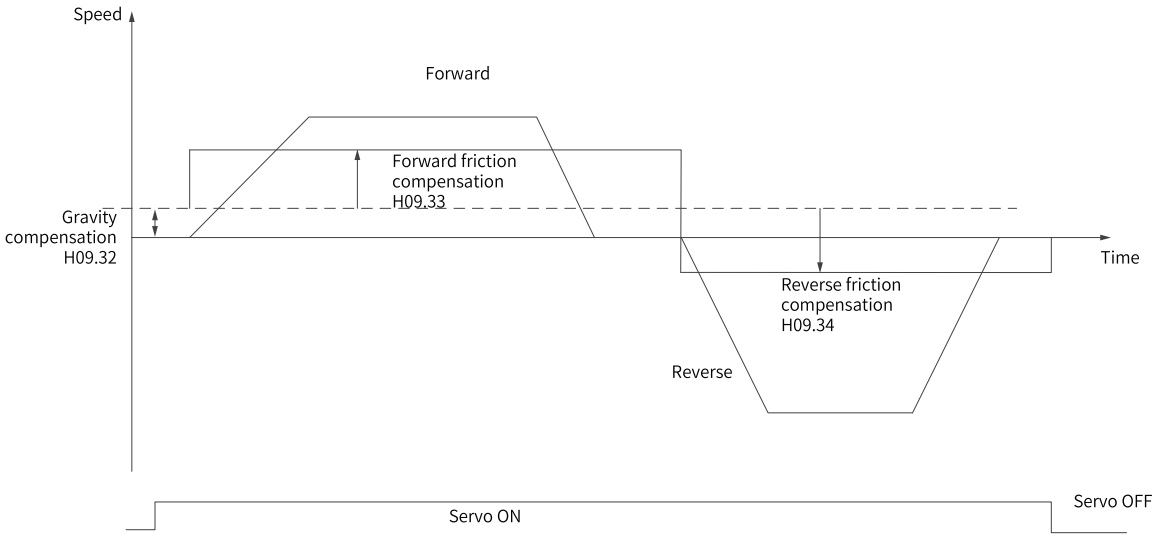
Friction compensation is effective only in the position mode.

☆Related parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.32	0x0920	Gravity compensation value	-100.0% to 100.0%	0.0	%	Real-time	"H09_en.32" on page 553
H09.33	0x0921	Positive friction compensation value	0.0% to 100.0%	0.0	%	Real-time	"H09_en.33" on page 554
H09.34	0x0922	Negative friction compensation value	-100.0% to 0.0%	0.0	%	Real-time	"H09_en.34" on page 554

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.35	0x0923	Friction compensation speed	0.0 to 20.0	2.0	-	Real-time	"H09_en.35" on page 554
H09.36	0x0924	Friction compensation speed	0: Slow mode+Speed reference 1: Slow mode+Model speed 2: Slow mode+Speed feedback 3: Slow mode+Observe speed 16: Quick mode +Speed reference 17: Quick mode +Model speed 18: Quick mode +Speed feedback 19: Quick mode+Observe speed	0x0	-	Real-time	"H09_en.36" on page 554

The diagram for friction compensation is as follows.



Note

Note: When the speed is less than the speed threshold, static friction applies. When the speed exceeds the speed threshold, dynamic friction applies. The compensation direction is determined by the direction of the position reference. Forward direction requires a positive compensation value. Reverse direction requires a negative compensation value.

9.5.10 Motor Cogging Torque Ripple Compensation

Motor cogging torque ripple compensation is used to compensate the torque ripple caused by the motor cogging torque, so as to suppress the speed ripple caused by the cogging torque ripple under the low control loop gain without compromising the stability margin of the system.

The SV680F-INT drive has two application modes for the rotary motor (general ROT):

Note

[1]: General-purpose ROT is used as the servo motor.

- **ROT application mode with Inovance absolute encoder**
  In this mode, the motor has already obtained the compensation data before delivery. You only need to enable or disable the feature through H06.28.

  Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H06.28	0x061C	Cogging torque ripple compensation	0: Disabled 1: Enabled	1	-	At stop	"H06_en.28" on page 528

- **ROT application mode with incremental encoder (quadrature pulse encoder with QEP counting)**
  When this mode is applied, it is necessary to carry out auto-tuning of motor cogging torque ripple and obtain the compensation list before enabling compensation. Auto-tuning and the compensation can only take effect after angle auto-tuning and homing are completed. The process is as follows:

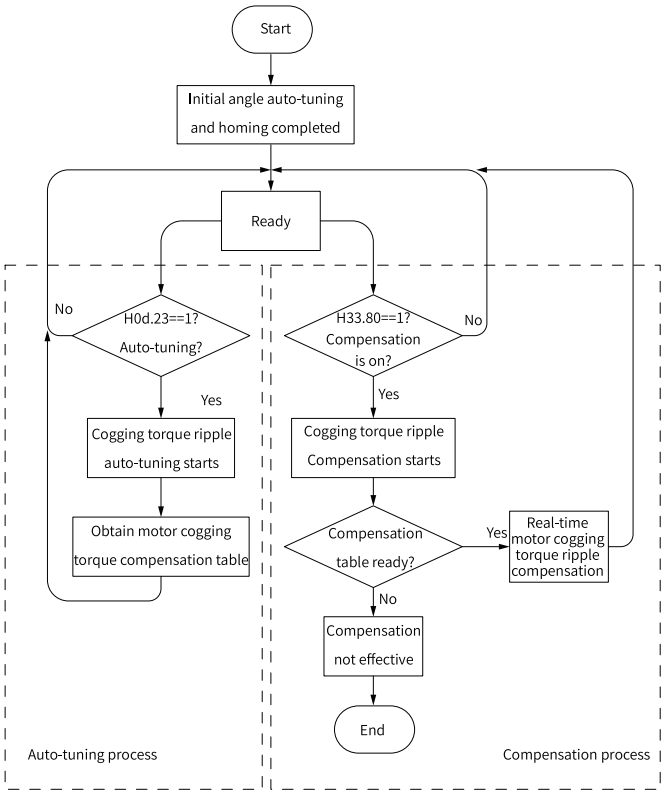


Figure 9-14 Flow chart of ROT application mode with incremental encoder

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode
H33.80	0x3350	Medium to save motor cogging Torque ripple compensation data	0: Encoder 1: Flash	0	-	At stop
H0d.23	0x0D17	Motor cogging torque ripple auto-tuning enable	0: Disabled 1: Enabled	0	-	At stop

When motor cogging torque ripple auto-tuning is enabled (H0d.23=1), the drive will control the motor to rotate for several revolutions to obtain the cogging torque ripple compensation list.

Note

During this process, you need to ensure that the motor has enough operating range to avoid collision. It is recommended to perform auto-tuning when the motor is unloaded, to avoid external disturbance.

After auto-tuning is completed, compensation is enabled automatically (H06.28=1). The drive is powered off and restarted to perform angle auto-tuning and homing. You can disable this feature manually when you do not need it (H06.28=0).

9.6 Parameter Adjustment in Different Control Modes

Perform parameter adjustment in the sequence of "Inertia auto-tuning" => "Gain auto-tuning => "Manual gain tuning" in all the control modes.

9.6.1 Parameter Adjustment in the Speed Control Mode

Parameter adjustment in the speed control mode is the same as that in the position control mode, except for the position loop gain (H08.02 and H08.05). For details, see *"9.6.2 Parameter Adjustment in the Position Control Mode" on page 203*.

9.6.2 Parameter Adjustment in the Position Control Mode

Obtain the value of H08.15 (Load inertia ratio) through inertia auto-tuning.

2) Perform gain adjustment.

- 1st gain set:

Parameter	Name	Function	Default
H07.05	Torque reference filter time constant 1	Defines the torque reference filter time constant.	0.50 ms
H08.00	Speed loop gain	Defines the speed loop proportional gain.	40.0 Hz

Parameter	Name	Function	Default
H08.01	Speed loop integral time constant	Defines the integral time constant of the speed loop.	19.89 ms
H08.02	Position loop gain	Defines the position loop proportional gain.	64.0 Hz

- 2nd gain set:

Parameter	Name	Function	Default
H07.06	Torque reference filter time constant 2	Defines the torque reference filter time constant.	0.27 ms
H08.03	2nd speed loop gain	Defines the speed loop proportional gain.	75.0 Hz
H08.04	2nd speed loop integral time constant	Defines the integral time constant of the speed loop.	10.61 ms
H08.05	2nd position loop gain	Defines the position loop proportional gain.	120.0 Hz
H08.08	2nd gain mode setting	Defines the mode of the 2nd gain set.	1
H08.09	Gain switchover condition	Used to set the condition for gain switchover.	0
H08.10	Gain switchover delay	Defines the gain switchover delay.	5.0 ms
H08.11	Gain switchover level	Defines the gain switchover level.	50
H08.12	Gain switchover hysteresis	Defines the dead time of gain switchover.	30
H08.13	Position gain switchover time	Defines the position loop gain switchover time.	3.0 ms

- Common gain set

Parameter	Name	Function	Default
H08.18	Time constant of speed feedforward filter	Defines the filter time constant of the speed feedforward signal.	0.50 ms
H08.19	Speed feedforward gain	Defines the speed feedforward gain.	0.0%
H08.20	Torque feedforward filter time constant	Defines the filter time constant of the torque feedforward signal.	0.50 ms
H08.21	Torque feedforward gain	Defines the torque feedforward gain.	0.0%
H08.22	Speed feedback filtering option	Defines the speed feedback filtering function.	0
H08.23	Cutoff frequency of speed feedback low-pass filter	Defines the cutoff frequency of the first-order low-pass filter for speed feedback.	8000 Hz
H08.24	PDFF control coefficient	Defines the coefficient of the PDFF controller.	100.0%

Parameter	Name	Function	Default
H09.38	Frequency of low-frequency resonance suppression 1 at the mechanical end	Defines the frequency of the low-frequency resonance suppression filter.	100.0 Hz
H09.39	Low-frequency resonance suppression 1 at the mechanical end	Defines the setting of low-frequency resonance suppression filter.	2

Perform gain auto-tuning to get the initial values of the 1st gain set (or 2nd gain set) and the common gain set.

Fine-tune the following gains manually.

Parameter	Name	Function	Default
H07.05	Torque reference filter time constant 1	Defines the torque reference filter time constant.	0.50 ms
H08.00	Speed loop gain	Defines the speed loop proportional gain.	40.0 Hz
H08.01	Speed loop integral time constant	Defines the integral time constant of the speed loop.	19.89 ms
H08.02	Position loop gain	Defines the position loop proportional gain.	64.0 Hz
H08.19	Speed feedforward gain	Defines the speed feedforward gain.	0.0%

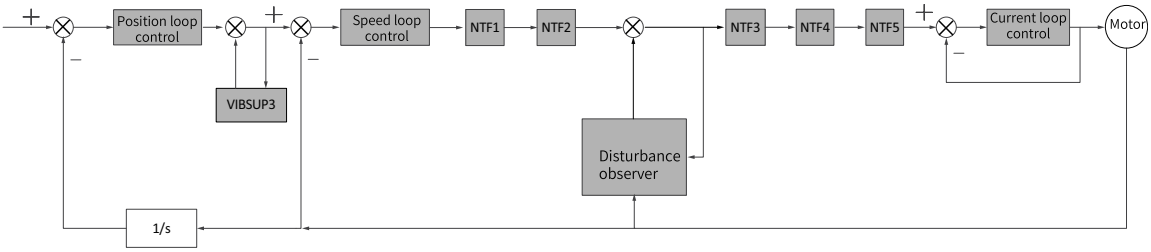
9.6.3 Parameter Adjustment in the Torque Control Mode

Parameter adjustment in the torque control mode are differentiated based on the following conditions:

- If the actual speed reaches the speed limit, the adjustment method is the same as that described in *"9.6.1 Parameter Adjustment in the Speed Control Mode" on page 203*.
- If the actual speed does not reach the speed limit, the adjustment method is the same as that described in *"9.6.1 Parameter Adjustment in the Speed Control Mode" on page 203*, except the position/speed loop gain and speed loop integral time constant.

9.7 Vibration Suppression

The block diagram for vibration suppression is as follows.



Where:

- NTF1–5: 1st notch to 5th notch

- VIBSUP3: Suppression of medium- and low-frequency vibration
- 1/s: Integral element

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.53	0x0835	Medium- and low-frequency jitter suppression frequency 3	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	"H08_en.53" on page 544
H08.54	0x0836	Medium- and low-frequency jitter suppression compensation 3	0% to 200%	0	%	Real-time	"H08_en.54" on page 545
H08.56	0x0838	Medium- and low-frequency jitter suppression phase modulation 3	0% to 600%	100	%	Real-time	"H08_en.56" on page 545

Note

- jitter suppression phase modulation coefficient: synchronous phase adjustment of the compensation value and vibration. It is recommended to use the default value. Adjustment is needed when the compensation value phase differs greatly from the vibration phase.
- Jitter suppression frequency: Defines the jitter frequency that needs to be suppressed.
- Jitter suppression compensation coefficient: Defines the compensation coefficient for jitter suppression.

9.7.1 Mechanical Resonance Suppression

Resonance frequency is present in the mechanical system. When the gain of the drive increases, resonance may occur near the resonance frequency, disabling further increase of the gain.

Mechanical resonance can be suppressed in the following two methods:

Torque reference filter (H07.05, H07.06)

To suppress the mechanical resonance, set the filter time constant to enable the torque reference to be attenuated in the frequency range above the cutoff frequency.

Filter cutoff frequency fc (Hz) = 1/[2π x H07.59 (ms) x 0.001]

Notch

The notch reduces the gain at certain frequencies to suppress mechanical resonance. After the vibration is suppressed by the notch, you can continue to increase the gain. The operating principle of the notch is shown in the following figure.

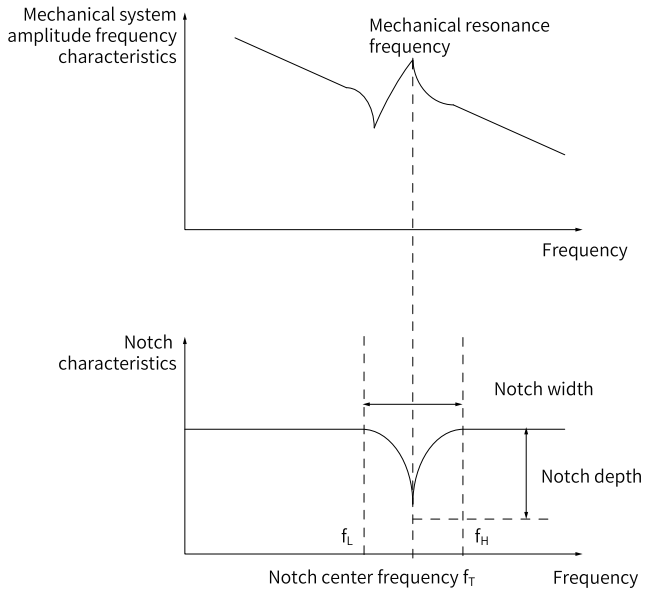


Figure 9-15 Operating principle of the notch

A total of 5 notches can be used, and each notch is defined by three parameters: frequency, width level, and depth level. The 1st, 2nd and fifth notches are manual notches whose parameters needs to be set by the user. Parameters of the 3rd and 4th notches can be either set by the user or set automatically after being configured as an adaptive notch (H09.02 =1 or 2).

Table 9–7 Description of notch parameters

Item	Manual Notch			Manual/Adaptive Notch	
	1st Notch	2nd Notch	5th Notch	3rd Notch	4th Notch
Frequency	H09.12	H09.15	H09.41	H09.18	H09.21
Width level	H09.13	H09.16	H09.42	H09.19	H09.22
Depth level	H09.14	H09.17	H09.43	H09.20	H09.23

Note

- When the frequency is 8000 Hz (default), the notch is inactive.
- The adaptive notch is preferred for resonance suppression. The manual notch can be used in cases where the adaptive notch cannot deliver desired performance.

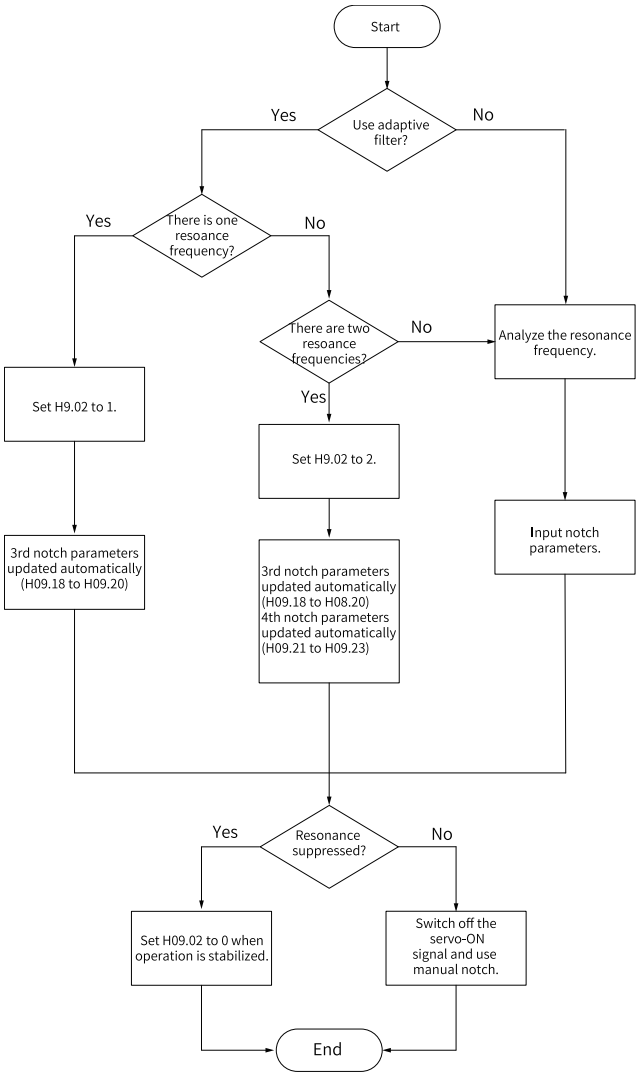


Figure 9-16 Using the notch

- Procedure for setting the adaptive notch:

  1. Set H09.02 (Adaptive notch mode selection) to 1 or 2 based on the number of resonance frequencies.
  2. When resonance occurs, set H09.02 to 1 first to enable one adaptive notch. If new resonance occurs after gain adjustment, set H09.02 to 2 to enable two adaptive notches.
  3. Parameters of the 3rd, 4th and 5th notches are updated automatically during operation, and parameter values are saved automatically to the corresponding parameters in group H09 every 30 min.
  4. If resonance is suppressed, the adaptive notch works. After the servo drive runs stably for a period of time, set H09.02 to 0 and the parameters of the adaptive notch are fixed to the last updated values.

     This is to prevent notch parameters from being updated to wrong values due to misoperation. Wrong values will intensity resonance.
  5. If resonance persists after the notch is working for a period of time, switch off the S-ON signal.

6. If there are more than two resonance frequencies, the problem cannot be solved by only using the adaptive notches. In this case, add a manual notch, Additionally use the manual notch, or use all the 5 notches as manual ones (H09.02 = 0).

Note

- When adaptive notch is applied, if the S-OFF signal is activated within 30 min, the notch parameters will not be saved to the corresponding parameter
- When the resonance frequency is below 300 Hz, the suppression effect of the adaptive notch may be degraded.

- Procedure for setting the manual notch:

  1. Analyze the resonance frequency.
  2. When using the manual notch, set the notch frequency to same value as the actual resonance frequency obtained in the following ways: The resonance frequency can be obtained by using the following methods:
     - Use the "Mechanical characteristic analysis" function in Inovance software tool.
     - Calculate the resonance frequency based on the motor phase current displayed on the oscilloscope interface of the software tool.
     - Set H09.02 (Adaptive notch mode) to 3. The drive detects the resonance frequency and saves the detected value to H09.24 automatically during operation.
  3. Input the resonance frequency obtained in step 1 to the parameter of the selected notch, and input the width level and depth level of this notch.
  4. If resonance has been suppressed, it indicates the notch functions well and you can continue adjusting the gain. If resonance occurs again, repeat steps 1 and 2.
  5. If resonance persists after the notch is working for a period of time, switch off the S-ON signal.

- Notch width level
  The width level indicates the ratio of the notch width to the center frequency of the notch.

$$\text{Notch width level} = \frac{f_H - f_L}{f_T}$$

  Where:

  f_T: center frequency of the notch, which is also the mechanical resonance frequency

  $f_H - f_L$ is the notch width, that is, the frequency bandwidth with an amplitude attenuation rate of –3 dB relative to the notch central frequency.

  The following figure shows the correspondence. Use the default value 2 in normal cases.

- Depth level of the notch
  The notch depth level indicates the ratio of the input to the output at the center frequency.

  When the depth level is 0, the input is completely suppressed at the center frequency. When the depth level is 99, the input can be fully passed at the center frequency. Therefore, the lower the depth level is, the higher the notch depth is, and the stronger the suppression effect will be. Note that an excessively low depth level may lead to system oscillation.

Note

If the amplitude frequency characteristic curve obtained through the mechanical analysis function does not have obvious peak, it indicates that vibration occurs actually. Such vibration may not be mechanical resonance, and cannot be suppressed by the notch. It occurs because the gain reaches the limit, and can be suppressed only by reducing the gain or the filter time of torque reference.

The following figure shows the frequency characteristics of the notch.

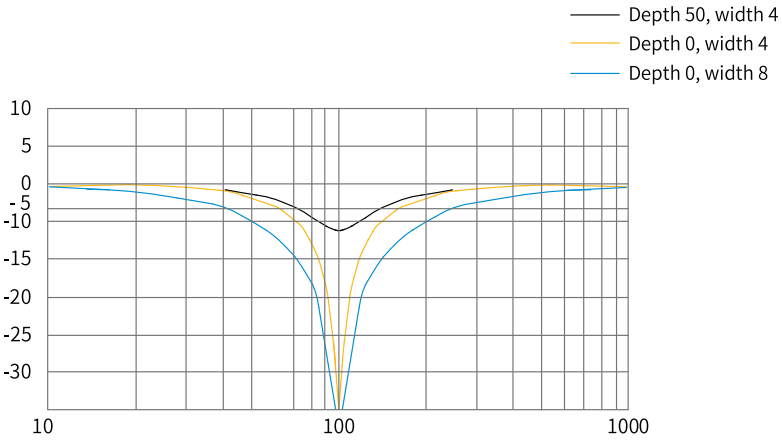


Figure 9-17 Notch frequency characteristics

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.02	0x0902	Mode selection of adaptive notch	0: Adaptive notch no longer updated 1: One adaptive notch activated (3rd notch) 2: Two adaptive notches activated (3rd and 4th notches) 3: Resonance point tested only (displayed in H09.24) 4: Adaptive notch cleared, values of 3rd and 4th notches restored to default	0	-	Real-time	"H09_en.02" on page 548
H09.12	0x090C	Frequency of the 1st notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.12" on page 551
H09.13	0x090D	Width level of the 1st notch	0 to 20	2	-	Real-time	"H09_en.13" on page 551
H09.14	0x090E	Depth level of the 1st notch	0 to 99	0	-	Real-time	"H09_en.14" on page 551
H09.15	0x090F	Frequency of the 2nd notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.15" on page 551

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.16	0x0910	Width level of the 2nd notch	0 to 20	2	-	Real-time	"H09_en.16" on page 552
H09.17	0x0911	Depth level of the 2nd notch	0 to 99	0	-	Real-time	"H09_en.17" on page 552
H09.18	0x0912	Frequency of the 3rd notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.18" on page 552
H09.19	0x0913	Width level of the 3rd notch	0 to 20	2	-	Real-time	"H09_en.19" on page 552
H09.20	0x0914	Depth level of the 3rd notch	0 to 99	0	-	Real-time	"H09_en.20" on page 552
H09.21	0x0915	Frequency of the 4th notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.21" on page 553
H09.22	0x0916	Width level of the 4th notch	0 to 20	2	-	Real-time	"H09_en.22" on page 553
H09.23	0x0917	Depth level of the 4th notch	0 to 99	0	-	Real-time	"H09_en.23" on page 553
H09.24	0x0918	Auto-tuned resonance frequency	0 Hz–5000 Hz	0	Hz	Unchangeable	"H09_en.24" on page 553
H09.41	0x0929	Frequency of the 5th notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.41" on page 556
H09.42	0x092A	Width level of the 5th notch	0 to 20	2	-	Real-time	"H09_en.42" on page 556
H09.43	0x092B	Depth level of the 5th notch	0 to 99	0	-	Real-time	"H09_en.43" on page 556

9.7.2 Low-Frequency Resonance Suppression at the Mechanical End

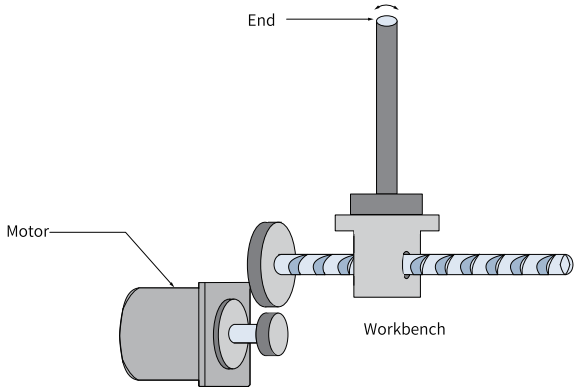


Figure 9-18 Low-frequency vibration at the mechanical end

If the mechanical load end is long and heavy, vibration may easily occur in this part during emergency stop, affecting the positioning effect. Such vibration is called low-frequency resonance as its frequency is generally within 100 Hz, which is lower than the mechanical resonance frequency mentioned in *"9.7.1 Mechanical Resonance Suppression" on page 206*. Use the low-frequency resonance suppression function to reduce such vibration.

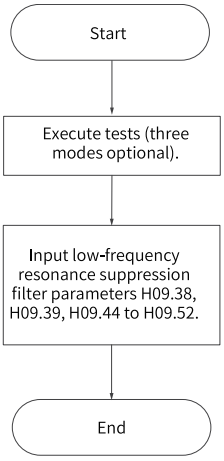


Figure 9-19 Procedure for setting low-frequency resonance suppression filter

First, use the oscilloscope function in the software tool to collect the position deviation waveform of the motor in the positioning state. Then calculate the position deviation fluctuation frequency, which is the low-frequency resonance frequency. Finally, input the value of H09.38 manually and use the default value of H09.39. Observe the resonance suppression effect after using the low-frequency resonance suppression filter.

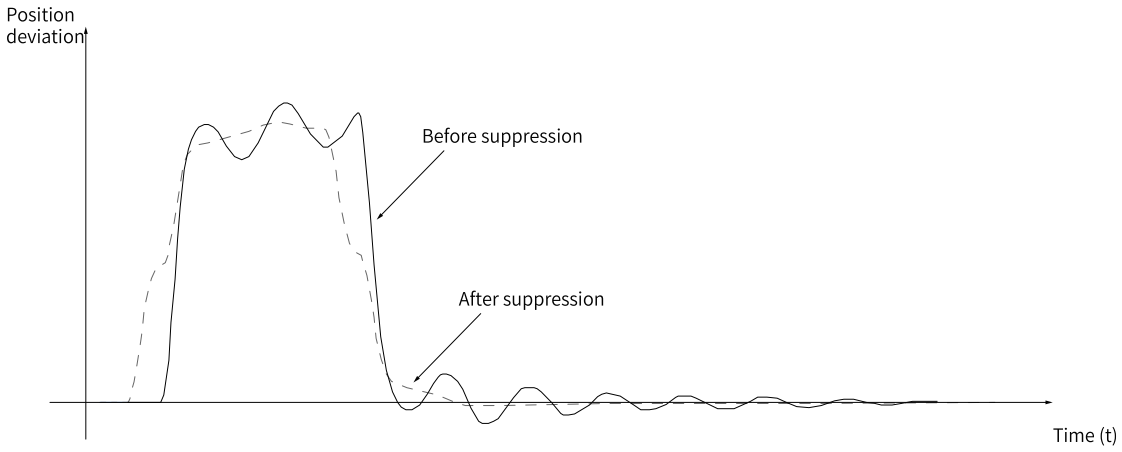


Figure 9-20 Low-frequency resonance suppression effect

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.38	0x0926	Frequency of low-frequency resonance suppression 1 at the mechanical end	1.0 Hz–100.0 Hz	100.0	Hz	At stop	"H09_en.38" on page 555
H09.39	0x0927	Low-frequency resonance suppression 1 at the mechanical end	0 to 3	2	-	At stop	"H09_en.39" on page 555
H09.44	0x092C	Frequency of low-frequency resonance suppression 2 at the mechanical end	0.0 Hz–200.0 Hz	0.0	Hz	At stop	"H09_en.44" on page 556
H09.45	0x092D	Responsiveness of low-frequency resonance suppression 2 at mechanical load end	0.01 to 10.00	1.00	-	At stop	"H09_en.45" on page 557
H09.47	0x092F	Width of low-frequency resonance suppression 2 at mechanical load end	0.00 to 2.00	1.00	-	At stop	"H09_en.47" on page 557
H09.49	0x0931	Frequency of low-frequency resonance suppression 3 at the mechanical end	0.0 Hz–200.0 Hz	0.0	Hz	At stop	"H09_en.49" on page 557

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.50	0x0932	Responsiveness of low-frequency resonance suppression 3 at mechanical load end	0.01 to 10.00	1.00	-	At stop	"H09_en.50" on page 557
H09.52	0x0934	Width of low-frequency resonance suppression 3 at mechanical load end	0.00 to 2.00	1.00	-	At stop	"H09_en.52" on page 557

9.8 Mechanical Characteristic Analysis

Overview

Mechanical characteristic analysis is used to determine the mechanical resonance point and system bandwidth. A maximum of 8 kHz response characteristic analysis is available and three modes including mechanical characteristic, speed open loop and speed closed loop are supported.

Steps

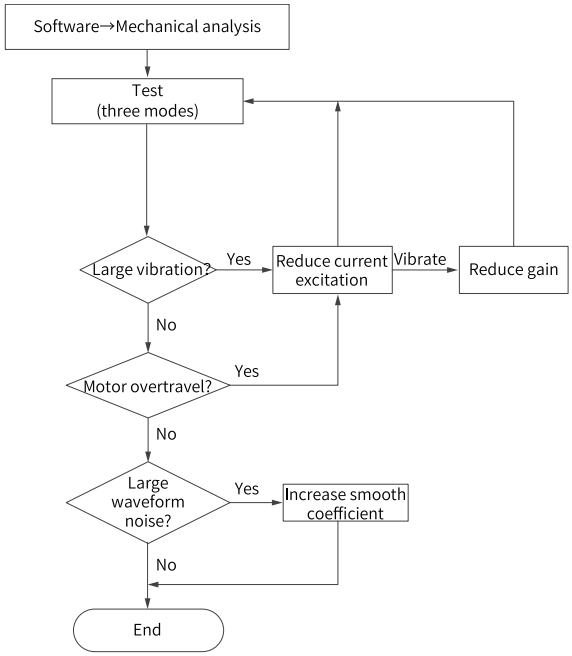


Figure 9-21 Operating procedure for mechanical characteristic analysis

Note

- To avoid large vibration during the test, set the current excitation to 10% during initial execution.
- The analysis waveform may be distorted if the current excitation is too low.
- If vibration generated during testing cannot be suppressed by reducing the current excitation, the causes and solutions may be: 1) The gain values are too high. Reduce the speed gain or set notch parameters based on the auto-tuned resonance point. 2) The set inertia ratio is too high. Set the inertia ratio properly.
- After setting the notch, the waveform under mechanical characteristic test mode is the same with that before the setting, but the speed closed loop and speed open loop modes will be attenuated.

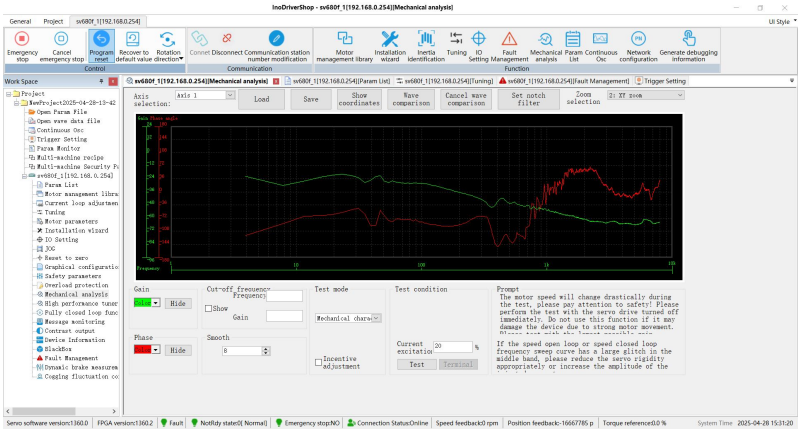


Figure 9-22 Example of the waveform obtained

An example of the waveform obtained with the mechanical characteristic analysis is shown in *"Figure 9–22 Example of the waveform obtained" on page 215*.

9.9 High-performance Tuning

Overview

High performance tuning is an upgraded function of mechanical characteristic analysis, which can not only judge the mechanical resonance point and system bandwidth, but also simulate the influence of adding filters and adjusting parameters on loop control. It supports response characteristic analysis up to 8 kHz and enables you to measure and simulate mechanical characteristics, current loop, speed and position open/closed loop frequency domain characteristics.

Note

- Before frequency domain measurement, you need to set H02.00 to the corresponding speed mode or position mode. Other modes may trigger an abnormal servo state alarm.
- During the measurement, do not disconnect the drive from the software, otherwise the measurement process will be interrupted.

Steps

1. **Generation of measured image**

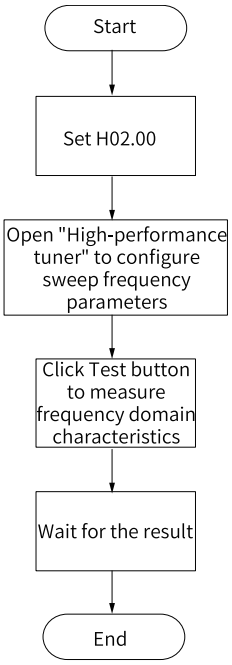


Figure 9-23 Flow chart of measured image generation

a. Select **High Performance Tuner** in **Workspace** and click **Sweep Frequency Config**.

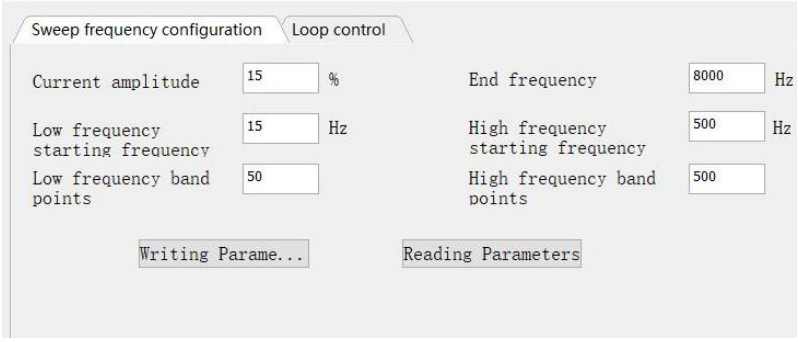


Figure 9-24 Sweep frequency configuration

☆ Related parameters:

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H09.71	0x0947	Starting frequency	0 Hz–8000 Hz	15	Hz	Real-time	*" H09_ en.71" on page 559*
H09.72	0x0948	End frequency	0 Hz–8000 Hz	8000	Hz	Real-time	*" H09_ en.72" on page 559*
H09.73	0x0949	Frequency subdivision	0 to 500	50	-	Real-time	*" H09_ en.73" on page 559*
H09.74	0x094A	Excitation amplitude	0.0% to 400.0%	15.0	%	Real-time	*" H09_ en.74" on page 560*

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H09.75	0x094B	Starting frequency 2	0 Hz–8000 Hz	500	Hz	Real-time	“ H09_ en.75” on page 560
H09.76	0x094C	Frequency subdivision 2	0 to 1000	500	-	Real-time	“ H09_ en.76” on page 560

b. After that, the measured frequency domain characteristics of the system are obtained. In the figure below, green and red are measured, and orange and purple are simulated.

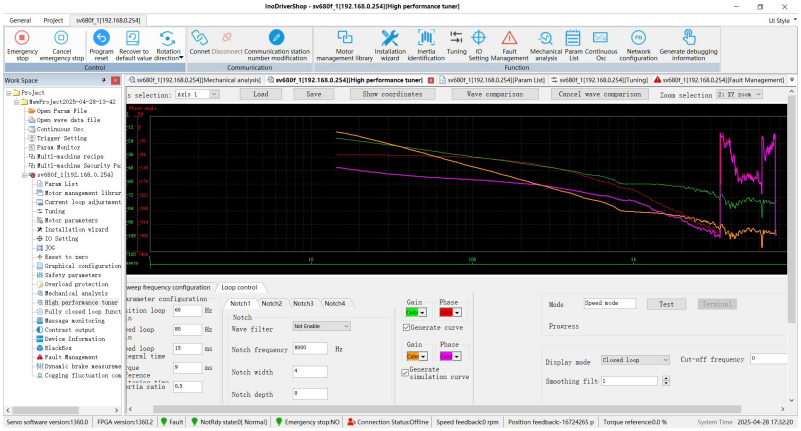


Figure 9-25 Measured frequency domain curve (green and red are measured, orange and purple are simulated)

Note

- To avoid large vibration during the test, set the current excitation to 10% during initial execution.
- The analysis waveform may be distorted if the current excitation is too low.
- If vibration is present during the test, and cannot be eliminated by reducing current excitation, possible causes and measures are:
  - 1) The gain is too high. Reduce the speed gain or set the notch based on the auto-tuned resonance point.
  - 2) The set inertia ratio is too high. Rectify the setting.

2. **Loop control adjustment**

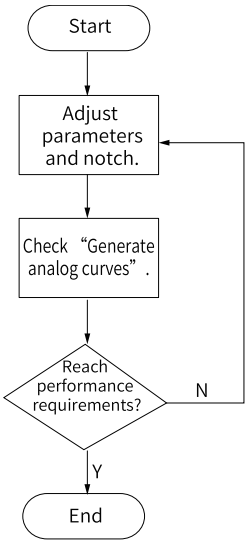


Figure 9-26 Flow chart of loop control adjustment

After adjusting parameter configuration and four notch filters, the simulation curve is generated again. You can see the influence of changing parameters on the system.

☆ Related parameters:

Parameter	Name	Parameter Type
H08.00	Speed loop gain	gain
H08.01	Speed loop integral time	gain
H08.02	Position loop gain	gain
H08.05	Inertia ratio	gain
H07.05	Torque Reference Filter	Filter
H09.77 to H09.81	Biquad filter	Filter
H09.12 to H09.23	Notch	Filter

Note

Notch filter 1 becomes a notch only when it is not enabled. It can be configured as first-order low-pass, second-order low-pass, lead-lag, or custom biquad filter.

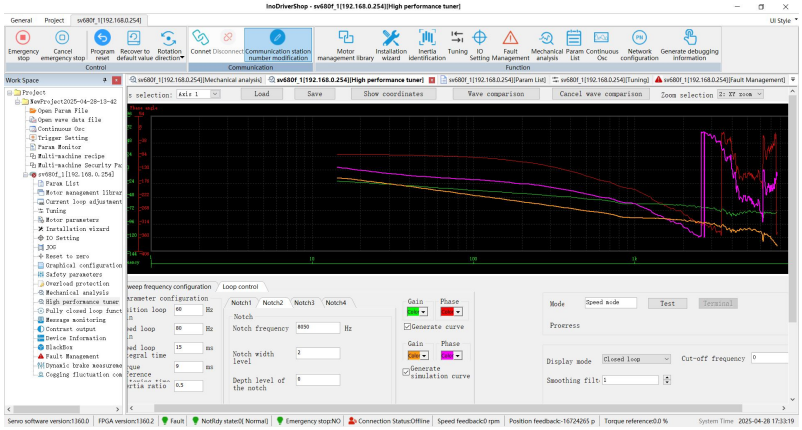


Figure 9-27 Comparison between simulated curve and measured curve

10 Function Overview

Functions of the servo drive are listed below. See details in corresponding chapters.

Function		Description	Reference
Selection table		Servo motors and third-party motors supported by the drive.	-
Second encoder		ABZ incremental encoder, Inovance communication encoder, BiSS-C encoder, SSI encoder and EnDat 2.2 encoder.	-
High-resolution encoder		The servo drive supports a high-performance encoder with resolution up to 2^{26} (67108864) PPR.	-
AI, AO		Supports AI and AO.	-
Built-in brake		Used to monitor the brake status in real time.	*SV680F-INT Series Servo Drive Hardware Guide*
External braking resistor		Used in case of insufficient braking capacity of the built-in braking resistor.	*SV680F-INT Series Servo Drive Hardware Guide*
Electronic gear ratio		Input pulse can be reduced or amplified: 0.001–4000 × Encoder resolution/10000).	*SV680F-INT Series Servo Drive Hardware Guide*
Status display		Used to display the drive status through the LED on the keypad.	-
External I/O display		Used to display ON/OFF status of external I/O signals.	-
Inertia Auto-tuning	Offline	The servo drive calculates the load inertia ratio automatically through inertia auto-tuning.	*"9.3.1 Offline Inertia Auto-tuning" on page 167*
	Online	The host controller sends a command to make the motor rotate, and the servo drive calculates the load inertia ratio in real time.	*"9.3.2 Online Inertia Auto-tuning" on page 169*
Auto Gain Tuning	STune and ETune.	The servo drive generates a group of gain parameters based on the correct inertia ratio.	*" Auto Gain Tuning" on page 170*

Function		Description	Reference
Manual Gain Tuning	Basic gains	If the auto-tuned gain values fail to deliver desired performance, fine-tune the gains manually to improve the performance.	"9.5.1 Basic Parameters" on page 183
	Gain switchover	Used to apply different gains to different status (operating or stop) of the motor. Gains can also be switched by external terminals during operation.	"9.5.2 Gain switchover" on page 186
	Reference filter	Smoothens the position, speed, and torque references.	"9.5.3 Position Reference Filter" on page 191
	Feedforward gain	Improves the follow-up behavior.	"9.5.4 Feedforward gain" on page 191
	PDFF Control	Adjusts the speed loop control mode to improve the anti-interference capability at low frequency range.	"9.5.5 PDFF Control" on page 194
	Torque disturbance observer	Improves the resistance against torque disturbance.	"9.5.6 Torque disturbance observer" on page 195
	Speed Observer	The speed observer, which facilitates quick positioning, applies in applications with slight load characteristic change and constant inertia.	"9.5.7 Speed Observer" on page 196
	Model Tracking	The model tracking can be used to improve responsiveness and shorten the positioning time. It is only available in the position control mode.	"9.5.8 Model Tracking" on page 198
	Friction Compensation	Friction compensation is used to provide positive/negative compensation values according to the direction of operation. Friction compensation is valid only in the position control mode.	"9.5.9 Friction Compensation" on page 200
	Motor Cogging Torque Ripple Compensation	It ensures the stability margin of the system and reduce the speed fluctuation.	"9.5.10 Motor Cogging Torque Ripple Compensation" on page 201
Parameter Adjustment in Different Control Modes	Parameter adjustment in speed/torque/position mode	-	"9.5.2 Gain switchover" on page 186
Vibration Suppression	Mechanical Resonance Suppression	It enables the notch to suppress the mechanical resonance that may be generated when the response speed is excessively high.	"9.7.1 Mechanical Resonance Suppression" on page 206
	Low-Frequency Resonance Suppression at the Mechanical End	Activate the filter used to suppress low-frequency resonance.	"9.7.2 Low-Frequency Resonance Suppression at the Mechanical End" on page 212
Mechanical Characteristic Analysis		Used to analyze the resonance frequency and characteristics of the mechanical system through a PC installed with Inovance software tool.	"9.8 Mechanical Characteristic Analysis" on page 214

Function	Description	Reference
High-performance Tuning	High performance tuning is an upgraded function of mechanical characteristic analysis, which can not only judge the mechanical resonance point and system bandwidth, but also simulate the influence of adding filters and adjusting parameters on loop control.	*"9.9 High-performance Tuning" on page 215*
Position Reference Filter	Used to achieve smooth acceleration and deceleration.	*"12.12 Position reference filter" on page 256*
Frequency-Division Output	Used to output the position reference pulses or the position pulses fed back by the encoder in the form of phase A/phase B quadrature pulses.	*"12.14 Frequency-division output" on page 257*
Homing	Used to search for the mechanical home automatically to locate the relative position between the mechanical home and mechanical zero Note: The value of H05.30 must be 6.	*"12.13 Homing" on page 257*
DI signal assignment	Used to assign functions such as S-ON to corresponding pins.	-
Touch Probe	It is the same as the position latch function.	*"12.8 Touch Probe" on page 244*
Black box	The black box function is used to capture and save the data generated upon occurrence of faults or under designated conditions.	*"12.7 Black Box" on page 241*
SEMI F47 Voltage Drop	With combination of this function and H0A.84 (instantaneous power outage holding time), the drive can continue to run when the power supply voltage decreases.	*"12.9 SEMI F47 Voltage Drop" on page 245*
Position comparison output	Used to output a DO signal with designated pulse width after the drive reaches the preset target position.	*"12.11 Position Comparison" on page 248*
STO function	The safe torque off (STO) function brings the machine safely into a no-torque state and prevents it from unexpected start.	*" STO" on page 261*

11 Basic Functions of the Servo Drive

The servo system consists of three major parts, the servo drive, servo motor, and feedback encoder.

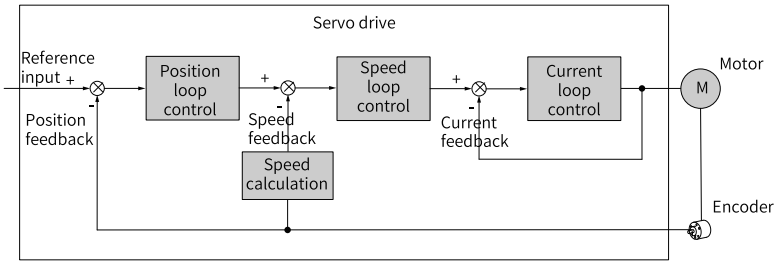


Figure 11-1 Structure of a basic servo system

As the control core of the servo system, the servo drive performs accurate position, speed, torque, or hybrid control on the servo motor by processing the input signals and feedback signals. Position control is the most important mode of a servo system.

Descriptions of the control modes are as follows:

- Position control In the position control mode, the target position of a motor is determined by the sum of position references, and the motor speed is determined by the position reference frequency. The servo drive performs quick and accurate position control and speed control through the feedback encoder installed on the motor. The position control mode mainly applies to applications requiring positioning control, such as manipulators, SMT machines, engraving and milling machines, and CNC machine tools.
- Speed control In the speed control mode, the servo drive performs quick and accurate speed control through the speed reference sent through communication. The speed control mode mainly applies to application requiring speed control or where a host controller is used for position control or the commands sent from the host controller are used as the speed references for the servo drive, such as the engraving and milling machine.
- In the torque control mode, the motor current is in linear relation with the torque. Therefore, torque control is implemented through current control. The servo drive controls the motor output torque based on torque references. The torque reference can be set through communication. This control mode is mainly applicable to the winding and unwinding devices with strict tension requirements. In these scenarios, the torque always changes with the winding radius so that the tension will not change along with the change of the winding radius.

12 Common Functions

12.1 Absolute Encoder System

12.1.1 Overview

For ROT motors:

The absolute encoder is used to detect the motor position within one turn and count the number of motor revolutions. For example, a 26-bit encoder has a single-turn resolution of 67108864 (2^{26}),and can record 26-bit multi-turn data. The absolute system integrated with the absolute encoder works in absolute position linear mode or absolute position rotating mode. These modes apply to position control, speed control, and torque control modes. The absolute encoder with a battery can back up data when the servo drive is powered off. This enables the servo drive to calculate the absolute mechanical position upon power-on again. Therefore, the homing operation is not required.

To match an Inovance 26-bit absolute encoder with the SV680F-INT drive, set H00.00 (Motor code) to 14102 (Inovance 26-bit absolute encoder). Then set H02.01 (Absolute system selection) based on actual conditions. E731.0 (Encoder battery failure) will occur upon initial power-on of the battery. Set H0d.20 (Absolute encoder reset function) to 1 to reset E731.0 before performing the homing operation.

Note

When you change the value of H02.02 (Direction of rotation) or H0d.20 (Absolute encoder reset selection), the absolute position recorded by the encoder changes suddenly, causing the mechanical absolute position reference to change. In this case, perform the homing operation. After homing is done, the deviation between the mechanical absolute position and that recorded in the encoder will be calculated automatically and saved in the EEPROM of the servo drive.

Table 12–1 Absolute modes supported by the motor of SV680F-INT

Type	Incremental mode	Absolute position linear mode	Absolute position rotation mode	Single-turn absolute mode
ROT motor + ABZ incremental encoder (TTL signal)	✓	×	×	×
ROT motor + Inovance absolute encoder	✓	✓	✓	✓
ROT motor + SSI encoder	✓	×	×	✓
ROT motor + BiSS-C encoder	✓	×	×	✓
ROT motor + EnDat 2.2 encoder	✓	×	×	✓

12.1.2 Related Parameters

Absolute encoder system settings

Select the motor through H00.00, and select the absolute position mode through H02.01.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H00.00	0x0000	Motor SN	20002: Rotary motor-pulse encoder 14000: Rotary motor-Inovance 20-bit encoder 14101: Rotary motor-Inovance 23-bit encoder 14102: Rotary motor-Inovance 26-bit encoder 14140: Rotary motor-Endat2.2 encoder 14150: Rotary motor-SSI encoder 14160: Rotary motor-BiSS-C encoder	14102	-	At stop	"H00_en.00" on page 487
H00.08	0x0008	Bus encoder type	0 to 65535	0	-	At stop	"H00_en.08" on page 488
H02.01	0x0201	Absolute system selection	0: Incremental mode 1: Absolute position linear mode 2: Absolute position rotation mode 3: Absolute position linear mode (without encoder overflow warning) 4: Absolute position single-turn mode 5: Absolute position rotational mode, modal axis single modal revolution absolute command	0	-	At stop	"H02_en.01" on page 494

Note

In the absolute position mode, the system detects the motor code automatically to check whether the motor used is configured with an absolute encoder. If not, E122.0 (Product mismatch in the absolute position mode) occurs.

Encoder feedback data

The encoder feedback data is divided into the number of revolutions and the single-turn position. For the incremental position mode and single-turn absolute position mode, the number of revolutions is not recorded.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.70	0x0B46	Number of absolute encoder revolutions	-32768Rev to 32767Rev	0	Rev	Unchangeable	"H0b_en.70" on page 590
H0b.71	0x0B47	Single-turn position fed back by the absolute encoder	0 to 2147483647	0	encoder unit	Unchangeable	"H0b_en.71" on page 590

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.77	0x0B4D	Encoder position (low 32 bits)	0 to 4294967295	0	encoder unit	Unchangeable	"H0b_en.77" on page 590
H0b.79	0x0B4F	Encoder position (high 32 bits)	-2147483648 to 2147483647	0	encoder unit	Unchangeable	"H0b_en.79" on page 590

Absolute position linear mode

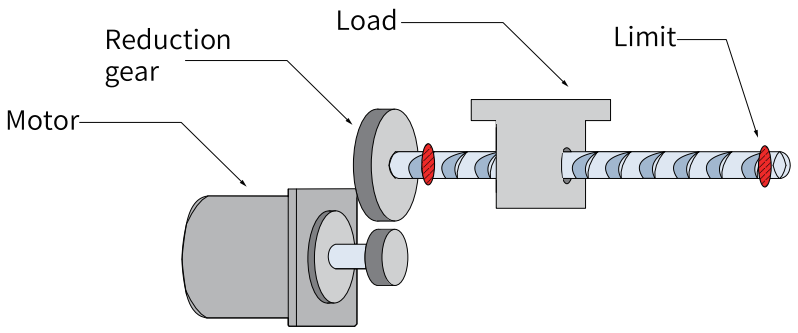


Figure 12-1 Servo motor linear mode mechanism

The SV680F-INT works with the Inovance absolute encoder in the absolute position linear mode.

Assume that the electronic gear ratio is B ÷ A, the mechanical absolute position (H0b.58 and H0b.60) is P_M, then the following formula applies: H0b.07 (Absolute position counter) = P_M ÷ (B ÷ A) H0b.07 indicates present mechanical absolute position (in reference unit).

The range of H0b.70 (absolute encoder revolutions) is -32768 to 32767. If H0b.70 overflows, E735.0 (Encoder multi-turn counting overflow) occurs. In this case, set H0d.20 to 2 (Reset multi-turn data), and then perform homing again. In special occasions, you can set H0A.36 to 1 to hide E735.0 or use absolute position linear mode 2.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.36	0x0524	Mechanical home offset	-2147483648 to 2147483647	0	reference unit	Real-time	"H05_en.36" on page 518
H05.46	0x052E	DI selection of multi-turn frequency-division Z starting point	0: No operation 1: DI1 2: DI2 3: DI3 4: DI4 5: DI5	0	-	Real-time	"H05_en.46" on page 520
H0b.07	0x0B07	Absolute position counter	-2147483648 to 2147483647	0	reference unit	Unchangeable	"H0b_en.07" on page 579

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.58	0x0B3A	Mechanical absolute position (low 32 bits)	0 to 4294967295	0	encoder unit	Unchangeable	"H0b_en.58" on page 588
H0b.60	0x0B3C	Mechanical absolute position (high 32 bits)	-2147483648 to 2147483647	0	encoder unit	Unchangeable	"H0b_en.60" on page 588

Absolute position rotation mode

This mode applies in cases where the load travel range is unlimited and the number of unidirectional revolutions is lower than 32767 upon power failure, as shown in the following figure.

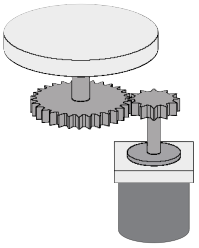
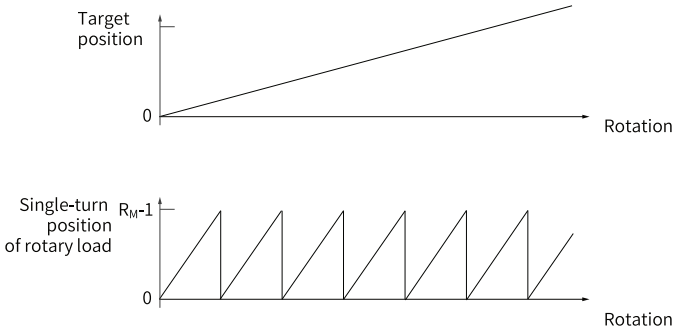
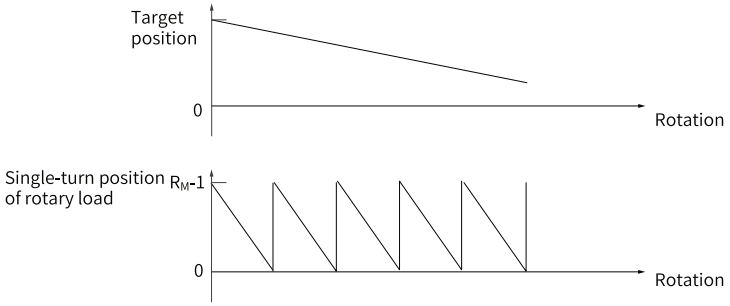


Figure 12-2 Application of the linear mode

The single-turn position range of the rotary load is 0 to (RM - 1) (RM: Encoder pulses per load revolution). When the gear ratio is 1:1, the variation law of the target position and the single-turn position of the rotary load during forward operation is shown as follows.



The variation law of the target position and the single-turn position of the rotary load during reverse operation is shown as follows.



When the motor operates in the absolute rotation mode and the drive operates in the hm mode, the setting range of the home offset is 0 to (R_M - 1). If the home offset is set to a value outside this range, the drive reports EE09.1.

The multi-turn data range is unlimited in the absolute position rotation mode. Therefore, E735.0 (Encoder multi-turn counting overflow) is hidden automatically.

Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.50	0x0532	Mechanical gear ratio in absolute position rotation mode (numerator)	1 to 65535	1	-	At stop	"H05_en.50" on page 521
H05.51	0x0533	Mechanical gear ratio in absolute position rotation mode (denominator)	1 to 65535	1	-	At stop	"H05_en.51" on page 521
H05.52	0x0534	Pulses per revolution of the load in absolute position rotation mode (low 32 bits)	0 to 4294967295	0	encoder unit	At stop	"H05_en.52" on page 522
H05.54	0x0536	Pulses per revolution of the load in absolute position rotation mode (high 32 bits)	0 to 4294967295	0	encoder unit	At stop	"H05_en.54" on page 522
H0b.81	0x0B51	Single-turn position of the rotary load (low 32 bits)	0 to 4294967295	0	encoder unit	Unchangeable	"H0b_en.81" on page 591
H0b.83	0x0B53	Single-turn position of the rotary load (high 32 bits)	-2147483648 to 2147483647	0	encoder unit	Unchangeable	"H0b_en.83" on page 591
H0b.85	0x0B55	Single-turn position of the rotary load (reference unit)	0 to 4294967295	0	reference unit	Unchangeable	"H0b_en.85" on page 591

Single-turn absolute mode

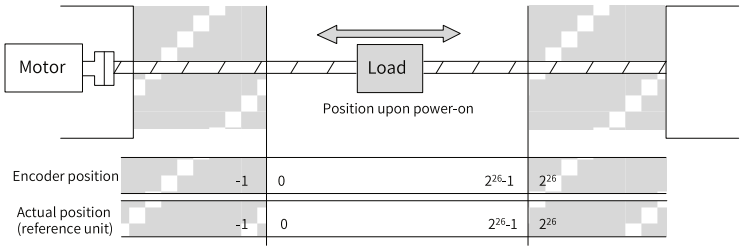
This mode applies to applications where the load travel range is within the single-turn range of the encoder. In this case, the absolute encoder needs no battery as it records the single-turn data only.

- Target position input range
  If a 26-bit absolute encoder is used in the single-turn absolute mode, the drive operates in the position control mode, and the electronic gear ratio 1:1, then:

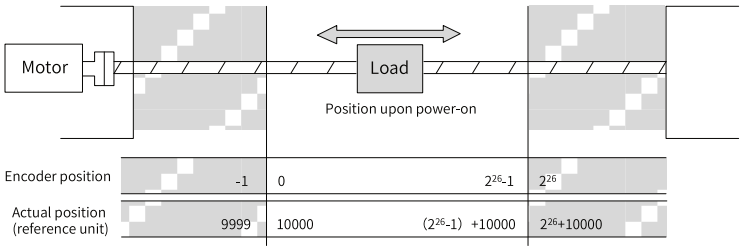
  When H05.36 (Mechanical home offset) is set to 0, the target position range is 0 to (2^{26} - 1).

  After homing is done, the target position range is H05.36 to (2^{26} - 1 + H05.36).

- Example
  Gear ratio: 1:1; H05.36 = 0:



  Gear ratio: 1:1; H05.36 = 10000:



12.1.3 Precautions for Using the Battery Box

This section only applies to Inovance servo motors.

E731.0 (Encoder battery failure) will occur at initial power-on of the battery. Set H0d.20 (Absolute encoder reset function) to 1 to reset E731.0 before further operations.

When the battery voltage detected is lower than 3.0 V, A730.0 (Encoder battery alarm) occurs.

In this case, replace the battery according to the following steps.

1. Power on the servo drive and make it stay in the non-operational state.
2. Replace the battery.
3. After the servo drive resets A730.0 automatically. If no other alarm occurs, continue to operate the servo drive.

Note

- If you replace the battery after powering off the servo drive, E731.0 (Encoder battery failure) will occur at next power-on, leading to an abrupt change in the multi-turn data. In this case, set H0d.20 to 1 to reset the encoder fault. Then perform the homing operation again.
- Ensure the maximum motor speed does not exceed 6000 rpm upon power-down of the servo drive. This is to enable the encoder to record the position accurately.
- Keep the battery in environments within the required ambient temperature range and ensure the battery is in reliable contact and carries sufficient power capacity. Otherwise, encoder data loss may occur.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0d.20	0x0D14	Absolute encoder reset	0: No operation 1: Reset fault 2: Reset fault and multi-turn data 3: Reset Inovance 2nd encoder fault 4: Reset Inovance 2nd encoder fault and multi-turn data	0	-	At stop	"H0d_en.20" on page 598

Note

The absolute position recorded by the encoder changes abruptly after multi-turn data reset. In this case, perform mechanical homing.

12.2 Full Closed-loop Mode

12.2.1 Full Closed-loop Parameter Setting

The drive supports full closed-loop operation only in AC3 mode. After you set basic gain parameters, the full Closed-loop function ensures that the servo drive operates properly without overshoot and stops without unexpected noise. When basic operating conditions are met, set the closed-loop parameters based on the following procedure.

1. **Set the external encoder feedback type.**
   Set H0F.03 based on the external encoder type.

Note

- BiSS-C encoder:
  - The BiSS-C encoder generally has a data bit and an error bit. You can obtain their data lengths in the corresponding encoder user guide. The data length of the error bit is usually 2 bits.
  - You can obtain the communication frequency and recovery time from the encoder user guide.
  - CRC is used.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).
- SSI encoder:
  - The SSI encoder generally has a data bit and an error bit. You can obtain their data lengths in the corresponding encoder user guide.
  - Parity check is used.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).
- EnDat2.2 encoder:
  - You need to set the data length for the EnDat2.2 encoder.
  - You need to configure the communication frequency (baud rate) and recovery time (from the first falling edge of the clock signal to the first rising edge of the data signal).

2. **Confirm the operating direction of the external encoder.**

   Check whether the operating directions of the internal and external encoders are the same, if not, runaway can occur due to positive feedback.

   ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.01	0x0F01	Fully closed-loop encoder application mode	0: Standard operating direction 1: Reverse operating direction	0	-	Real-time	"H0F_en.01" on page 602

   The following describes how to confirm the operating direction of the external encoder.

   Enter the JOG mode, and perform jogging at low speed in one direction. Observe the value of H0F.18 (Feedback pulse counter of internal encoder) and H0F.20 (Feedback pulse counter of external). If these two values change in the same way (increase or decrease simultaneously), set H0F.01 to 0; if not, set H0F.01 to 1.

Caution

- Before running the motor, be sure to perform the trial run inspection. For specific operations, see Section "Commissioning and Operation".
- Set H0F.01 properly. If H0F.01 is set improperly, runaway fault may occur.

3. **Determine the resolution of external encoder (external encoder pulses per revolution)**

   Rotate the motor and observe the value of H0F.18 (Feedback pulse counter of internal encoder) to confirm the motor has rotated for a full turn. Then calculate the variation of H0F.20 (Feedback pulse counter of external encoder), and incorporate this value into H0F.04.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.04	0x0F04	Number of fully closed-loop encoder pulses per revolution	1 to 2147483647	10000	-	At stop	"H0F_en.04" on page 603

Caution

- Suppose the values of H0F.18 and H0F.20 before the motor rotates are X_1 and Y_1 respectively, and their values change to X_2 and Y_2 after the motor rotates, then the following formula applies:

$$\text{H0F.04} = \text{Number of encoder pulses per revolution} \times \frac{Y_2-Y_1}{X_2-X_1}$$

- The calculation result must be a positive value. If it is a negative value, it indicates H0F.01 is set improperly. In this case, check the value of H0F.01 again.
- Set H0F.04 properly. If H0F.04 is set to a wrong value, EB02.0 (Position deviation too large in fully closed-loop mode) may occur when the drive is operating.

4. **Set the electronic gear ratio of external encoder.**

If H0F.00 is set to 1, set H05.07/H05.09. If H0F.00 is set to 2, set H05.07/H05.09 for inner loop H05.11/H05.13 for outer loop.

Suppose for a fully closed-loop device, the external mechanical displacement corresponding to each X_1 pulse reference sent by the host controller is Y_1.

Then perform the following operations:

a. Step 1: Set the electronic gear ratio to 1:1.

b. Step 2: Make the host controller send X_2 pulses. The external mechanical displacement measured is Y_2,

then the electronic gear ratio fulfills the needs.

Note

- To set the fully closed-loop electronic gear ratio in internal/external closed-loop position switchover mode, set the electronic gear switchover switch (Gear_Sel) to the external closed-loop state.
- This method also applies to internal closed-loop mode. In the internal closed-loop mode, ensure the present state is internal closed-loop state.
- Set the electronic gear ratio correctly. Failure to comply will result in mechanical deviation.

5. **Set the alarm threshold.**

Set H0F.08 and H0F.10 as follows.

- Set H0F.08 (Excessive deviation in compound control).

  H0F.08 defines the position deviation threshold at which the servo drive reports EB02.0 (Position deviation too large in fully closed-loop mode). Its unit is one reference unit (same as one external encoder unit).

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.08	0x0F08	Excessive deviation threshold in compound control mode	0 to 2147483647	1000	encoder unit	Real-time	"H0F_en.08" on page 604

For example, if H0F.08 is set to 1000, EB02.0 (Position deviation too large in fully closed-loop mode) will be outputted if the deviation between the mechanical displacement driven by the motor and the mechanical displacement (compound deviation) measured by the external encoder exceeds the displacement corresponding to 1000 external encoder pulses.

Note

- If it is set to 0, EB02.0 (Position deviation too large in fully closed loop) will not be output.
- H0F.08 must be set to a value (such as H0F.04 x H0F.10 x 50%) lower than H0F.04 x H0F.10. Otherwise, EB02.0 cannot be outputted.

- Set H0F.10 (Clear deviation in compound control).
  The value of H0F.10 indicates the revolutions to be ran by the motor per deviation clear in the compound control mode.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.10	0x0F0A	Clear deviation in compound control mode	0 Rev–100 Rev	1	Rev	Real-time	"H0F_en.10" on page 604

If its value is set to 0, the deviation in compound control will not be cleared.

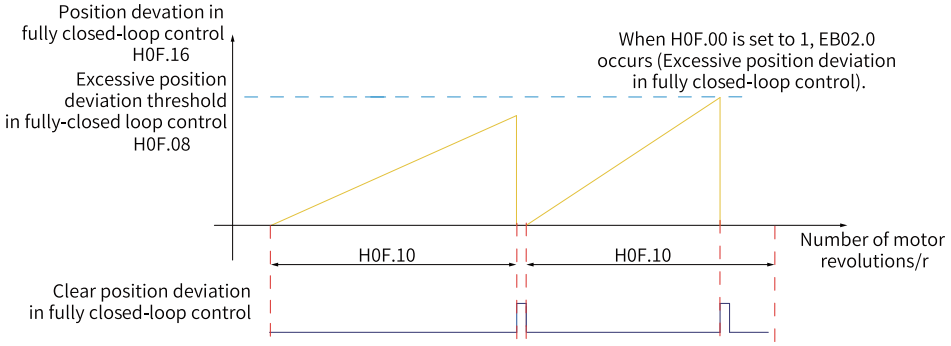


Figure 12-3 Description of position deviation clear in the fully closed-loop mode

The number of revolutions defined by H0F.10 is detected through internal encoder feedback pulses.

For example, if H0F.10 is set to 50, the servo drive detects whether the deviation in compound control exceeds the pulse unit defined by H0F.08 when the motor is in the process of rotating within 50 turns. If yes, EB02.0 will be reported. If not, the servo drive clears the deviation after the motor rotates for more than 50 turns, and then starts monitoring again.

- Set the first-order low-pass filter for deviation in compound control.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.13	0x0F0D	Compound vibration suppression filter time	0.0 ms–6553.5 ms	0.0	ms	At stop	"H0F_en.13" on page 604

The first-order filter time constant is used to filter vibration of the deviation in compound control, smoothening the speed in fully closed-loop mode.

- Set the source of touch probe Z signal in fully closed-loop mode.

  ☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.25	0x0F19	Set the source of touch probe Z signal in fully closed-loop mode.	0: Motor Z signal 1: External feedback Z signal	0	-	Real-time	"H0F_en.25" on page 606

H0F.25 (Source of touch probe Z signal in fully closed-loop mode) defines the source of Z signal during homing in the fully closed-loop mode. The setpoint 0 indicates Z signal of inner loop of used as the source and the setpoint 1 indicates Z signal of the outer loop is used as the source. When the Z signal of outer loop is used as the source, ensure Z signal is wired correctly. Otherwise, Z signal may fail to be detected.

Caution

- Set H0F.10 properly for clearing deviation in compound control. Given the setpoint of H0F.08, if H0F.10 is set to an excessively low value, protection against excessive deviation in compound control can fail.
- Pay attention to encoder limit setting during use.
- Set this warning properly. Failure to comply may incur physical injuries due to runaway accident.

12.2.2 Enable Fully Closed-loop

After setting preceding fully closed-loop parameters, observe the internal/external encoder feedback through H0F.18 and H0F.20, and check whether the fully closed-loop wiring and the application mode of the external encoder are proper. If yes, enable the fully closed-loop function.

Set the following parameters while enabling the fully closed-loop function:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H03.02	0x0302	DI1 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 38: Probe 1 39: Probe 2 56: External switch of the EEPOS program block	14	-	Real-time	"H03_en.02" on page 504
H0F.00	0x0F00	Encoder feedback mode	0: Internal encoder feedback 1: External encoder feedback 2: Inner/Outer loop switchover	0	-	Real-time	"H0F_en.00" on page 601

Note

To switch between inner and outer loops, you need to set H0F.00 to 2, rather than changing it to 0 or 1 in realtime.

12.3 Software Limit

12.3.1 Software position limit

Function

Hardware position limit is implemented by inputting external encoder signals to CN1 of the servo drive.

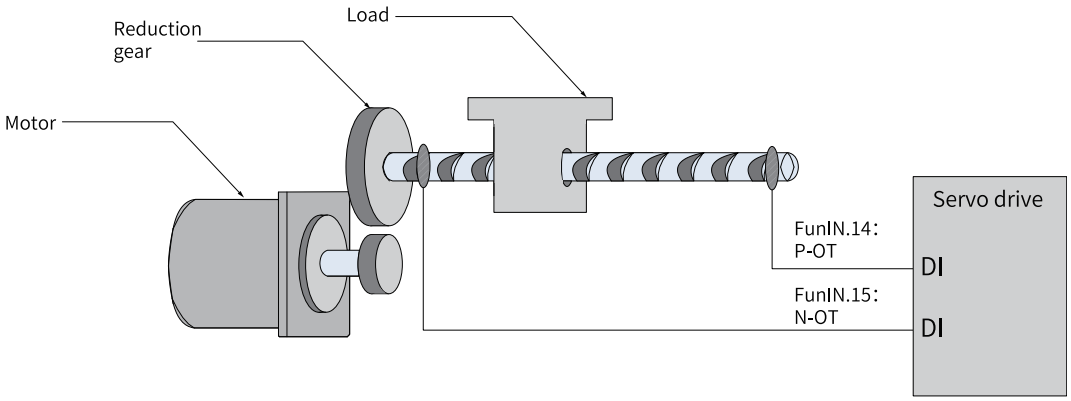


Figure 12-4 Installation of limit switches

Software position limit is implemented through a comparison between the internal position feedback and the set limit value. If the set limit value is exceeded, the servo drive reports an alarm and stops immediately. Software position limit is available both in the absolute position mode and the

incremental position mode. To use the software position limit in the incremental position mode, set H0A.01 (Software position limit) to 2 (Enabled after homing) first, and then perform homing upon power-on before applying software position limit.

Table 12–2 Comparison between the hardware position limit and software position limit

Hardware Position Limit		Software position limit	
1	Restricted to linear motion and single-turn rotational motion.	1	Applicable to both the linear motion and the rotational motion.
2	Requires an external mechanical limit switch.	2	Removes the need for hardware wiring, preventing malfunction due to poor cable contact.
3	Suffered from the risk of mechanical slip.	3	Prevents malfunction due to mechanical slip through internal position comparison.
4	Unable to sense or detect an overtravel fault after power-off.		

Related objects

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.00	0x0A00	Power input phase loss and failure protection	0: Enable 1: Disable	0	-	Real-time	"H0A_en.00" on page 562
H0A.41	0x0A29	Forward position of software position limit	-2147483648 to 2147483647	2147483647	reference unit	At stop	"H0A_en.41" on page 568
H0A.43	0x0A2B	Reverse position of software position limit	-2147483648 to 2147483647	-2147483648	reference unit	At stop	"H0A_en.43" on page 568

Communication mode:

- When H0A.01 is set to 0 (disable absolute position limit), software limit is disabled.
- When H0A.01 is set to 1 (enable absolute position limit), software limit is enabled immediately upon power-on. Soft limit uses a minimum position limit and a maximum position limit. Ensure the min. position limit ⩽ max. position limit. If you set min. position limit > max. position limit, EE09.0 (Software limit setting error) will occur.
- When H0A.01 = 2 (absolute position limit enabled after homing), the soft limit is not enabled after the drive is powered on and before homing. When the absolute position counter is greater than the maximum position limit after homing, A950.0 alarm/E950.0 fault occurs, and forward overtravel stop is executed; After homing, when the absolute position counter is less than the minimum position limit, A952.0 alarm/E952.0 fault occurs, and reverse overtravel stop is executed.

Non-communication mode:

- When H0A.01 is set to 0 (disable absolute position limit), software limit is disabled.

- When H0A.01 is set to 1 (enable absolute position limit), software limit is enabled immediately upon power-on. When the value of the absolute position counter (H0b.07) is higher than the value of H0A.41, A950.0 alarm/E950.0 fault occurs and the drive stops accordingly.
  When the value of the absolute position counter (H0b.07) is lower than the value of H0A.43, A952.0 alarm/E952.0 fault occurs and the drive stops accordingly.
- If H0A.01 is set to 2 (enable absolute position limit after homing), software limit is not enabled after homing upon power-on. When the value of the absolute position counter (H0b.07) is higher than the value of H0A.41 after homing, A950.0 alarm/E950.0 fault occurs and the drive stops accordingly.
  When the value of the absolute position counter (H0b.07) is lower than the value of H0A.43 after homing, A952.0 alarm/E952.0 fault occurs and the drive stops accordingly.

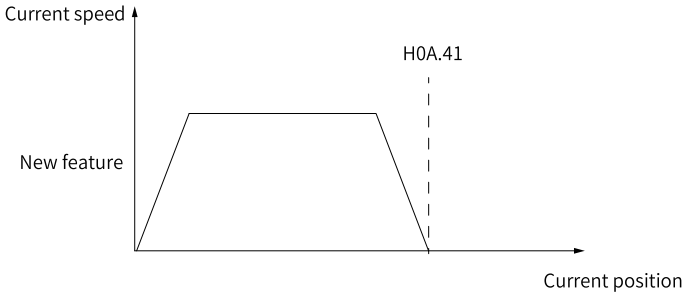
Note

Ensure the value of home offset is within the software position limit. Otherwise, the servo drive reports EE09.1.

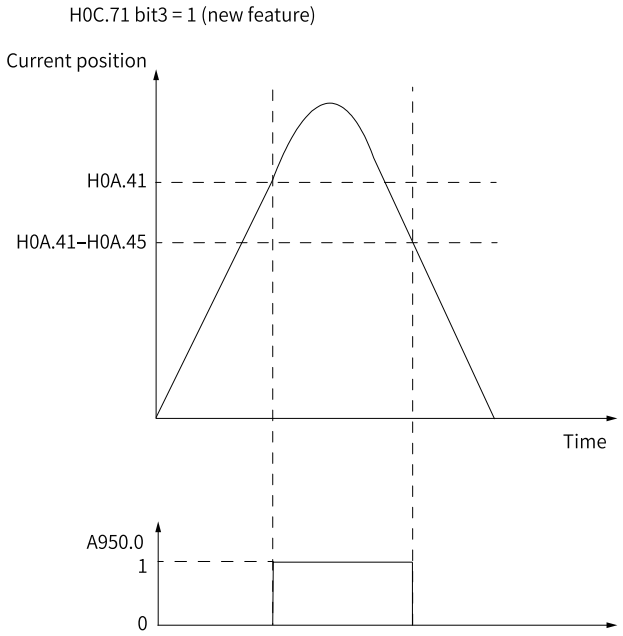
12.3.2 Software Position Limit Stops Within Limit

This function is enabled when H0A.01 = 1 and H0C.71.bit3 = 1; When H0A.01 = 0 or H0C.71 = 0, the function is turned off. After this function is turned on or off, the effective state of the function will not be updated until disabling. After the feature takes effect. In modes 1, 2, 3, 7, and 8 of AC3, if the target position is set outside the soft limit range, the specific effect is the soft limit of the planned fixed position. In modes 1, 2, and 8, an A950.1 or A952.1 alarm will be reported.

The new feature is that the deceleration stop is planned in advance before the soft limit, and the stop position is at the soft limit.



Use new features (H0C.71.bit3 = 1)



- The A950.0 alarm/E950.0 fault is reported when the current position (user reference unit) is greater than the forward soft limit threshold.
- The A950.0 alarm/E950.0 fault is eliminated when the current position (user reference unit) is less than the forward soft limit threshold.

12.4 Software Reset

Function

The software reset function applies when power cycling of the drive is not allowed on the application site.

Related objects

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0d.00	0x0D00	Software Reset	0: No operation 1: Enable	0	-	At stop	"H0d_en.00" on page 594

12.5 Motor Protection

Motor overload protection

The motor generates heat continuously due to thermal effect of the current after power-on. The heat is then dissipated to the surroundings. When the heat generated exceeds the heat dissipated, the motor temperature will rise to a point that could damage the motor. To prevent such risks, the drive offers

the motor overload protection function to prevent the motor from being damaged due to over-temperature.

The motor is compliant with NEC and CEC requirements and equipped with protective functions against overload and overtemperature.

Set the motor overload protection gain (H0A.04) to adjust the report time of fault E620.0. Use the default value of H0A.04 in general conditions, however, in case of one of the following situations, modify H0A.04 based on the actual heating condition.

- The motor works in environments with high temperature.
- The motor is in the cyclic motion featuring short motion cycle and frequent acceleration/deceleration.

You can also hide motor overload detection (H0A.26 = 1) when you are sure that the motor will not be damaged due to overtemperature.

Caution

Take caution when hiding the motor overload fault as it may damage the motor.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.04	0x0A04	Motor overload protection gain	50 to 300	100	-	Real-time	"H0A_en.04" on page 562
H0A.26	0x0A1A	Motor overload detection	0: Show motor overload alarm (A909.0) and fault (E620.0) 1: Hide motor overload alarm (E909.0) and fault (E620.0)	0	-	Real-time	"H0A_en.26" on page 566

Locked rotor over-temperature protection

When the motor is stalled, the motor speed is nearly 0 RPM while the current is large. In this case, the motor is overheated significantly. The motor is capable of operating upon stall in an allowable period of time, exceeding of which can damage the motor due to overtemperature. To prevent such risks, the drive offers motor overtemperature protection to protect the motor from being damaged by overtemperature.

You can set the time for reporting E630.0 (Motor stall over-temperature fault) by setting the time threshold for motor overtemperature protection (H0A.32). The motor overtemperature protection function is enabled by default (H0A.33 = 1).

Caution

Take caution when hiding motor stall over-temperature protection as it may result in a damage to the motor.

Use the dedicated motor for the SV680P series servo drive. Failure to comply will result in the risk of short circuit due to aging of insulation.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.32	0x0A20	Time threshold for locked motor overheat protection	10 ms–65535 ms	200	ms	Real-time	"H0A_en.32" on page 567
H0A.33	0x0A21	Locked motor overheat protection	0: Disabled 1: Enabled	1	-	Real-time	"H0A_en.33" on page 567

Motor overspeed protection

An excessively high speed may damage the motor or machine. Motor overspeed protection is used to protect the motor in case of overspeed, preventing the motor or machine from being damaged due to overtemperature.

$$\text{Overspeed threshold} = \begin{cases} \text{Max. motor speed} \times 1.2 & \text{H0A.08} = 0 \text{ or H0A.08} > \text{Max. motor speed x 1.2} \\ \text{H0A.08} & \text{H0A.08} \neq 0 \text{ and H0A.08} < \text{Max. motor speed x 1.2} \end{cases}$$

Caution

- The servo drive also offers motor runaway protection to prevent motor stall caused by lose of control.
- In applications where the motor drives a vertical axis or is driven by load, set H0A.12 to 0 to hide runaway fault detection. Use this function with caution.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.08	0x0A08	Overspeed threshold	0[mm/s]/[rpm]–20000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	"H0A_en.08" on page 563
H0A.12	0x0A0C	Runaway protection enable	0: Disable 1: Enable	1	-	Real-time	"H0A_en.12" on page 563

Besides runaway protection, the drive also allows you to set the speed limit in the speed/torque control mode to protect the motor and the machine.

12.6 DI Filter Time

Function

The drive provides 5 physical DI terminals, in which DI1 to DI3 are normal DI terminals, and DI4 to DI5 are high-speed DI terminals. Assign the probe function to DI4 or DI5 to guarantee precision.

When regular functions (touch probe excluded) are assigned to DIs, the filter time of these DIs is set in H03.60...H03.62. Ensure the effective level hold time of the DI assigned with regular function is above 0.5 ms. Otherwise, the DI function may not be responded to.

When a high-speed DI is assigned with the touch probe function, the filter time of this DI is defined by H0A.19 and H0A.20. Ensure the effective level hold time of the high-speed DI is longer than the filter time.

Related objects

The drive provides two high-speed DIs with input signal frequency up to 4 kHz. When the DI signal is being disturbed, set the filter time in H0A.19 and H0A.20.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H03.60	0x033C	DI1 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time	"H03_en.60" on page 510
H03.61	0x033D	DI2 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time	"H03_en.61" on page 510
H03.62	0x033E	DI3 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time	"H03_en.62" on page 510
H03.63	0x033F	DI4 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time	"H03_en.63" on page 510
H03.64	0x0340	DI5 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time	"H03_en.64" on page 510
H0A.19	0x0A13	Filter time constant of touch probe 1	0.00μs to 6.30μs	2.00	μs	Real-time	"H0A_en.19" on page 564
H0A.20	0x0A14	Filter time constant of touch probe 2	0.00μs to 6.30μs	2.00	μs	Real-time	"H0A_en.20" on page 564

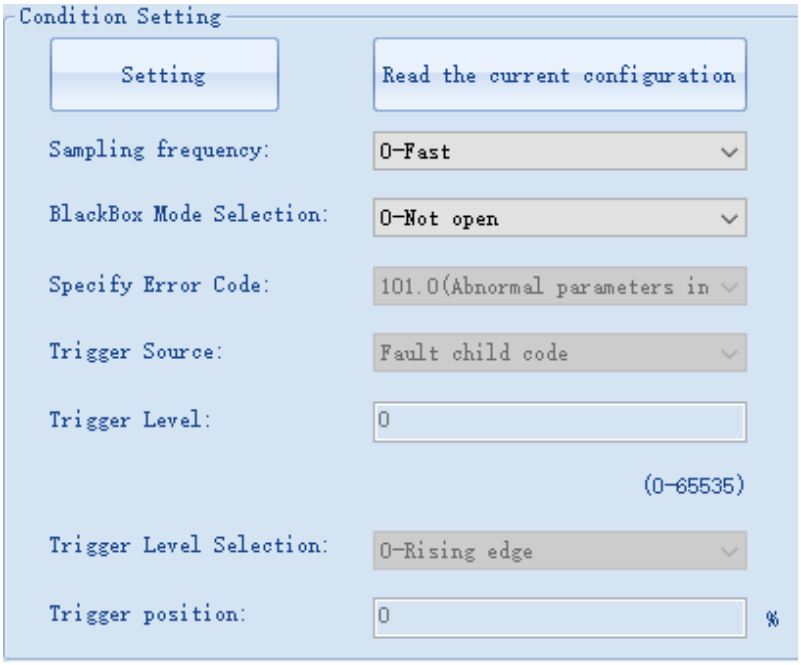
12.7 Black Box

Function

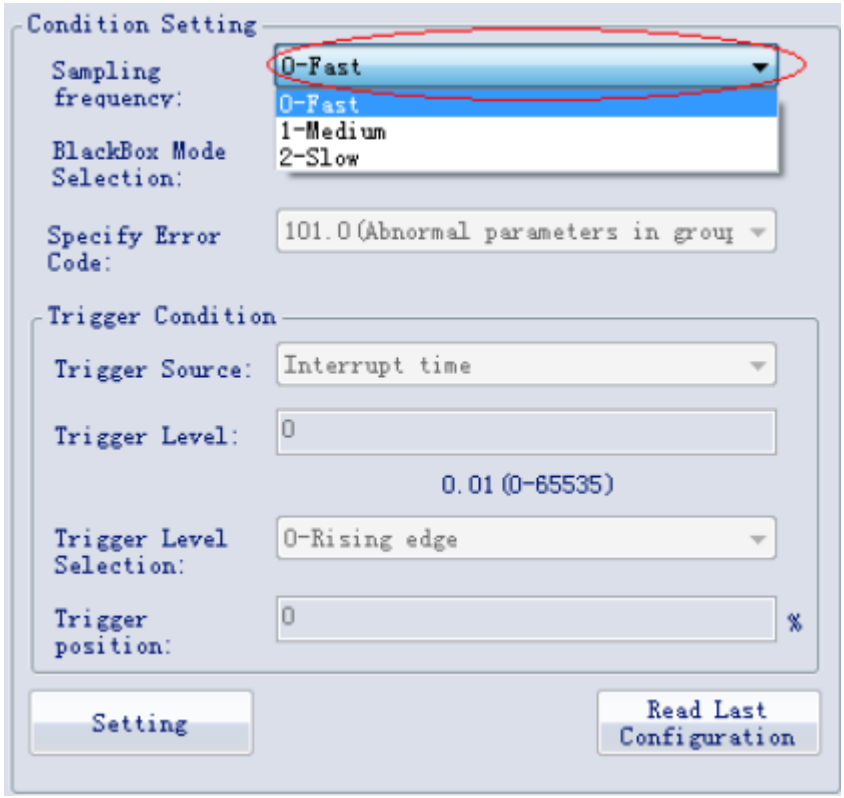
The black box function is used to capture and save the data generated upon occurrence of faults or under designated conditions. Such data can be read and uploaded by users through the software tool to facilitate troubleshooting. You can set black box channels through H32.45 to specifically analyze different types of issues. For example, in the real-time target speed/electrical angle channel, real-time target absolute position is acquired when H32.45=0, and the electrical angle is acquired when H32.45=1.

The black box is enabled by default. It is triggered upon occurrence of a fault or a sampling frequency of 16k. The black box function will be turned off automatically after it is being triggered, or turned on automatically upon fault reset or power cycling.

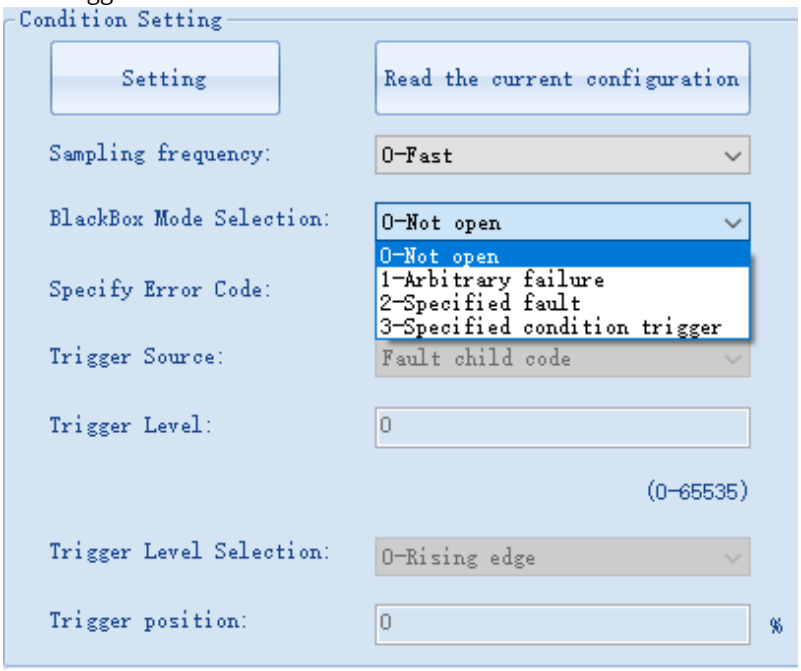
Triggering the black box



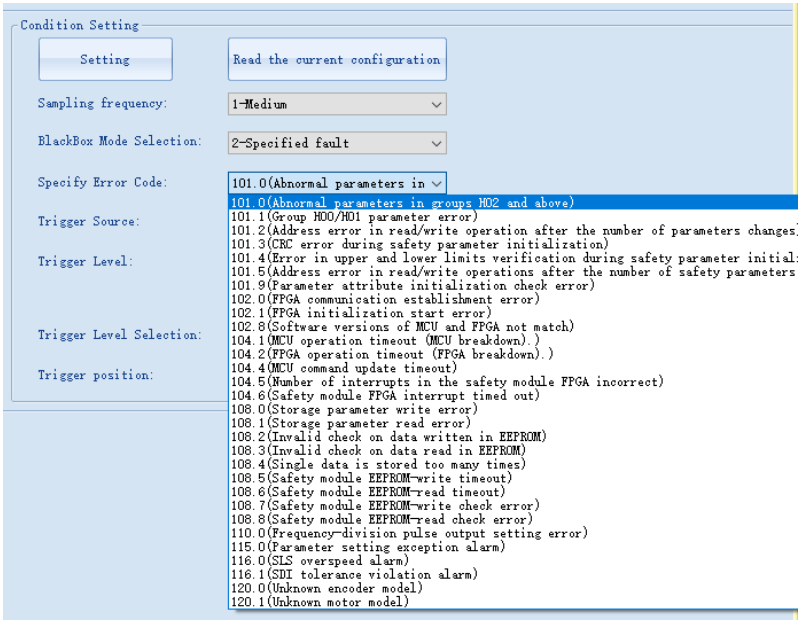
1. Sampling frequency: including three sampling frequencies, namely 16k (Fast), 4k (Medium), and 1k (Slow).



2. Black box mode selection: including three modes, namely Arbitrary failure, Specified fault, and Specified condition trigger.



3. Select designated fault in the combo box, as shown below.



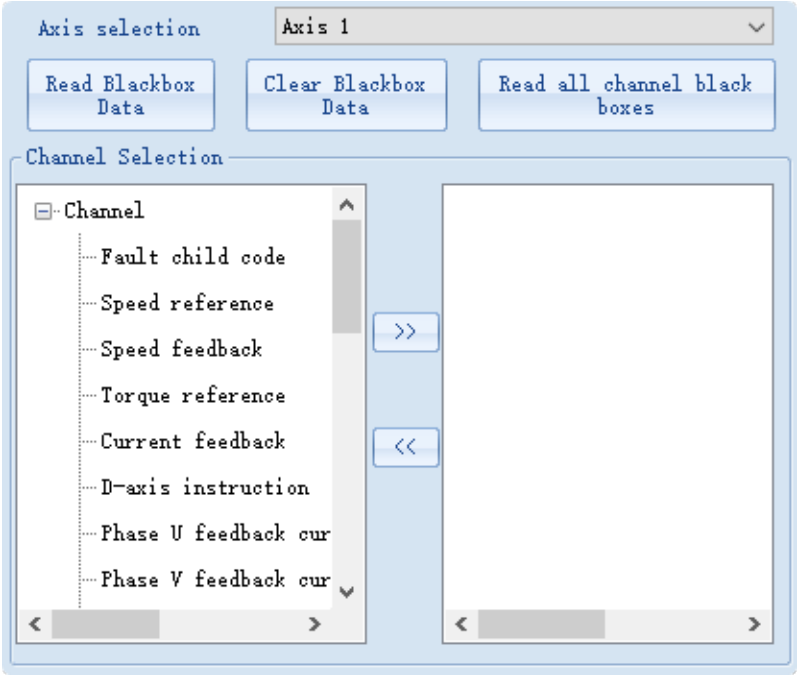
4. The Trigger Condition includes Trigger Source, Trigger Level, and Trigger Level Selection, as shown below.



5. Trigger position is used to set the position of the trigger time in the total sampling time, which is set to 75% by default.
6. After the black box is set, click Setting to download configuration parameters to the servo drive.

Reading black box data

You can select the black box channels (4 channels at most) by clicking >> or <<, or read data of all the channels by clicking Read all, then click Save to save the waveform files.



12.8 Touch Probe

Function

The touch probe function is the same as the position latch function. Position feedback sources include motor position and full closed-loop feedback. This feature latches the position information (in reference unit) when an DI signal or Z signal changes.

The drive offers two touch probes to record position values corresponding to the rising edge and falling edge of each touch probe signal, which means four position values can be latched simultaneously.

When a DI is used to trigger the touch probe, the relation between the DI logic and the touch probe edge is shown in the following table. Note that the probe is only available for high speed DI.

Table 12–3 Description of bit3 of H0A.40

Bit3 of H0A.40	Touch Probe Edge	DI logic	DI switch
0	Rising Edge	NO	OFF→ON
		NC	ON→OFF
	Falling Edge	NO	ON→OFF
		NC	OFF→ON
1	Rising Edge	NO/NC	OFF→ON
	Falling Edge	NO/NC	ON→OFF

When a DI is used to trigger the touch probe, you can set the filter window of the touch probe signal through H0A.19 and H0A.20.

The DI touch probe supports hardware action delay compensation to compensate for the precision loss incurred by ON/OFF delay of the DI. Related parameters are shown in the following table.

Parameter		Description
H0A.40	bit1	Touch probe rising edge compensation: 1: Enabled, 0: Disabled
	bit2	Touch probe falling edge compensation: 1: Enabled, 0: Disabled
H0A.53		DI probe DI on compensation time (DI switch off→on)
H0A.54		DI probe DI off compensation time (DI switch on→off)

To shorten the hardware delay to about 7 μs, it is recommended to set the touch probe latch through the ON-edge of the DI.

There are three Z touch probe triggers: motor Z signal, frequency-division output Z signal, and fully closed-loop Z signal, as shown in the following table.

Feedback Source	Parameter	Description
Motor encoder	H05.41.bit2 = 0, motor Z signal	The Z touch probe is triggered by the motor Z signal.
	H05.41.bit2 = 1, frequency-division output Z signal	The Z touch probe is triggered by the frequency-division output Z signal, including the multi-turn Z signal.
Fully closed-loop feedback	H0F.25 = 0, motor Z signal	When there is no Z signal input in the pulse-type fully closed-loop mode, you can trigger the touch probe through the motor Z signal to latch external position feedback.
	H0F.25 = 1, fully closed-loop Z signal	When there is Z signal input in the pulse-type fully closed-loop mode, you can trigger the touch probe latch function through the fully closed-loop Z signal.

12.9 SEMI F47 Voltage Drop

Description

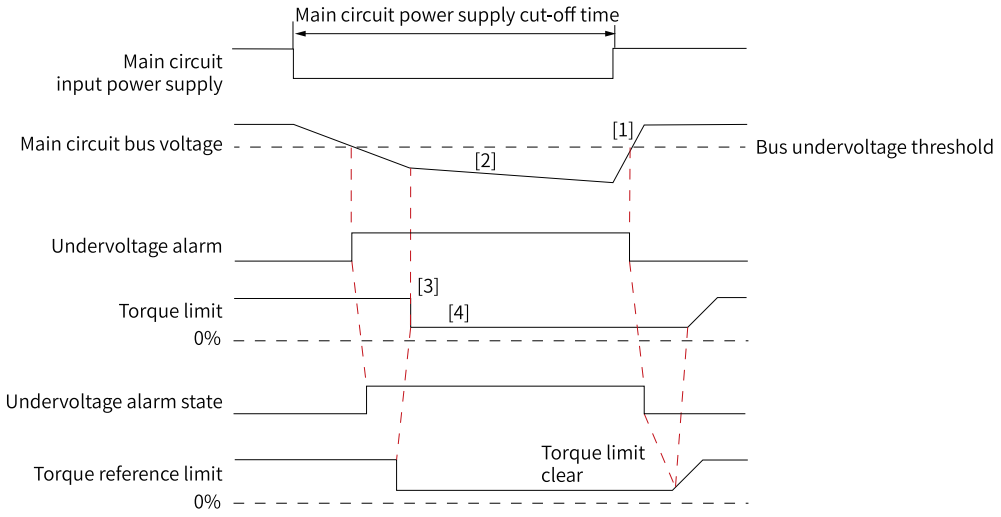
When the DC voltage of the main circuit of the drive is lower than the undervoltage threshold due to instantaneous power failure or temporary low power supply voltage of the main circuit, A971.0 warning is reported and the output current is limited.

With combination of this function and H0A.84 (instantaneous power outage holding time), the drive can continue to run when the power supply voltage decreases, and it will not stop because of alarm.

Description

This function can be executed by the instruction issued by the host controller or the servo drive. You can choose through H0A.81 (enable voltage drop protection).

- **When executed by the host controller (H0A.81 = 1)**
  After receiving the warning of undervoltage A971.0, the host controller limits the torque, and removes torque limit after receiving A971.0 warning release signal.

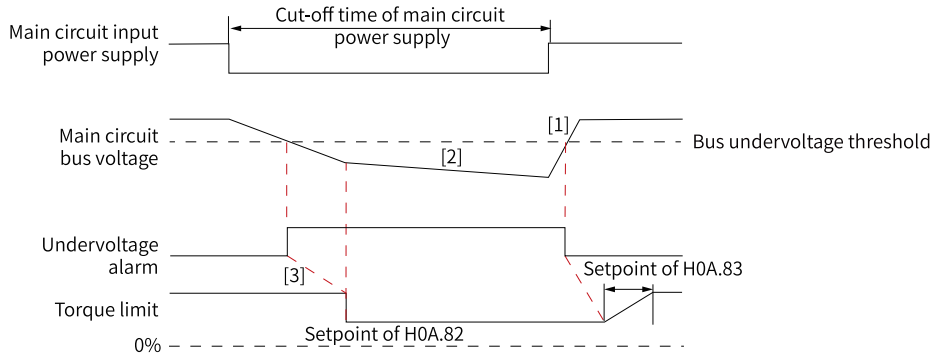


Note

- [1]: After the main circuit power supply is restored, the bus voltage of the main circuit rises.
- [2]: By limiting the output torque, you can reduce the bus voltage of the main circuit gently.
- [3]: Torque limiting starts.
- [4]: Limit torque after an undervoltage warning is received.

  - When H07.07 = 0:
    The forward torque limit is set in H07.09 and the reverse torque limit is set in H07.10.
  - When H07.07=2, you select AI1 or AI2 as the torque limit input source for T-LMT through H07.08.
  - When H07.07 = 5:
    PN torque limit

- **When executed by the drive (H0A.81 = 2)**
  According to the undervoltage A971.0 warning, apply torque limit inside the servo drive; After receiving the undervoltage warning release signal, the torque limit value is controlled in the servo drive according to the set time.



Note

- [1]: After the main circuit power supply is restored, the bus voltage of the main circuit rises.
- [2]: By limiting the output torque, you can reduce the bus voltage of the main circuit gently.
- [3]: Torque limiting starts.

- **The A971.0 undervoltage warning is not detected (H0A.81 = 0)**
  Voltage drop does not trigger A971. 0 alarm, but E410.0.

Related parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.81	0x0A51	Voltage drop protection enable	0: No operation 1: Host controller executes torque limit 2: Servo executes torque limit	0	-	At stop	"H0A_en.81" on page 575
H0A.82	0x0A52	Voltage drop torque limit	0.0% to 100.0%	50.0	%	Real-time	"H0A_en.82" on page 575
H0A.83	0x0A53	Torque limit cancel time	0 ms–1000 ms	100	ms	Real-time	"H0A_en.83" on page 576
H0A.84	0x0A54	Instantaneous power failure holding time	20 ms–50000 ms	1000	ms	Real-time	"H0A_en.84" on page 576

Note

- This function is suitable for instantaneous power outage with the voltage and time specified by SEMI F47. If the voltage and time beyond this range, a standby power supply is needed.
- When the power supply of the main circuit is restored, use the torque limit of the host controller or servo drive to set the torque, so as to avoid the output torque being greater than the commanded acceleration torque.
- When used on vertical axes, do not limit the torque below the holding torque.
- This function is to limit the torque within the capacity of the powered off servo drive, and is not applicable to all load conditions or operating conditions. The parameter to be set may vary with the actual device.
- After you set H0A.84, the time from disconnecting the power supply to stopping the motor power will become longer. You can power off the motor immediately through the input and output of servo ON input signal.

12.10 S-curve

The S-curve function must be used in position mode and telegram 111.

By setting H05.74 (S-curve mode selection) to 1–6, you can turn on the S-curve function. The larger the value, the smoother the filtered position reference.

When the S-curve function is turned on, you can set H05.06 (average filter time constant 1). The larger the value of H05.06, the smoother the filtered position reference.

☆ Related parameters:

Parameter	Hex	Name	Value	Default	Unit	Change Mode	Page
H05.06	0x0506	Moving average filter time constant 1	0.0 ms–128.0 ms	0.0	ms	At stop	"H05_en.06" on page 515
H05.74	0x054A	S-curve mode selection	0: 1 filter on 1: 2 filters on, filter time 5:1 2: 2 filters on, filter time 2:1 3: 2 filters on, filter time 1:1 4: 3 filters on, filter time 4:1:1 5: 3 filters on, filter time 2:1:1 6: 3 filters on, filter time 1:1:1	0	-	At stop	"H05_en.74" on page 523

12.11 Position Comparison

Function

Position comparison works by comparing the instantaneous position feedback with the value pre-saved in the data array and, once available, outputting a DO signal with pulse width settable or an ABZ/OCZ signal. Position comparison is applicable to high-speed motion axes as comparison actions are implemented by FPGA, removing the risk of software communication delay between processors.

Note

During position comparison, if any one of the comparison start point, end point, or comparison mode is modified, position comparison will be executed again.

The following table describes the specifications of position comparison output.

Specifications of Position Comparison Output		Function
Trigger output	Output terminal	DO or ABZ/OCZ signals.
	Logic	The effective level of DO is defined by the DO logic in group H04.
		The effective level of ABZ/OCZ output is defined by H18.06.
	Pulse width	The pulse output width is defined by H18.05.
	Delay compensation	Defined by H18.14 and used to compensate for hardware output delay.
Comparison source	Motor encoder feedback	Supported
	Pulse feedback fully closed-loop (ABZ)	Supported
	Communication-type fully closed-loop	Supported
Comparison value	Number of comparison points	40 points, signed 32-bit integer
Comparison attribute	Attribute of comparison point	Defines the attribute of the comparison point.
		Defines the output terminal for comparison.

Related objects

When position comparison is enabled, you can assign FunOUT.25 (Position comparison) to any one of the DOs. The DO you select will be used to output the position comparison output signal. You can also use the ABZ/OCZ signal as the position comparison output terminal by setting H18.16.

Position comparison output parameters:

Parameter	Name	Description
H18: Position comparison output		
H18.00	Position comparison output selection	0: Disabled 1: Enabled (rising edge-triggered)
H18.01	Position comparison output feedback source	0: Motor encoder feedback 1: Fully closed-loop feedback
H18.02	Position comparison resolution[1]	Defines the number of pulses per revolution. For example, if H18.02 is set to 1, the number of pulses per revolution is 2^{23}. 0: 24-bit 1: 23-bit 2: 22-bit 3: 21-bit 4: 20-bit 5: 19-bit 6: 18-bit 7: 17-bit
H18.03	Position comparison mode	0: Individual comparison 1: Cyclic comparison 2: Fixed cyclic comparison
H18.04	Current position as zero	0: Disabled 1: Enabled (rising edge-triggered) Note: This function needs to be used when the comparison state is inactive, otherwise the comparison logic may malfunction.
H18.05	Position comparison output width	Defines the active pulse width of the DO when the comparison point is reached. The value range is 0.1 to 204.7 (in ms).
H18.06	Position comparison output ABZ polarity	bit0: OCZ output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic bit1: Z output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic bit2: A/B output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic
H18.07	Start point of position comparison	Activated when H18.00 is set to 1 again.
H18.08	End point of position comparison	Activated when H18.00 is set to 1 again.
H18.09	Current state of position comparison	0: No comparison; n: Waiting for the comparison point N
H18.10	Real-time position of position comparison	Displays the current comparison position value Value range: -2^{31} to (2^{31} - 1)

Parameter	Name	Description
H18: Position comparison output		
H18.12	Zero offset of position comparison	Defines the offset value after current position is taken as the zero point Value range: -2^{31} to $+2^{31}$ - 1
H18.14	Position comparison output delay compensation	Comparison delay compensation time: -12 μs to +12 μs
H18.15	Fixed cyclic comparison	1–65535
H18.16	ABZ output function setting	bit0: OCZ output function 0: Frequency-division output 1: Position comparison bit1: Z port output function 0: Frequency-division output 1: Position comparison bit2: A/B port output function 0: Frequency-division output 1: Position comparison
H18.17	Number of fixed mode cycles	Range: 0 to 65535

Note

[1]: When the source of position comparison is full closed-loop feedback, it is only effective for Inovance encoders.

Parameter	Name	Description
H19: Target position parameters		
H19.00	Target value of position comparison 1	Defines the target value of position comparison 1. Value range: -2^{31} to 2^{31} - 1
H19.02	Attribute value of position comparison 1	Bit 0: 1: Current position changes from "less than" to "more than" the comparison point; 0: None Bit 1: 1: Current position changes from "more than" to "less than" the comparison point; 0: None bit2 to bit6: N/A bit7: 1: DO1 output; 0: None bit8: 1: DO2 output; 0: None bit9: 1: DO3 output; 0: None bit10: 1: DO4 output; 0: None bit11: 1: DO5 output; 0: None bit12: 1: Frequency-division A output; 0: None bit13: 1: Frequency-division B output; 0: None bit14: 1: Frequency-division C output; 0: None bit15: 1: Frequency-division OCZ output; 0: None
H19.03	Target value of position comparison 2	Defines the target value of position comparison 2. Value range: -2^{31} to 2^{31} - 1
H19.05	Attribute value of position comparison 2	Defines the attribute value of position comparison 2. Value range: Same as H19.02
...	...	...
H19.117	Target value of position comparison 40	Defines the target value of position comparison 40. Value range: -2^{31} to 2^{31} - 1
H19.119	Attribute value of position comparison 40	Defines the attribute value of position comparison 40. Value range: Same as H19.02

Function operation

1. Description

   Position comparison works by comparing the instantaneous position feedback with the value pre-saved in the data array and, once available, outputting a DO signal with pulse width settable for future use in subsequent motion control. Position comparison is applicable to high-speed motion axes as comparison actions are implemented by FPGA, removing the risk of software communication delay between processors.

   - Position comparison switch
     When the value of H18.00 (Position comparison switch) changes from 0 to 1, position comparison starts and the value of H18.09 (Current state of position comparison) is updated to the start point of position comparison. When the value of H18.00 changes to 0, position comparison stops and the current comparison state will be cleared.
   - Position comparison resolution
     The comparison resolution defines the number of pulses per revolution. Given the maximum and minimum limits on the target position (defined by group H19), you can reset the resolution when data overflow occurs on the comparison value. For example, when H18.02 is set to 7, the maximum value of the target position is 2^{31} - 1, and the motor rotates (2^{31} - 1)/2^{17} turns.

   Note

   The target position in group H19 is only related to the set resolution.

   - Individual comparison mode
     In the individual comparison mode, when comparison of the end point is done, the comparison function is switched off automatically and the current comparison value is cleared. Position comparison can be enabled again only when the position comparison switch is switched on again.

     The real-time position feedback in the individual comparison mode is an absolute value, which means it is an accumulative value based on preceding comparison points, which cannot be cleared automatically.
   - Cyclic comparison
     In the cyclic comparison mode, position comparison will not be switched off when the comparison end point is reached, and current position comparison value will be reset as the start point for position comparison. After comparison of each point is done, the real-time position feedback (H18.10) will be cleared and counted again for cyclic comparison. In the cyclic comparison mode, the target position is a relative (incremental) value. Each time a comparison point is reached, the real-time position feedback is cleared and counted again for comparison with the new target.
   - Fixed cyclic comparison
     In fixed cyclic comparison mode, the comparison process works in the same way as the cyclic comparison mode. The number of cycles is defined by H18.15. After the set number of cycles are done executing, comparison will be disabled automatically.
   - Position comparison output width

When the position comparison conditions are fulfilled, the servo drive outputs DO active level signal. The width of the active signal can be set in H18.05 (value range: 1 to 2047 x 0.1 ms). 1 to 2047 × 0.1 ms.

When position comparison DO is active, the comparison logic is suspended and no comparison will be performed. In this case, ensure the operating time between two target points is larger than the output width of DO.

- Target value of position comparison
  There are 40 target values for position comparison. The target value and attribute value of position comparison must be updated to parameters in group H19 in advance.

Note

Set the target position properly. overflow comparison (H18.10) is not supported in the position comparison mode.

- Start point for comparison
  The start point indicates the position of the first comparison point. For example, if the start point is set to 5, the comparison starts from position comparison 5.
- End point for comparison
  The end point indicates the position of the last comparison point. For example, if the end point is set to 7, the comparison stops or restarts from the start point after position comparison 7 is reached.
- Zero offset of position comparison
  The value of H18-10 (Real-time position feedback) will be changed to the offset value defined by H18-12 (Zero offset of position comparison) at the rising edge (0 → 1) of H18-04 (Present position as zero).

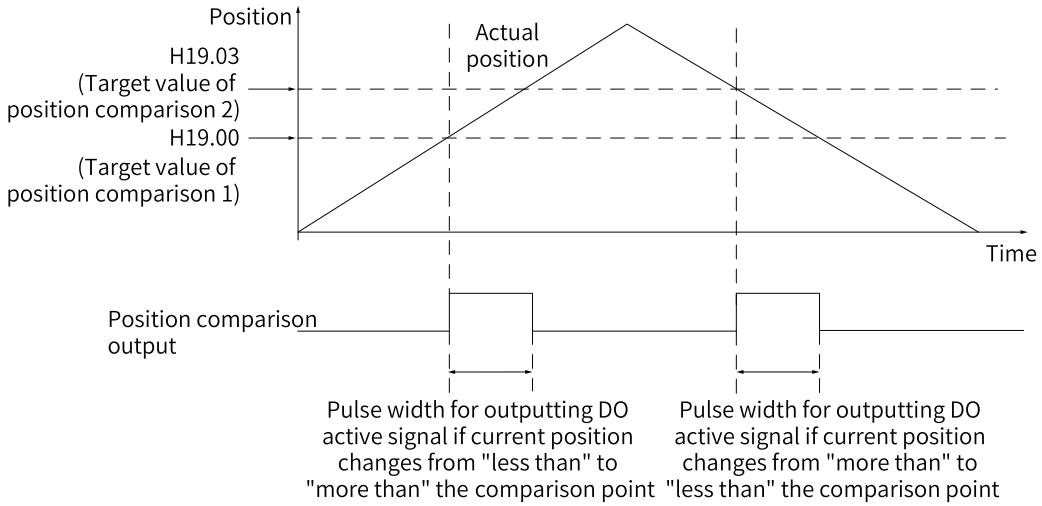
Note

Check whether zero offset needs to be set before enabling position comparison output. Otherwise, comparison error may occur.

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2. Function operation

- When the position feedback of the encoder passes the target position comparison points, the output width of the output terminal is defined by H18.05 (Position comparison output width).

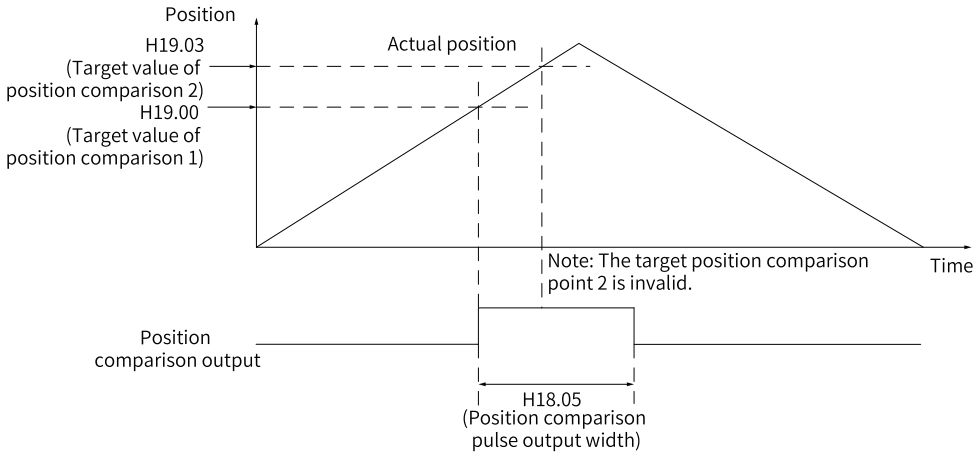


When the attribute of the comparison point is set to "bit0 = 1" (Output DO active signal if current position changes from "less than" to "more than" the comparison point), the DO outputs the position comparison signal when the axis passes the target position comparison point with position changing from "less than" to "more than" the comparison point position.

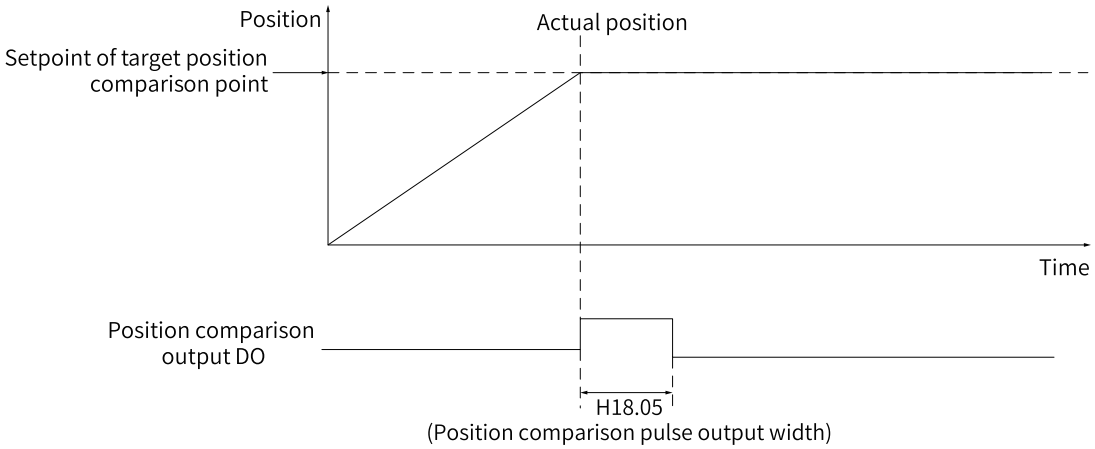
When the attribute of the comparison point is set to "bit1 = 1" (Output DO active signal if current position changing from "more than" to "less than" the comparison point), the DO outputs the position comparison signal when the axis passes the target position comparison point with position changing from "more than" to "less than" the comparison point position.

When the attribute of the comparison point is set to "bit0/bit1 = 1" (Output DO active signal in both situations), the DO outputs the position comparison signal when the position feedback passes the target position comparison point.

- When multiple position comparison values are set, no comparison will be performed once the position comparison output terminal is active. Therefore, ensure the operating time between two position comparison points is larger than the pulse output width.
  As shown in the following figure, comparison is not performed when the position changing from "more than" to "less than" the comparison point position. This is because the operating time between the two comparison points is lower than the pulse output width.



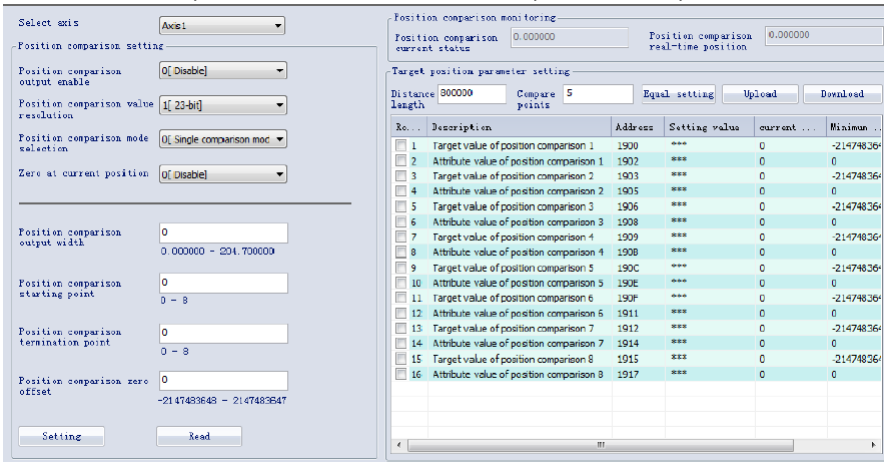
- Only one pulse will be outputted when the stop position is the same with the target value of position comparison. See the following figure.



3. Interface of the software tool

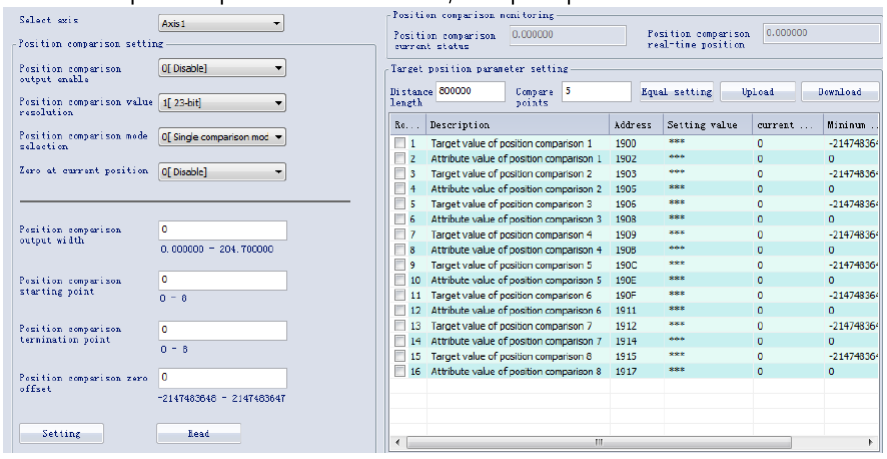
- Individual comparison mode

  a. Set H18.03 (Position comparison mode) to 0 (Individual position comparison).



  b. **Target position parameter setting**: **Distance length** (total operating distance) and **Compare points**

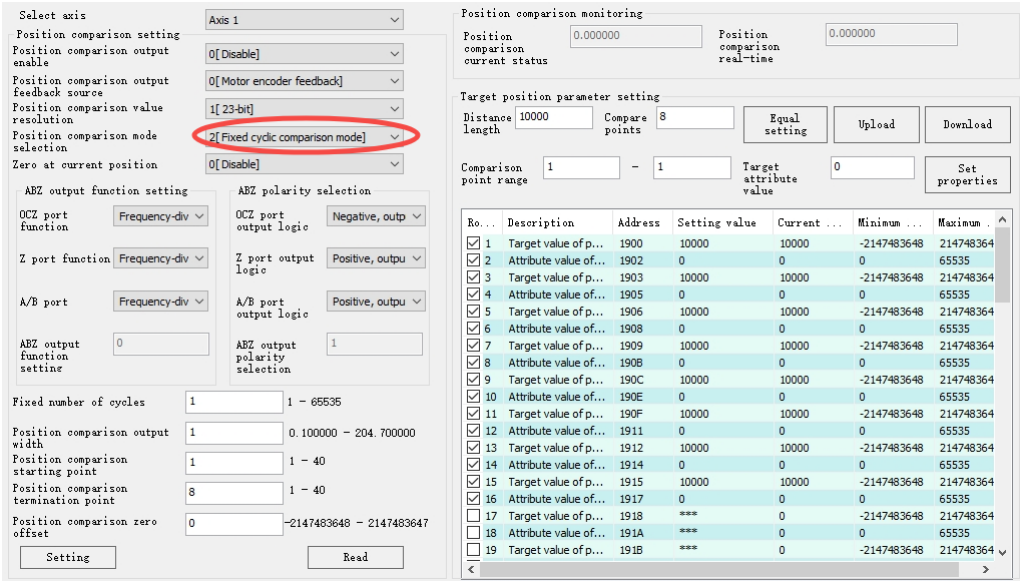
  c. In the single comparison mode, set the total running distance and number of comparison points. After clicking "Equal Setting", the target value of the first point is updated to "Offline x 1/Number of comparison points", the target value of the second point is updated to "Distance x 2/Number of comparison points", and the target value of the Nth point is updated to "Distance x N/Number of comparison points". Distance x N/Compare points



When H18.00 (Position comparison output selection) changes from 0 to 1 (Enable rising edge-triggered), H18.09 (Current state of position comparison) changes from 0 to 1 and the first target position value will be compared. When H18.10 (Real-time position feedback) reaches the value of the first target position, H18.09 changes from 1 to 2, and so on.

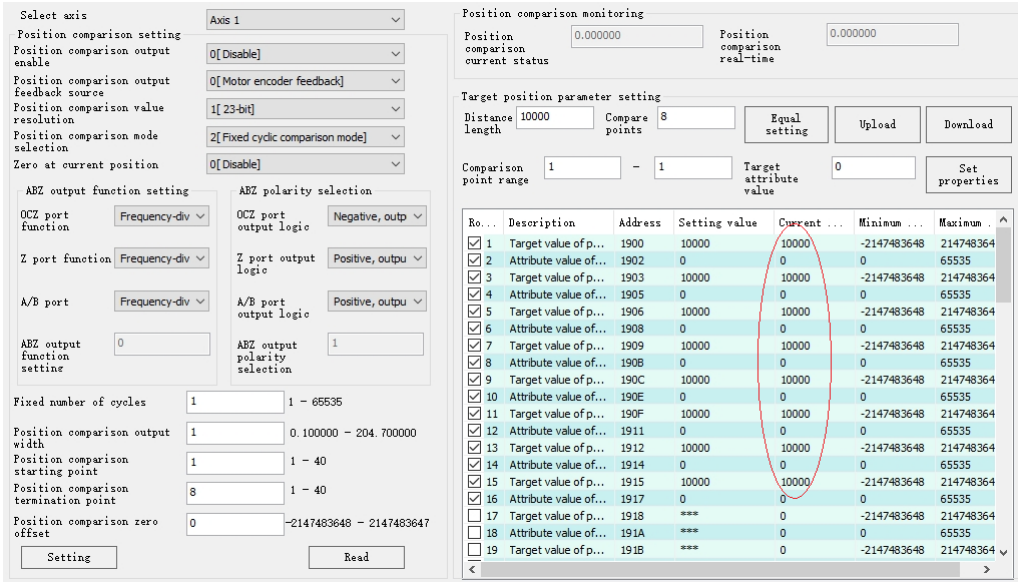
- Cyclic comparison mode/Fixed cyclic comparison mode

  a. Set **Position comparison mode selection** to **1 (Cyclic comparison mode)**.



  b. **Target position parameter setting**: **Distance length** (distance between two adjacent points) and **Compare points** (points to be compared cyclically)

  c. After clicking **Equal setting**, the target values of the 1st point to the Nth point are updated to equal interval distance values.



When H18.00 (Position comparison output selection) changes from 0 to 1 (Enable rising edge-triggered), H18.09 (Current state of position comparison) changes from 0 to 1 and the first target position value will be compared. When H18.10 (Real-time position feedback) reaches the value of the first target position, H18.09 changes from 1 to 2, and so on.

12.12 Position reference filter

Position reference filter serves to filter the position references (in encoder unit) multiplied or divided by the electronic gear ratio, which includes first-order low-pass filtering and moving average filtering. It involves the first-order filter and moving average filter.

It is applicable to the following conditions:

- The acceleration/deceleration process is not performed on the position references sent from the host controller.
- The pulse reference frequency is low.
- The electronic gear ratio is larger than 10.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.04	0x0504	First-order low-pass filter time constant	0.0 ms–6553.5 ms	0.0	ms	At stop	"H05_en.04" on page 515
H05.06	0x0506	Moving average filter time constant 1	0.0 ms–128.0 ms	0.0	ms	At stop	"H05_en.06" on page 515

Note

This function does not affect the displacement value (position reference sum).

An excessively high setpoint delays the responsiveness, so set a proper filter time constant based on actual conditions.

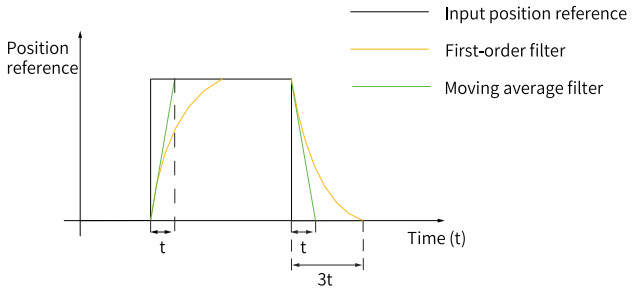


Figure 12-5 First-order filter and moving average filter for rectangular position references

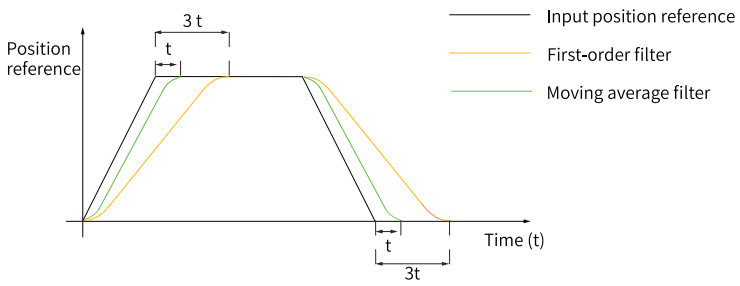


Figure 12-6 First-order filter and moving average filter for trapezoid position references

12.13 Homing

Caution

Do not set H05.30 to 65 or 8 when the motor is operating by commands. Otherwise, speed fluctuation will occur.

Description

- Home: The mechanical home, which can represent the home switch or motor Z signal position.
- Zero: positioning target point, represented as home + offset (set in H05.36). When H05.36 (Mechanical home offset) is set to 0, the zero position coincides with the home.

In the position control mode, when homing is triggered after the S-ON signal is activated, the motor starts searching for the zero position.

When homing is in progress, the servo drive does not respond to other position references (including another homing trigger signal) until homing is done.

Sequence

H05.30 = 6

- To take the current position as the home and achieve home offset (H05.40 = 0 or 2, H05.36 ≠ 0), set H05.36 and H05.40 first, and then set H05.30 to 6. Failing to do so will cause H0b.07 to keep the previous value of H05.36 rather than the one set currently.
- After homing is done, H05.30 will be set to 0. To enable homing again, re-write H05.36 and set H05.30 to 6.

12.14 Frequency-division output

Caution

It is recommended to use the active edge output by the Z signal in cases where a high precision frequency-division output of Z signal is required.

Parameter	bit	Description
H05.41	Bit 0: Frequency-division Z signal output polarity	0: Positive (falling edge-triggered) 1: Negative (rising edge-triggered)
	Bit 1: OCZ signal output polarity	0: Positive (falling edge-triggered) 1: Negative (rising edge-triggered)

The frequency-division output function outputs the position reference pulses or encoder feedback position references as A/B phase quadrature pulses.

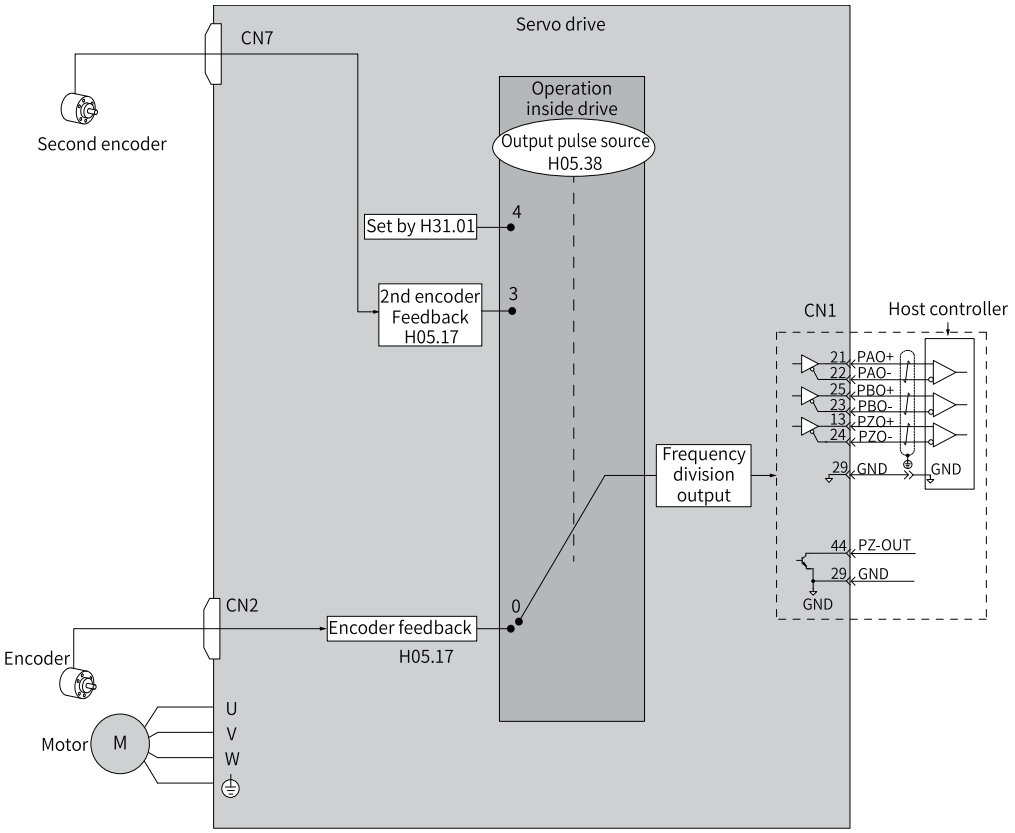


Figure 12-7 Schematic diagram of frequency-division output

- when the host controller provides closed-loop feedback, encoder frequency-division output (H05.38 = 0) is recommended.
- when the host controller provides full closed-loop feedback, encoder frequency-division output (H05.38 = 3) is recommended. When the output frequency setpoint is used, it is recommended to use H31.01 frequency division output setting mode , that is, H05.38=4.

The drive offers one group of frequency-division terminals, as described below:

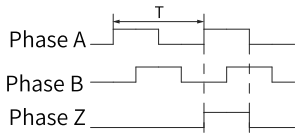
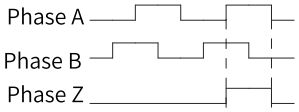
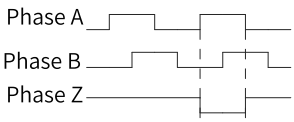
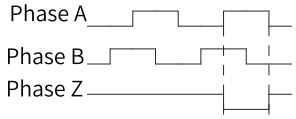
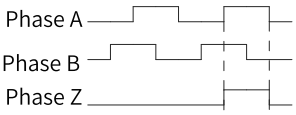
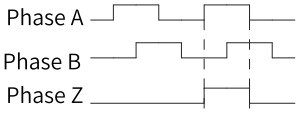
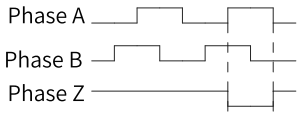
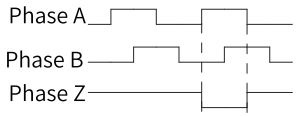
- Phase A pulses: PAO+ and PAO-, differential output, maximum output pulse frequency: 4 Mpps
- Phase B pulses: PBO+ and PBO-, differential output, maximum output pulse frequency: 4 Mpps
- Phase Z pulses: PZO+ and PZO-, differential output, maximum output pulse frequency: 4 Mpps
- PZ-OUT, GND, open-collector output, maximum output pulse frequency: 100 kpps

When using the frequency-division output function, set the output pulse source (H05.38), phase (H02.03), resolution (H05.17), and phase Z pulse polarity (H05.41) according to requirements.

When the output source is encoder frequency-division pulse (H05.38 = 0), the motor rotates one revolution and the phase A/B output pulses per motor revolution are determined by H05.17 (Encoder frequency-division pulses). The pulse width (T) of phase A/B is determined by the motor speed. The phase Z, whose width is also T, is synchronized with phase A. For communication motors, Z signal is output once per motor revolution.

When the output source is H31.01 (H05.38 = 4), the A/B phase output pulse frequency (quadruple) is determined by H31.01, and there is no Z phase pulse output.

Table 12–4 Pulse diagrams of encoder frequency-division output (H05.38 = 0)

H02.03 (Output pulse phase)	H05.41 (Z pulse output polarity)	Pulse Output Diagram of Forward RUN	Pulse Output Diagram of Reverse RUN
0	0	 Phase A leads phase B by 90°.	 Phase B leads phase A by 90°.
	1	 Phase A leads phase B by 90°.	 Phase B leads phase A by 90°.
1	0	 Phase B leads phase A by 90°.	 Phase A leads phase B by 90°.
	1	 Phase B leads phase A by 90°.	 Phase A leads phase B by 90°.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.03	0x0203	Output pulse phase	0: Phase A leads phase B 1: Phase A lags behind phase B	0	-	At stop	"H02_en.03" on page 495
H05.17	0x0511	Number of encoder frequency-division pulses	0 PPR to 4194303 PPR	2500	PPR	At stop	"H05_en.17" on page 516

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.38	0x0526	Frequency-division output source	0: Encoder frequency-division output 2: Frequency-division output inhibited 3: Second encoder frequency-division output 4: H31-01 reference frequency output	0	-	Real-time	"H05_en.38" on page 518
H05.41	0x0529	Z pulse output polarity	bit0: Frequency-division Z output polarity 0: Positive (high level upon active Z pulse) 1: Negative (low level upon active Z pulse) bit1: OCZ output polarity 0: Positive (high level upon active Z pulse) 1: Negative (low level upon active Z pulse) bit2: Inner loop probe Z signal source 0: Motor Z signal 1: Frequency-division output Z signal	0x1	-	At stop	"H05_en.41" on page 519

13 STO Function

13.1 Safety Overview

13.1.1 Precautions for Use

Safety Instructions

The chapter contains the warning symbols used in this manual and the safety instructions which you must obey when you install or connect an option module to a drive or inverter. If you ignore the safety instructions, injury, death or damage can occur. Read this chapter before you start the installation.

Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.

The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual.

Table 13–1 Warnings, Cautions and Notes

Icon	Signal word	Description	Consequences in case of disregard
Example:  General hazards  Special hazards e.g. electric shock	DANGER	DANGER	Indicates that failure to comply with the notice will result in death or severe personal injuries
	WARNINGS	Alarm	Indicates that failure to comply with the notice may result in death or severe personal injuries
	CAUTION	Note	Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage
	STOP	Prohibited	Indicates that failure to comply with the notice will result in equipment or environmental damage

Caution

- High attention is required for electrical installation and at the system design to avoid hazards either in normal operation or in the event of equipment malfunction.
- System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read the operating instruction and this safety information.

It is the responsibility of the machine builder/OEM/system integrator to make sure that the essential health and safety function requirements specified in the Machinery Directive are met. Risk analysis and risk assessment is needed before using a product. Make sure that adequate measures are taken to eliminate/reduce the relating risks and components chosen must meet the safety requirements.

This section describes the information that needs to be noted before starting operation. Read the following safety precautions, risk assessment information, and limitations before starting operation.

Use the safety function STO after properly understanding all of this information. Incorrect use of safety functions or use of safety functions that are not sufficient to meet the safety requirements of the site may result in personal injury.

Safety Precautions

Carefully read the following important precautions and observe them when using the safety function.

- The STO function is not a substitute for the emergency stop (E-stop) function. If only the STO function is triggered, with no extra measures taken, the power supply cannot be cut off in emergencies and high-current parts of the motor and drive are still energized, incurring the risk of electric shock or other risks result in electric energy. Therefore maintenance work on electrical parts of the drive or motor can only be carried out after isolating the drive system from the main supply.
- Depending on the standards and requirements for a particular application, it may be possible to use STO as an integral part of an E-stop system. However, its main purpose is for use in a dedicated safety control arrangement whose purpose is to prevent any hazard from occurring, without the use of an E-stop.
- An E-stop is often provided in a machine to allow for unexpected situations where an operator sees a hazard and can take action to prevent an accident.
- The design requirement for an E-stop differs from that of a safety interlock. Generally, the E-stop is required to be independent from any complex or "intelligent" control. It may use purely electromechanical devices to either disconnect the power or initiate a controlled rapid stop using other means such as dynamic or regenerative braking.

Note

- The design of safety-related systems requires specialist knowledge. To ensure that a complete control system is safe, it is necessary for the whole system to be designed according to recognized safety principles. The use of individual sub-systems such as drives with STO function, which are intended for safety-related applications, does not in itself ensure that the complete system is safe.
- The STO function can be used to stop the drive in emergency stop situations.
- In processes without personnel protection, it is recommended not to stop the drive by using the STO function. If a drive running is stopped by using STO, the drive performs a coast-to-stop. If this is not acceptable, the system should be stopped using the correct mode instead of the STO function.
- This publication is a guide to the application of Inovance SV660 series safety functions, and also on the design of safety-related systems for machinery control.
- It is the responsibility of the designer of the end product or application to ensure that it is safe and in compliance with the relevant regulations.

Risk Assessment

- When using the safety functions, perform risk assessment on the servo system in advance. Make sure that the safety integrity level of the standards is met.
- The following residual risks can be present even when the safety functions operate. Therefore, safety must always be given consideration during risk assessment.
- If external forces (such as gravitational force with a vertical axis) are applied when the safety functions are operating, the motor will rotate due to the action of these external forces. Therefore, you must use a separate mechanical brake to secure the motor.

Note

In the case of failure of multiple IGBTs, regardless of whether the STO function is enabled, the servo drive can generate an alignment torque. This torque can cause the motor shaft to rotate within a range of up to 180/p (for a synchronous reluctance motor, the range is 180/2p).

To ensure safety, users should decide all the risk assessments and residual risks in the entire machine equipment. A company and individual who constructed the safety related system must take full responsibility for installation and commissioning of the system. Additionally, when complying with a European machinery directive, the system must acquire safety standards certification as a whole.

Perform all risk assessments and safe level certification to the machine or the system as a whole. It is recommended that a Certification Body final safety certification of the system be used.

The following shows residual risks concerning the safety function of this product.

Common residual risks

- At the shipment to end-users, check the settings of safety related components with programming tools and monitored/displayed contents on display and record and save the setting data concerning the safety observation function and the programming tools you used. Perform them using a check sheet, etc.
- The safety will not be ensured such as in assembling machine until installing, wiring, and adjustment are completed properly. Install, wire, and adjust your system referring to installation guide for each unit.
- Only qualified personnel are authorized to install, start-up, repair or adjust the machines in which these components are installed. Only trained engineers should install and operate the equipment.
- Separate the wiring for safety observation function from other signal wiring.
- Protect the cables with appropriate ways (routing them in a cabinet, using a cable guard, etc.).
- We recommend using a switch, relay, sensor, etc. which comply with safety standards. When using a switch, relay, sensor, etc. which do not comply with safety standards, perform a safety confirmation.
- Keep the required clearance/creepage distance depending on voltage you use.

Residual risks of STO

Safe torque off (STO)

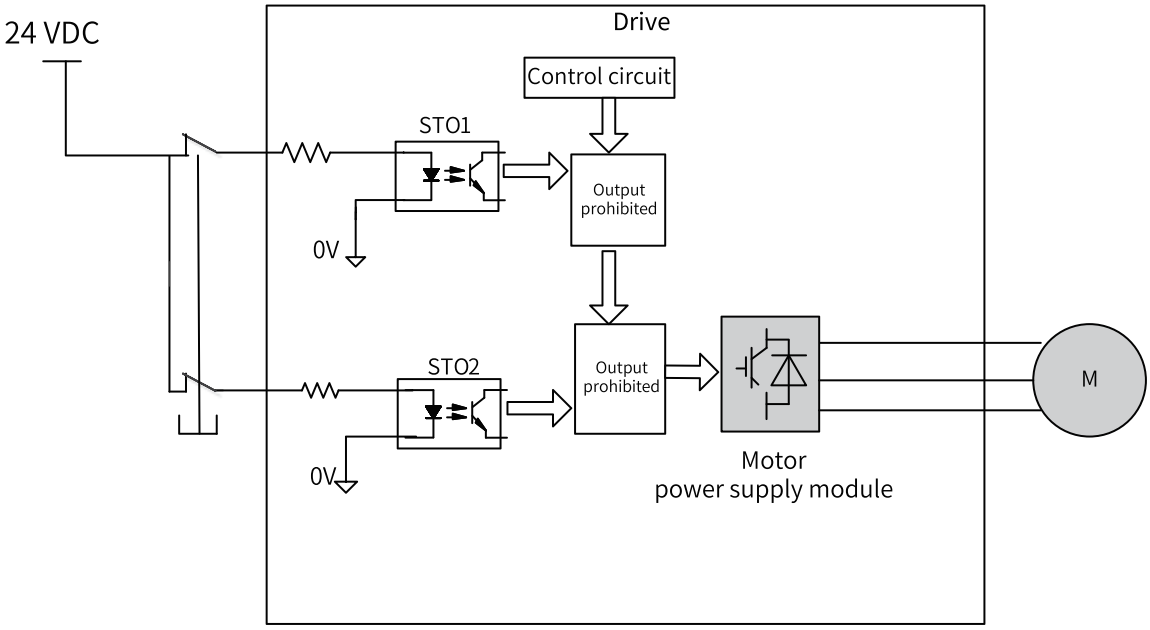
This function only cuts off the torque of the motor, and does not cut off the power supply of the servo/inverter. Before servicing the servo/inverter, cut off the power supply and ensure that the servo/inverter are not energized.

Note

Perform STO function diagnosis at least once every three months. Run the STO function once to check whether the motor stops.

13.2 Safety Functions

13.2.1 Overview



By cutting off the output of the motor supply module, the power supply current and torque of the motor is off.

Figure 13-1 Schematics of the STO function

Safe Torque Off (STO) is a safety function that complies with IEC 61800-5-2:2016. It is built into Inovance SV680F-INT series servo drives.

Remember to perform a power cycle of the drive every three months or trigger the STO through disconnecting the 24V input of CN6, so that STO can be reset periodically.

The STO function inhibits the control signal of the power semiconductors on the drive output end, preventing the drive from generating torque at the motor shaft end.

The STO function prevents movement of the motor by two redundant external hardware signals (STO1 and STO2) that block the PWM signals from being outputted to the power layer of the servo drive. STO1 and STO2 input signals must be both active to allow the servo drive to operate normally.

See the following table for the STO function.

STO1 Input	STO2 Input	PWM Signal
H	H	Normal
L	H	Prohibited
H	L	Prohibited
L	L	Prohibited

STO (safe torque)	
Description	Cuts off the power of the motor.
Description	The safe torque off (STO) function brings the machine safely into a no-torque state and prevents it from unexpected start. When the STO function is activated, the servo drive stops according to the preset stop mode (H02.08).

STO (safe torque)	
Safe state	Disables the PWM gating signal of the drive.
Operation mode	High demand mode or continuous mode

13.2.2 Function Use and Monitoring

Function Use

The keypad displays the STO function state and error information.

See the following table to identify the cause of a fault and the action to be taken. Contact Inovance technical support if the fault persists after corrective actions listed in the following table are taken.

Fault codes related to the STO function are listed in the following table:

Fault Code	Fault code name	Description	Cause	Corrective Action
E150.0	STO safety state applied	The STO input protection applies (safety state).	STO is triggered because either or both of two 24 V inputs are disconnected.	There is no need to take any corrective actions. After the STO terminal is back to normal, clear the fault using the fault reset function. Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected. Replace the servo drive.
E150.1	STO input state abnormal	The single-channel input of STO is ineffective.	1. STO input power supply is abnormal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
			2. STO input resistor is abnormal.	Replace the servo drive.
			3. STO is ineffective.	Replace the servo drive.
E150.2	Buffer 5 V supply error	The MCU monitors the 5 V power supply of the PWM Buffer to detect whether overvoltage or undervoltage occurs. If the voltage is abnormal, E150.2 occurs.	The 5 V voltage supplied to the STO Buffer is abnormal due to undervoltage or overvoltage.	Replace the servo drive.
E150.3	STO input circuit hardware diagnosis	The photocoupler of the front hardware circuit for STO input is inspected. If the photocoupler is short-circuited, the servo will display E150.3.	Direct connection occurs on the upstream optocoupler of STO1 or STO2.	Replace the servo drive.

Fault Code	Fault code name	Description	Cause	Corrective Action
E150.4	STO activated	An error occurs on the PWM buffer integrated circuit during initialization detection upon power-on (the PWM signal cannot be blocked).	STO buffer power-on detection abnormal	Replace the servo drive.
E150.5	STO input signal interference	The STO input signal is interfered with, but the interference does not meet the noise filtering conditions set in H0A.73.	Poor contact of the STO terminal or unstable external 24V input voltage may lead to STO misoperation or malfunction.	Replace the 24V power supply.

Note

- For a motor with brake, if either STO1 or STO2 closes, the drive will be disabled within 30 ms (STO response time).
- For a motor without brake, if either STO1 or STO2 closes, the drive will be disabled within 5 ms (STO response time).

EDM DO signal

When STO1 and STO2 input 24V voltage are cut off, the EDM DO signal is active, otherwise the EDM DO signal is inactive.

At this time, STO1 and STO2 are filtered signals. When EDM is active, the servo drive blocks the PWM signal.

Signal Name	Mark	Photo coupler logic			
Safety input	STO1	ON	ON	OFF	OFF
	STO2	ON	OFF	ON	OFF
EDM output	EDM	OFF	OFF	OFF	ON

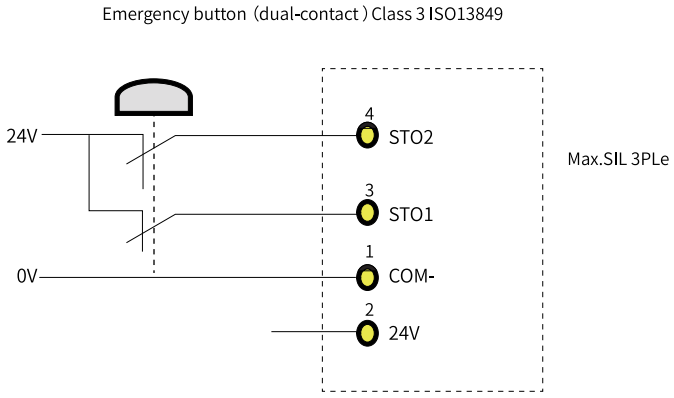
Note

The DO output of this EDM is only a monitoring signal to detect whether a safety function is triggered, not a safety signal output.

The EDM state of the integrated STO can only be output through the non-safe DO output of the drive, not through the DO output on the safety module.

Application Example of Safety Function

Example 1:



13.2.3 Fault reset

The exceptional operation refers to the durations of power-on and initialization, and how to return from the STO state.

- The PWM buffer is disabled as the enable terminal is pulled up during power-on, so the PWM signal is inhibited.
- The PWM buffer is disabled as the enable terminal is pulled up during initialization of the MCU, so the PWM signal is inhibited. Such condition is cleared and servo drive works normally after initialization is done.
- When all of the following conditions are met, the servo system that enters the safe state through the STO function can be back to normal with the safe state cleared after auto-reset of the drive.
  - The input state of the STO request must be "high".
  - The servo ON or servo RUN command must be inactive.
  - No dangerous faults exist.

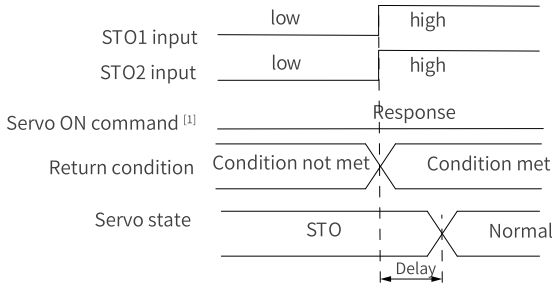


Figure 13-2 Return condition of external STO request state

Note

[1]: The servo ON command is a servo-enabled command, not an internal servo-enabled state.

- When STO_IN (STO1 or STO2 input) is restored to 24 V, the EDM and servo ready signals are immediately reset to 0. When STO1 and STO2 are restored to 24V at the same time, the servo ready to output signal and servo operational signal are activated after 400 milliseconds. Servo operation is PWM drive signal output.

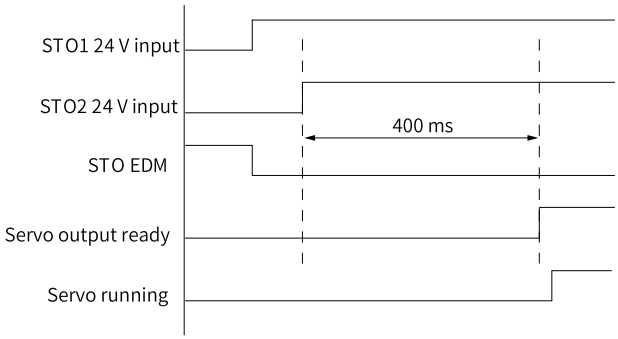
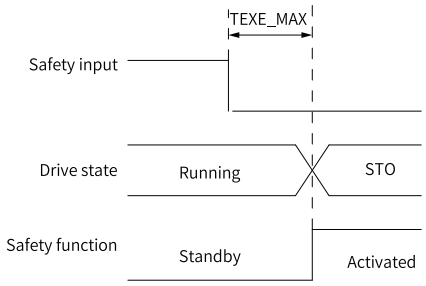


Figure 13-3 Servo drive reset timing diagram

13.2.4 Safety Function Response Time

The STO function prevents movement of the motor by two redundant external hardware signals (STO1 and STO2) that block the PWM signals from being outputted to the power layer of the servo drive. STO1 and STO2 input signals must be both active to allow the servo drive to operate normally.

If either one or both signals are set to "Low" level, the PWM signals will be blocked within 30 ms[1].



Note

[1]: The typical response time is 30 ms. The maximum response time is 100 ms, given the discrete type of the electronic device.

13.3 Acceptance

Basic requirements

- Technical staff must be trained to understand the requirements and principles of designing and operating safety-related systems.
- Person performing the maintenance must be trained to understand the requirements and principles of designing and operating safety-related systems.
- Operators must be trained to understand the requirements and principles of designing and operating safety-related systems.
- The safety-related circuit on the control board that fails to operate must be replaced with a new one as it is not repairable.

Commissioning Checklist

- Start-up test and validation

IEC 61508, EN/IEC 62061 and EN ISO 13849 require the final assembler of the equipment to verify the operation of the safety function through acceptance testing. This acceptance test is described in the drive manual. The testing of optional safety features is described in the corresponding manuals.

The acceptance test must be performed:

- at initial start-up of the safety function
- After any changes related to safety functions (wiring, assembly, settings, or other related operations)
- after any maintenance work related to the safety function.

The acceptance test of the safety function must be carried out by an authorized person with expertise and knowledge of the safety function. The test must be documented and signed by the test staff.

Signed acceptance test reports must be stored in the logbook of the machine. The report shall include documentation of start-up activities and test results, fault reports, and troubleshooting records. Any new acceptance tests performed due to changes or maintenance need to be logged into the logbook.

- Checklist of integrated STO functions

Step	Action	Result
1	Ensure that the drive runs and stops freely during commissioning.	
2	Stop the drive (if running), switch the input power supply off and isolate the drive from the power line by a disconnector.	
3	Check the STO circuit connections against the circuit diagram.	
4	Check that the shield of the STO input cable is grounded to the drive frame.	
5	Close the disconnector and switch the power supply on.	
5.1	Test the STO signal #1 when the motor is stopped: Set STO1 and STO2 to H. Send a stop command to the drive (if running) and wait until the motor shaft is at standstill. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal #1 and send a start command to the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	
5.2	Set STO1 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	
5.3	Test the STO signal #2 when the motor is stopped: Set STO1 and STO2 to H. Send a stop command to the drive (if running) and wait until the motor shaft is at standstill. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal #2 and give a start command for the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	

Step	Action	Result
5.4	Set STO2 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	
6.1	Test the STO channel 1 when the motor is running: Set STO1 and STO2 to H. Start the drive and ensure the motor is running. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal 1. Ensure that the motor stops and the drive trips. Reset the fault and try to start the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	
6.2	Set STO1 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	
6.3	Test the STO channel 2 when the motor is running: Set STO1 and STO2 to H. Start the drive and ensure the motor is running. Awake the STO function by de-energizing (low state or open-circuit) the STO input signal 2. Ensure that the motor stops and the drive trips. Reset the fault and try to start the drive. Ensure that the motor stays at a standstill and the keypad of the drive displays "E150.1".	
6.4	Set STO2 to "H" and disable the ON/RUN command of the drive. Then, reset the drive automatically and enable ON/RUN command of the drive. Finally, check whether the motor runs normally.	
7	Document and sign the acceptance test report which verifies that the safety function is safe and acceptable for operation.	

Special requirements

You must conduct STO diagnosis every three month by powering off and powering on the drive once, or running the STO function once.

Note

There are two ways to perform STO diagnosis:

- Power off and restart;
- Trigger and then cancel STO.

You can use either of them.

13.4 Troubleshooting

See the following table to identify the cause of a fault and the action to be taken. Contact Inovance technical support if the fault persists after corrective actions listed in the following table are taken. Fault codes related to the STO function are listed in the following table.

Error code	Cause	Corrective Action
E150.1	1. STO input power supply is abnormal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
	2. STO input resistor is abnormal.	Replace the servo drive.
	3. STO is ineffective.	Replace the servo drive.
E150.2	The 5 V voltage supplied to the STO Buffer is abnormal due to undervoltage or overvoltage.	Replace the servo drive.
E150.3	Direct connection occurs on the upstream optocoupler of STO1 or STO2.	Replace the servo drive.
E150.4	STO buffer power-on detection abnormal	Replace the servo drive.
E150.5	Poor contact of the STO terminal or unstable external 24V input voltage may lead to STO misoperation or malfunction.	Replace the 24V power supply.

14 Communication

PROFINET is an automation bus standard based on the industrial Ethernet technology. PROFINET provides two types of real-time communication: PROFINET IO RT and PROFINET IO IRT.

In the PROFINET IO RT channel, real-time data is transmitted through Ethernet, with no special hardware requirements.

The PROFINET I/IRT channel is used to transmit data with more accurate time requirements, with a cycle of up to 250 μs. But it requires special I/O devices and switches.

All diagnostic and configuration data are transmitted through non-real-time channels.

14.1 PROFINET Communication Technical Specifications

PROFINET comprehensive parameters	
Item	Item
Communication protocol	PROFINET
Process Data	RT and IRT
Acyclic	Enables SinaParaS access to profile parameters, function parameters, and safety parameters. The safety parameters are read only. Enables SinaPara (mix) access to function parameters and safety parameters. The safety parameters are read only.
Bus period	RT mode: min. 1 ms IRT mode: min. 250 μs
Sync jitter	< 1 μs
Physical layer	100BASE-TX
Baud rate	100 Mbit/s (100Base-TX)
Duplex mode	Full duplex
Topology	Ring, linear, star, and tree types
Transmission distance	Less than 100 m between two nodes (with proper environment and cables)
Transmission medium	Shielded cables of Cat 5e or higher
Number of slaves	Up to 65535 (dependent on the performance of the PLC)
Bit error rate	10^{-10} Ethernet standard
I&M data	I&M0 to I&M4
GSD version	V2.25, V2.33, V2.43
Configuration version	TIA Portal V11 or higher STEP7 V5.5 or higher SMOTION and 200Smart compatible versions, consistent with SV660F
PROFINET version	V2.4
PROFINET interface	Number of ports: 2 Switch: supported
Type	PROFINET IO device

Function	PROFINET IO devices, support for medium redundancy
Alarm/diagnosis information	Supported
DCP CALL (search for device)	Supported
MRP (ring-type network)	Supported

Function	PROFINET IO devices, support for medium redundancy
MRPD (Quick reset ring-type network)	Supported
Profinet system redundancy	Supported
Start priority	Supported
Port disabling	Supported
No configuration is required when you change the configuration.	Supported

14.2 Telegrams

14.2.1 Supported Telegrams

The drive supports the application of AC1, AC3 and AC4 and supports standard and Siemens telegrams in speed control and basic positioning controller control. The auxiliary telegrams can only be used with the main telegram. For safety telegrams, see the "SV680F-INT Series Servo Drive Safety Guide". From the drive device point of view, the process data received is the receive word, and the process data to be sent is the transmit word. See the following table for details.

Telegram	Maximum number of PZDs (1 PZD = 1 word)	
	Receive word	Transmit word
Standard telegram 1	2	2
Standard telegram 2	4	4
Standard telegram 3	5	9
Siemens telegram 102	6	10
Siemens telegram 105	10	10
Siemens telegram 111	12	12
Siemens telegram 750 (auxiliary)	3	1
Inovance telegram 850 (auxiliary)	1	1

- **Telegram for speed control mode**

Telegram	1		2		3		102		105	
Application Mode	AC1		AC1		AC4		AC4		AC4	
PZD1	STW1	ZSW1	STW1	ZSW1	STW1	ZSW1	STW1	ZSW1	STW1	ZSW1
PZD2	NSOLL_A	NIST_A	NSOLL_B	NIST_B	NSOLL_B	NIST_B	NSOLL_B	NIST_B	NSOLL_B	NIST_B
PZD3										
PZD4			STW2	ZSW2	STW2	ZSW2	STW2	ZSW2	STW2	ZSW2
PZD5					G1_STW	G1_ZSW	MOMRED	MELDW	MOMRED	MELDW

Telegram	1		2		3		102		105	
Application Mode	AC1		AC1		AC4		AC4		AC4	
PZD6						G1_XIST1	G1_STW	G1_ZSW	G1_STW	G1_ZSW
PZD7								G1_XIST1	XERR	G1_XIST1
PZD8						G1_XIST2				
PZD9								G1_XIST2	KPC	G1_XIST2
PZD10										

- **Description of auxiliary telegrams**
  - When telegram 750 is used, an uncontrollable acceleration occurs when either of the following settings is made:
    - Set the torque upper limit to a negative value through PZD M_LIMIT_POS.
    - Set the torque lower limit to a positive value through PZD M_LIMIT_NEG.

Telegram	750	
Application mode	-	
PZD1	M_ADD1	M_ACT
PZD2	M_LIMIT_POS	-
PZD3	M_LIMIT_NEG	

  - When the telegram 850 is used, you can customize the receive word and transmit word, and select the function through H24.35 and H24.36.

Telegram	850	
Application mode	-	
PZD1	USER_SEND	USER_RECIEVE

- **Telegrams for basic positioner mode**

Telegram	111	
Application mode	AC3	
PZD1	STW1	ZSW1
PZD2	POS_STW1	POS_ZSW1
PZD3	POS_STW2	POS_ZSW2
PZD4	STW2	ZSW2
PZD5	OVERRIDE	MELDW
PZD6	MDI_TARPOS	XIST_A
PZD7		
PZD8	MDI_VELOCITY	NIST_B
PZD9		
PZD10	MDI_ACC	FAULT_CODE
PZD11	MDI_DEC	WARN_CODE
PZD12	User	User

Note

user means user-defined receive word or send word.

14.2.2 IO Data Signal

Signal	Description	Receive/transmit word	Data type	Scaling
STW1	Control word 1	Receive word	U16	
STW2	Control word 2	Receive word	U16	
ZSW1	Status word 1	Transmit word	U16	
ZSW2	Status word 2	Transmit word	U16	
NSOLL_A	Speed setpoint A	Receive word	I16	4000H≒Rated motor speed
NSOLL_B	Speed setpoint B	Receive word	I32	40000000H≒Rated motor speed
NIST_A	Actual speed A	Transmit word	I16	4000H≒Rated motor speed
NIST_B	Actual speed B	Transmit word	I32	40000000H≒Rated motor speed
G1_STW	Encoder 1 control word	Receive word	U16	
G1_ZSW	Encoder 1 status word	Transmit word	U16	
G1_XIST1	Encoder 1 actual position value 1	Transmit word	U32	
G1_XIST2	Encoder 1 actual position 2	Transmit word	U32	
MOMRED	Torque decrease	Receive word	I16	4000H≒Max. torque
MELDW	Message word	Transmit word	U16	
MDI_TARPOS	MDI position	Receive word	I32	1H≒1 LU
MDI_VELOCITY	MDI speed	Receive word	I32	1H≒1000 LU/min
MDI_ACC	MDI acceleration override	Receive word	I16	4000H≒100%
MDI_DEC	MDI deceleration override	Receive word	I16	4000H≒100%
XIST_A	Actual position A	Transmit word	I32	1H≒1 LU
OVERRIDE	Position speed override	Receive word	I16	4000H≒100%
FAULT_CODE	Error code	Transmit word	U16	
WARN_CODE	Warning code	Transmit word	U16	
User	Customized receive word 0: None 1: Additive torque	Receive word	I16	4000H≒Max. torque/ Motor rated torque × 100%
User	Customized transmit word 0: None 1: Actual torque 2: Actual current 3: DI state	Transmit word	I16	4000H≒Max. torque/ Motor rated torque × 100%

14.2.3 Control Words

- **STW1 control word (for telegrams 1 and 2)**

Signal	Description
STW1.0	1 = ON (pulse can be enabled) 0 = OFF1 (ramp stop, pulse cleared, and ready to switch on)
STW1.1	1 = No OFF2 (pulse can be enabled) 0 = OFF2 (coast to stop, pulse cleared, and switch-on prohibited)
STW1.2	1 = No OFF3 (pulse can be enabled) 0 = OFF3 (fast stop, pulse cleared, and switch-on prohibited)
STW1.3	1 = Running allowed 0 = Running prohibited (pulse cleared)
STW1.4	1 = Ramp function generator allowed 0 = Ramp function generator disabled (set RFG output to 0)
STW1.5	1 = Continue RFG 0 = Freeze RFG output, not applicable to AC4
STW1.6	1 = Setpoint enabled 0 = Setpoint prohibited (set RFG input to 0)
STW1.7	Rising edge-triggered, response fault
STW1.8 to STW1.9	Reserved
STW1.10	1 = Controlled by PLC 0 = Not controlled by PLC
STW1.11	1 = Setpoint invert 0 = non setpoint invert
STW1.12 to STW1.15	Reserved

- **STW1 control word (for telegrams 3 and 102)**

Signal	Description
STW1.0	1 = ON (pulse can be enabled) 0 = OFF1 (ramp stop, pulse cleared, and ready to switch on)
STW1.1	1 = No OFF2 (pulse can be enabled) 0 = OFF2 (coast to stop, pulse cleared, and switch-on prohibited)
STW1.2	1 = No OFF3 (pulse can be enabled) 0 = OFF3 (fast stop, pulse cleared, and switch-on prohibited)
STW1.3	1 = Running allowed 0 = Running prohibited (pulse cleared)
STW1.4	1 = Running condition (enable ramp function generator) 0 = Disable RFG (set RFG output to 0)
STW1.5	1 = Continue RFG 0 = Freeze RFG output, not applicable to AC4
STW1.6	1 = Setpoint enabled 0 = Setpoint prohibited (set RFG input to 0)
STW1.7	Rising edge-triggered, response fault
STW1.8 to STW1.9	Reserved

Signal	Description
STW1.10	1 = Controlled by PLC 0 = Not controlled by PLC
STW1.11 to STW1.15	Reserved

- **STW1 control word (for telegram 105)**

Signal	Description
STW1.0	1 = ON (pulse can be enabled) 0 = OFF1 (ramp stop, pulse cleared, and ready to switch on)
STW1.1	1 = No OFF2 (pulse can be enabled) 0 = OFF2 (coast to stop, pulse cleared, and switch-on prohibited)
STW1.2	1 = No OFF3 (pulse can be enabled) 0 = OFF3 (fast stop, pulse cleared, and switch-on prohibited)
STW1.3	1 = Running allowed 0 = Running prohibited (pulse cleared)
STW1.4	1 = RFG enabled 0 = RFG disabled
STW1.5	1 = Continue RFG 0 = Freeze RFG output, not applicable to AC4
STW1.6	1 = Setpoint enabled 0 = Setpoint prohibited (set RFG input to 0)
STW1.7	Rising edge-triggered, response fault
STW1.8	Reserved
STW1.9	Reserved
STW1.10	1 = Controlled by PLC 0 = Not controlled by PLC
STW1.11 to STW1.13	Reserved
STW1.14	1 = Closed-loop torque control effective 0 = Closed-loop speed control ineffective
STW1.15	Reserved

- **STW1 control word (for telegram 111)**

Signal	Description
STW1.0	1 = ON (pulse can be enabled) 0 = OFF1 (ramp stop, pulse cleared, and ready to switch on)
STW1.1	1 = No OFF2 (pulse can be enabled) 0 = OFF2 (coast to stop, pulse cleared, and switch-on prohibited)
STW1.2	1 = No OFF3 (pulse can be enabled) 0 = OFF3 (fast stop, pulse cleared, and switch-on prohibited)
STW1.3	1 = Running allowed 0 = Running prohibited (pulse cleared)
STW1.4	1 =Do not refuse to run task 0 = Refuse to run task
STW1.5	1 = Do not pause task 0 = Pause task
STW1.6	Rising edge-triggered, activate operation task

Signal	Description
STW1.7	Rising edge-triggered, response fault
STW1.8	1 = Start JOG1 0 = Stop JOG1
STW1.9	1 = Start JOG2 0 = Stop JOG2
STW1.10	1 = Controlled by PLC 0 = Not controlled by PLC
STW1.11	1 = Start returning to reference point 0 = Stop returning to reference point
STW1.12	Reserved
STW1.13	1 = External program block switchover
STW1.14 to STW1.15	Reserved

- **STW2 control word (for telegrams 2 and 3)**

Signal	Description
STW2.0 to STW2.11	Reserved
STW2.12	PLC heartbeat count value, bit 0
STW2.13	PLC heartbeat count value, bit 1
STW2.14	PLC heartbeat count value, bit 2
STW2.15	PLC heartbeat count value, bit 3

- **STW2 control word (for telegrams 102 and 105)**

Signal	Description
STW2.0 to STW2.7	Reserved
STW2.8	1 = Run to the stopper
STW2.9 to STW2.11	Reserved
STW2.12	PLC heartbeat count value, bit 0
STW2.13	PLC heartbeat count value, bit 1
STW2.14	PLC heartbeat count value, bit 2
STW2.15	PLC heartbeat count value, bit 3

- **G1_STW control word (for telegrams 3, 102 and 105)**

Signal	Description
G1_STW.0	• When G1_STW.7 = 0, search for reference point 1 • When G1_STW.7 = 1, probe 1 positive edge
G1_STW.1	1: • When G1_STW.7 = 0, search for reference point 2 • When G1_STW.7 = 1, probe 1 negative edge
G1_STW.2	1: • When G1_STW.7 = 0, search for reference point 3 • When G1_STW.7 = 1, probe 2 positive edge
G1_STW.3	1: • When G1_STW.7 = 0, search for reference point 4 • When G1_STW.7 = 1, probe 2 positive edge

<table>
<tr><th>Signal</th><th>Description</th></tr>
<tr><td>G1_STW.4
G1_STW.5
G1_STW.6</td><td>
<table>
<tr><th>G1_STW.4</th><th>G1_STW.5</th><th>G1_STW.6</th><th>Description</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>Not activated</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>Activated</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>Read value</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>Cancel</td></tr>
</table>
</td></tr>
<tr><td>G1_STW.7</td><td>1 = Real-time measurement
0 = Search for reference point</td></tr>
<tr><td>G1_STW.8 to G1_STW.11</td><td>Reserved</td></tr>
<tr><td>G1_STW.12</td><td>Rising-edge triggered, request for zero setting</td></tr>
<tr><td>G1_STW.13</td><td>Rising-edge triggered, request for cyclic transmission of the absolute position in G1_XIST2</td></tr>
<tr><td>G1_STW.14</td><td>Parking encoder</td></tr>
<tr><td>G1_STW.15</td><td>Rising edge-triggered, response encoder fault</td></tr>
</table>

- **POS_STW1 position control word (for telegram 111)**

Signal	Description
POS_STW1.0	Program block selection, bit 0
POS_STW1.1	Program block selection, bit 1
POS_STW1.2	Program block selection, bit 2
POS_STW1.3	Program block selection, bit 3
POS_STW1.4	Program block selection, bit 4
POS_STW1.5	Program block selection, bit 5
POS_STW1.6 to POS_STW1.7	Reserved
POS_STW1.8	1 = Absolute positioning 0 = Relative positioning
POS_STW1.9	0 = Absolute positioning by shortest distance
POS_STW1.10	1 = Absolute positioning/MDI direction selection, forward 2 = Absolute positioning/MDI direction selection, reverse 3 = Absolute positioning by shortest distance
POS_STW1.11	Reserved
POS_STW1.12	1 = Continuous transmission 0 = Activate MDI block switching by running task (STW1.6) rising edge
POS_STW1.13	Reserved
POS_STW1.14	1 = Setup signal selected 0 = Positioning signal selected
POS_STW1.15	1 = MDI activated 0 = MDI deactivated

- **POS_STW2 position control word (for telegram 111)**

Signal	Description
POS_STW2.0	Reserved
POS_STW2.1	1 = Set reference point
POS_STW2.2	1 = Reference point stopper activated
POS_STW2.3 to POS_STW2.4	Reserved

Signal	Description
POS_STW2.5	1 = JOG, increment activated 0 = JOG, speed activated
POS_STW2.6 to POS_STW2.13	Reserved
POS_STW2.14	1 = Software limit switch activated 0 = Software limit switch deactivated
POS_STW2.15	1 = Stopper activated 0 = Stopper deactivated

14.2.4 Status Words

- **ZSW1 status word (for telegrams 1, 2, 3, 102)**

Signal	Description
ZSW1.0	1 = Power ready 0 = Not energized
ZSW1.1	1 = Ready for RUN 0 = Not ready for RUN
ZSW1.2	1 = Enabled 0 = Not enabled
ZSW1.3	1 = Faulty 0 = Normal
ZSW1.4	1 = Coast to stop disabled (OFF2 is inactive) 0 = Coast to stop enabled
ZSW1.5	1 = Fast stop disabled (OFF3 is inactive) 0 = Fast stop enabled
ZSW1.6	1 = Switch-on prohibit enabled 0 = Switch-on prohibit disabled
ZSW1.7	1 = Warning 0 = No warning
ZSW1.8	1 = Speed error within tolerance 0 = Speed error exceeds tolerance
ZSW1.9	1 = PLC control request present 0 = No PLC control request
ZSW1.10	1 = Reached or exceeded frequency/speed comparison value 0 = Not reached or exceeded frequency/speed comparison value
ZSW1.11	Reserved
ZSW1.12	1 = Release the motor brake
ZSW1.13	Reserved
ZSW1.14	1 = Motor forward run (n_act ⩾ 0) 0 = Motor reverse run (n_act < 0) Note: bit14 cannot be used when the servo drive runs at ±1 rpm. Bit jumping may occur in this case.
ZSW1.15	1 = Reserved

- **ZSW1 status word (for telegram 105)**

Signal	Description
ZSW1.0	1 = Power ready 0 = Not energized
ZSW1.1	1 = Operation ready 0 = Operation not ready
ZSW1.2	1 = Enabled 0 = Not enabled
ZSW1.3	1 = Faulty 0 = Normal
ZSW1.4	1 = Coast to stop disabled 0 = Coast to stop enabled
ZSW1.5	1 = Fast stop disabled 0 = Fast stop enabled
ZSW1.6	1 = Switch-on prohibit enabled 0 = Switch-on prohibit disabled
ZSW1.7	1 = Warning 0 = No warning
ZSW1.8	Reserved
ZSW1.9	1 = PLC control request present 0 = No PLC control request
ZSW1.10 to ZSW1.11	Reserved
ZSW1.12	1 = Release the motor brake
ZSW1.13	Reserved
ZSW1.14	1 = Closed-loop torque control enabled
ZSW1.15	Reserved

- **ZSW1 status word (for telegram 111)**

Signal	Description
ZSW1.0	1 = Power ready 0 = Not energized
ZSW1.1	1 = Operation ready 0 = Operation not ready
ZSW1.2	1 = Enabled 0 = Not enabled
ZSW1.3	1 = Faulty 0 = Normal
ZSW1.4	1 = Coast to stop disabled (OFF2 is inactive) 0 = Coast to stop enabled (OFF2 is active)
ZSW1.5	1 = Fast stop disabled (OFF3 is inactive) 0 = Fast stop enabled (OFF3 is inactive)
ZSW1.6	1 = Switch-on prohibit enabled 0 = Switch-on prohibit disabled
ZSW1.7	1 = Warning 0 = No warning
ZSW1.8	1 = Position following error within tolerance 0 = Position following error exceeds tolerance

Signal	Description
ZSW1.9	1 = PLC control request present 0 = No PLC control request
ZSW1.10	1 = Target position reached 0 = Target position not reached
ZSW1.11	1 = Reference point is set, back to reference point is executed, reference point is valid 0 = Reference point not set
ZSW1.12	Rising edge move task confirmed, accept new move tasks or confirm MDI setpoint through the rising edge
ZSW1.13	1 = Drive stopped 0 = Drive is running
ZSW1.14	1 = Axis accelerated
ZSW1.15	1 = Axis decelerated

- **ZSW2 status word (for telegrams 2 and 3)**

Signal	Description
ZSW2.0 to ZSW2.11	Reserved
ZSW2.12	Drive heartbeat count value, uploaded to PLC, bit 0
ZSW2.13	Drive heartbeat count value, uploaded to PLC, bit 1
ZSW2.14	Drive heartbeat count value, uploaded to PLC, bit 2
ZSW2.15	Drive heartbeat count value, uploaded to PLC, bit 3

- **ZSW2 status word (for telegrams 102 and 105)**

Signal	Description
ZSW2.0 to ZSW2.7	Reserved
ZSW2.8	1 = Run to the stopper
ZSW2.9 to ZSW2.11	Reserved
ZSW2.12	Drive heartbeat count value, uploaded to PLC, bit 0
ZSW2.13	Drive heartbeat count value, uploaded to PLC, bit 1
ZSW2.14	Drive heartbeat count value, uploaded to PLC, bit 2
ZSW2.15	Drive heartbeat count value, uploaded to PLC, bit 3

- **G1_ZSW status word (for telegrams 3, 102 and 105)**

Signal	Description
G1_ZSW.0	1 = Function 1 activated
G1_ZSW.1	1 = Function 2 activated
G1_ZSW.2	1 = Function 3 activated
G1_ZSW.3	1 = Function 4 activated
G1_ZSW.4	1 = Actual value 1 readable
G1_ZSW.5	1 = Actual value 2 readable
G1_ZSW.6	1 = Actual value 3 readable
G1_ZSW.7	1 = Actual value 4 readable
G1_ZSW.8	Touch probe 1
G1_ZSW.9	Touch probe 2
G1_ZSW.10	Reserved
G1_ZSW.11	Response encoder fault
G1_ZSW.12	Set zero response

Signal	Description
G1_ZSW.13	Cyclic transmission of the absolute position in G1_XIST2
G1_ZSW.14	Reserved encoder activated
G1_ZSW.15	The encoder is faulty.

- **POS_ZSW1 status word (for telegram 111)**

Signal	Description
POS_ZSW1.0	Running program block, bit 0
POS_ZSW1.1	Running program block, bit 1
POS_ZSW1.2	Running program block, bit 2
POS_ZSW1.3	Running program block, bit 3
POS_ZSW1.4	Running program block, bit 4
POS_ZSW1.5	Running program block, bit 5
POS_ZSW1.6 to POS_ZSW1.7	Reserved
POS_ZSW1.8	1 = Reverse stopper activated 0 = Negative stopper not activated
POS_ZSW1.9	1 = Forward stopper activated 0 = Forward stopper not activated
POS_ZSW1.10	1 = Jog mode activated 0 = Jog mode not activated
POS_ZSW1.11	1 = Back to reference point activated
POS_ZSW1.12	Reserved
POS_ZSW1.13	1 = Operating program block activated
POS_ZSW1.14	Reserved
POS_ZSW1.15	1 = MDI enabled 0 = MDI disabled

- **POS_ZSW2 status word (for telegram 111)**

Signal	Description
POS_ZSW2.0	Reserved
POS_ZSW2.1	1 = Speed limit enabled
POS_ZSW2.2 to POS_ZSW2.3	Reserved
POS_ZSW2.4	1 = Axis moves forward 0 = Axis not moving
POS_ZSW2.5	1 = Axis moves reversely 0 = Axis not moving
POS_ZSW2.6	1 = Hit negative soft limit switch 0 = Not hit negative soft limit switch
POS_ZSW2.7	1 = Hit positive soft limit switch 0 = Not hit positive soft limit switch
POS_ZSW2.8 to POS_ZSW2.9	Reserved
POS_ZSW2.10	1 = Direct output 1 set through the running program block
POS_ZSW2.11	1 = Direct output 2 set through the running program block
POS_ZSW2.12	1 = Fixed stop point reached
POS_ZSW2.13	1 = Fixed stop point clamped torque reached

Signal	Description
POS_ZSW2.14	1 = Run to fixed stop point enabled
POS_ZSW2.15	Reserved

14.3 AC1 Mode

14.3.1 Overview

Siemens S7-200 Smart, S7-1200, S7-1500PLC can perform speed control with the drive through PROFINET. The PROFINET RT communication mode and standard message 1 are used. A PLC is used for start-up and speed setting. Speed control calculation is done within the servo drive.

14.3.2 Configuration Notes

1. Connect the PC to CN3 or CN4 of the drive through a communication cable.Go to network configuration in the commissioning software, and set the device name and IP address of the servo drive as shown in the figure.

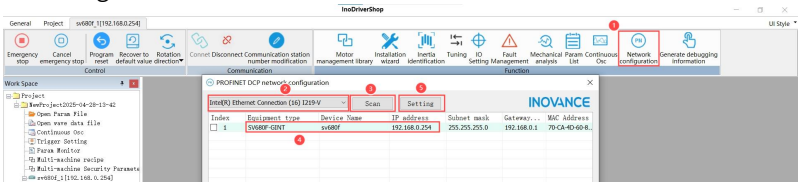


Figure 14-1 Setting the device name and IP address

2. Installing SV680F-INT GSD file: Run the PLC programming software → Options → Manage general-purpose station description file.

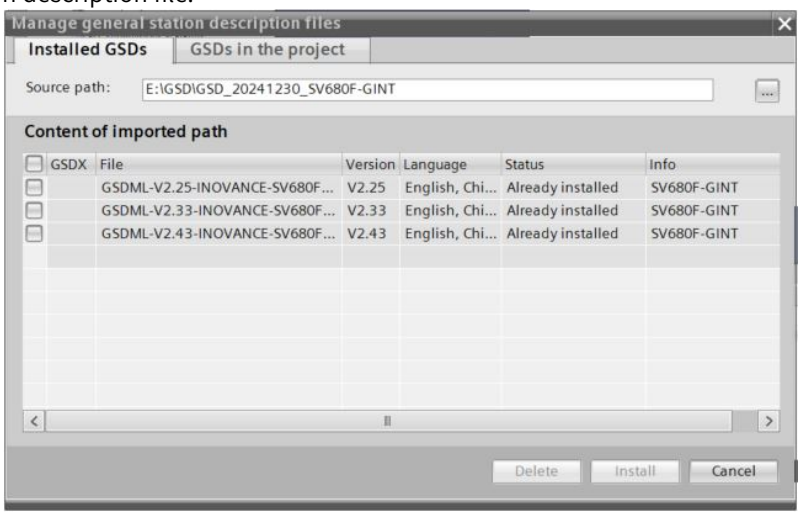


Figure 14-2 Installing the GSD file

3. Select Device and Network, and import SV680F-INT and establish connection with the PLC in the network view.

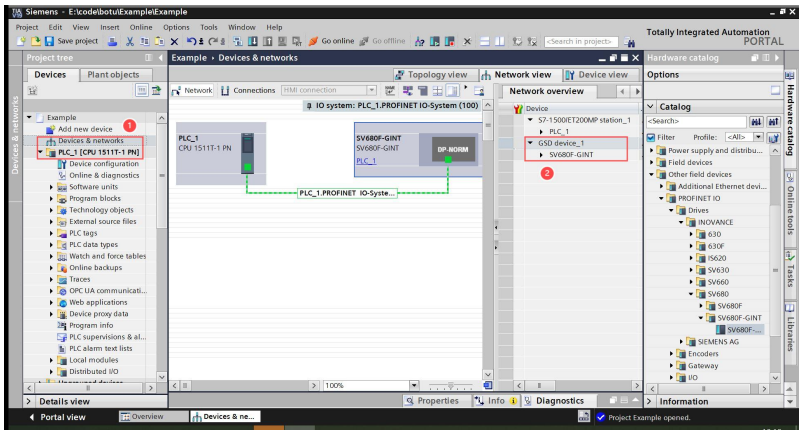


Figure 14-3 Connecting the PLC and drive

4. Double-click SV680F-INT in the device view and add telegram 1.

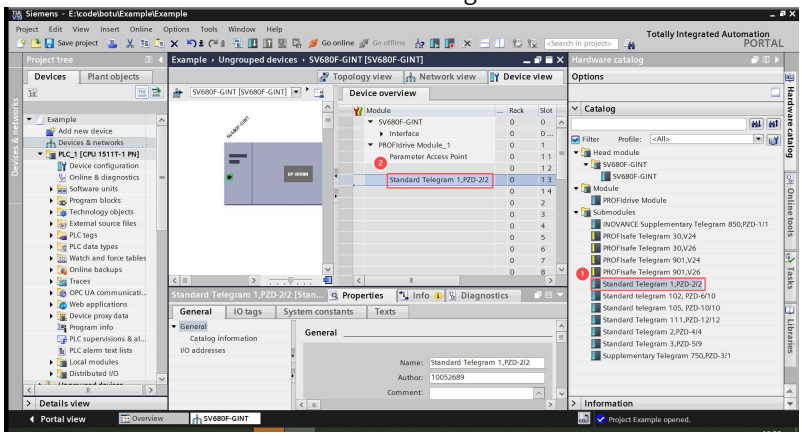


Figure 14-4 Adding telegram 1

5. Find the hardware identifier: Select telegram 1 and right click. Select System constant → Hardware identifier.

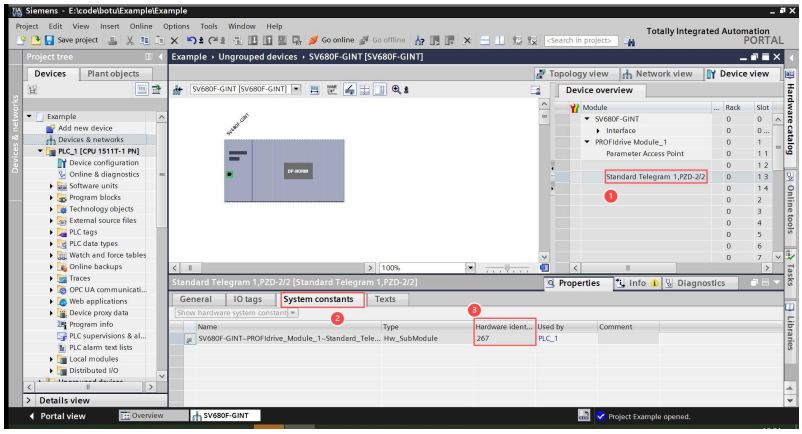


Figure 14-5 Finding hardware identifier

6. Drag and drop the SINA_Speed (FB285) block to the programming network.

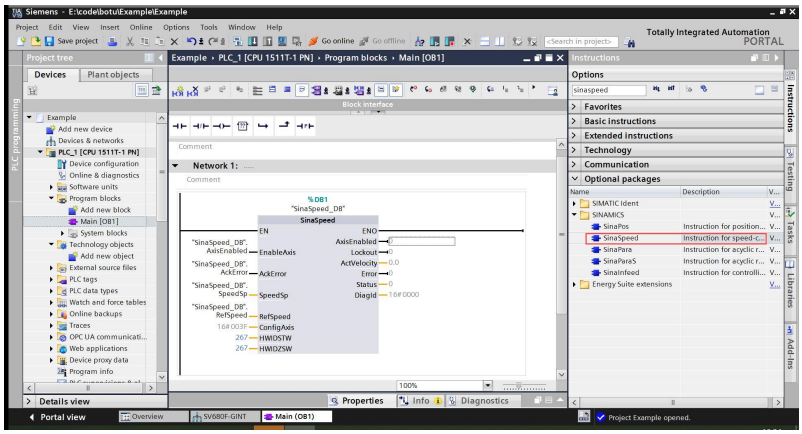


Figure 14-6 Calling the SINA_Speed function block

7. The device name of the configuration setting needs to be consistent with the real device name. If the two are inconsistent, you can assign a device name to the device through Portal.

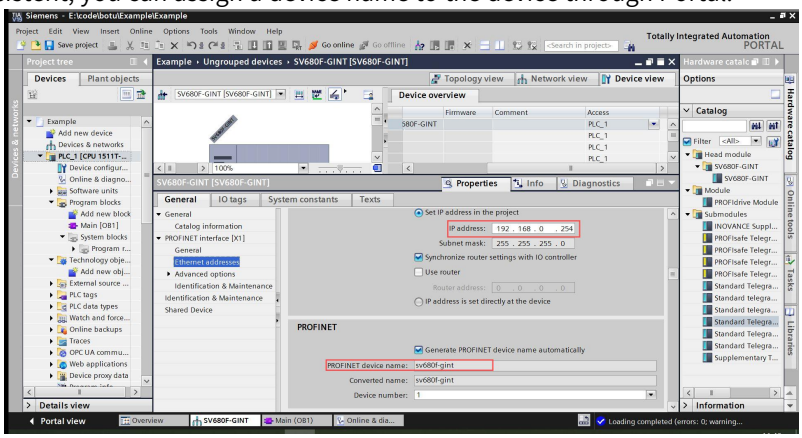


Figure 14-7 Configuring the IP address and device name

14.4 AC3 Mode

14.4.1 Overview

The S7-1200 and 1500PLC can be connected to the SV680F-INT servo drive through PROFINET communication. The PLC realizes basic positioning control through telegram 111 and the function block SINA_POS FB284/FB300 in the drive library provided by TIA Portal. The servo panel displays 43ry. This manual takes SV680F-INT as an example to introduce how to use telegram 111.

14.4.2 SinaPOS Pins

Pin	Data type	Default	Description
Input			
ModePos	INT	0	Operation mode: 1: MDI relative positioning 2: MDI absolute positioning 3: MDI adjustment mode (run continuously at the specified speed) 4: Active homing 5: Set homing position 6: Running program blocks 0 to 15 7: Jog at the specified speed 8: Jog at a specified distance
EnableAxis	BOOL	0	0: OFF 1: ON
CancelTransing	BOOL	1	0: Cancel running task 1: Do not cancel running task
IntermediateStop	BOOL	1	0: Pause task 1: Do not pause task
Positive	BOOL	0	Forward
Negative	BOOL	0	Reverse
Jog1	BOOL	0	Jog in the reverse direction
Jog2	BOOL	0	Forward jog
AckError	BOOL	0	Fault reset
ExecuteMode	BOOL	0	Request activating mode
Position	DINT	0[LU]	Position setpoint when ModPos = 1 or 2 Block No. when ModPos = 6
Velocity	DINT	0 [LU/min]	Speed setpoint when ModPos = 1, 2, 3 (in 1000 [LU/min])
OverV	INT	100[%]	Speed override 0 to 199%
OverAcc	INT	100[%]	Acceleration override 0 to 100%
OverDec	INT	100[%]	Deceleration override 0 to 100%

Pin	Data type	Default	Description
ConfigEPos	DWORD	0	The control bit of the 111 telegram can be used to transmit signals such as hardware limit enabling and home switch. If variables are assigned to the pin in the program, ensure that both ConfigEpos.%X0 and ConfigEpos.%X1 are 1, so that the drive can run. ConfigEpos.%X0: OFF2 stop ConfigEpos.%X1: OFF3 stop ConfigEpos.%X2: Activate software limit ConfigEpos.%X3: Activate hard limit ConfigEpos.%X6: Home switch ConfigEpos.%X7: External program switchover ConfigEpos.%X8: When ModePos = 2, the setpoint can change continuously and takes effect in real time. ConfigEPos.%X0: STW1.%X1 ConfigEPos.%X1: STW1.%X2 ConfigEPos.%X2: EposSTW2.%X14 ConfigEPos.%X3: EposSTW2.%X15 ConfigEPos.%X4: EposSTW2.%X11 ConfigEPos.%X5: EposSTW2.%X10 ConfigEPos.%X6: EposSTW2.%X2 ConfigEPos.%X7: STW1.%X13 ConfigEPos.%X8: EposSTW1.%X12 ConfigEPos.%X9: STW2.%X0 ConfigEPos.%X10: STW2.%X1 ConfigEPos.%X11: STW2.%X2 ConfigEPos.%X12: STW2.%X3 ConfigEPos.%X13: STW2.%X4 ConfigEPos.%X14: STW2.%X7 ConfigEPos.%X15: STW1.%X12 ConfigEPos.%X16: STW1.%X14 ConfigEPos.%X17: STW1.%X15 ConfigEPos.%X18: EposSTW1.%X6 ConfigEPos.%X19: EposSTW1.%X7 ConfigEPos.%X20: EposSTW1.%X11 ConfigEPos.%X21: EposSTW1.%X13 ConfigEPos.%X22: EposSTW2.%X3 ConfigEPos.%X23: EposSTW2.%X4 ConfigEPos.%X24: EposSTW2.%X6 ConfigEPos.%X25: EposSTW2.%X7

Pin	Data type	Default	Description
ConfigEPos	DWORD	0	ConfigEPos.%X26: EposSTW2.%X12 ConfigEPos.%X27: EposSTW2.%X13 ConfigEPos.%X28: STW2.%X5 ConfigEPos.%X29: STW2.%X6 ConfigEPos.%X30: STW2.%X8 ConfigEPos.%X31: STW2.%X9
HWIDSTW	HW_IO	0	Hardware identifier for telegram 111
HWIDZSW	HW_IO	0	Hardware identifier for telegram 111
output			
Error	BOOL	0	1: Error appears
Status	Word	0	16#7002: No error, function block is executing 16#8401: Drive error 16#8402: Drive start prohibited 16#8403: Homing cannot start during operation 16#8600: DPRD_DAT error 16#8601: DPWR_DAT error 16#8202: Incorrect operating mode selected 16#8203: Incorrect setpoint parameter 16#8204: Incorrect block No.
DiagID	Word	0	Expansion communication fault
ErrorID	IN	0	Operation mode error/block error: 0: No error 1: Communication activated 2: Incorrect operation mode selected 3. Incorrect parameter setting 4: Invalid running block number 5. Drive fault activated 6: Switch prohibition activated 7: Homing cannot start during operation
AxisEnabled	BOOL	0	Drive enabled
Lockout	BOOL	0	Drive is prohibited to turn on. Check whether ConfigEPos.%X0 and ConfigEPos.%X1 are set to 1.
AxisError	BOOL	0	The servo drive is faulty.
AxisWarn	BOOL	0	Drive alarm
AxisPosOK	BOOL	0	The target position is reached.
AxisRef	BOOL	0	Completion of return to zero
ActVelocity	DINT	0	Actual speed (hexadecimal 40000000h corresponds to H24.64 reference speed data)
ActPosition	DINT	0[LU]	Current position LU

Pin	Data type	Default	Description
ActMode	INT	0	Current running mode
EposZSW1	WORD	0	EPOS ZSW1 state
EposZSW2	WORD	0	EPOS ZSW2 state
ActWarn	WORD	0	Warning code
ActFault	WORD	0	Error code

SINA_POS EnableAxis pin

- If you set EnableAxis to 0, that is, OFF1 is turned off, during operation, the drive ramps to stop. The deceleration time of the motor is related to H06.40 and H06.42.
- When OFF2 is turned off, the drive coasts to stop.
- When OFF3 is turned off, the drive executes quick stop. At this time, the deceleration time of the motor is related to H06.41 and H06.43.

OFF1 disable deceleration time (ms) = (Current speed rpm ÷ Rated speed rpm) × H06.40 × $10^{H06.42}$

OFF3 disable deceleration time (ms) = (Current speed rpm ÷ Rated speed rpm) × H06.41 × $10^{H06.43}$

SINA_POS CancelTraversing and IntermediateStop pins

1. The input signals CancelTraversing and IntermediateStop are effective for all operating modes except Jog. It must be set to "1" when running EPOS.
2. If you set CancelTraversing = 0, the axis decelerates to stop at the ramp speed and the working data is discarded. If you set CancelTraversing = 1, the axis will not continue to run.
3. If you set IntermediateStop = 0, the axis stops at the maximum deceleration, and the working data is not discarded. If you set IntermediateStop = 1, the axis will continue to run. That can be deemed as a pause of the axis. You can switch the operating mode when the axis is stationary.

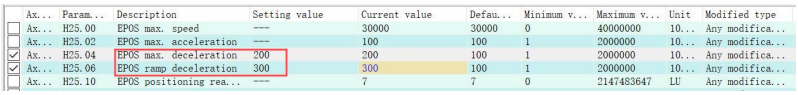
Note

The deceleration time of CancelTraversing is related to H25.06, and the deceleration time of Intermediatestop is related to H25.04.

Case

Test with telegram 111 mode 1 relative positioning: H00.00 = 14102, H05.07 = 67108864, H05.09 = 10000, assign 10000 to Velocity pin (the speed unit of MDI operation mode is 1000 LU/min). Then the motor speed is 1000 rpm.

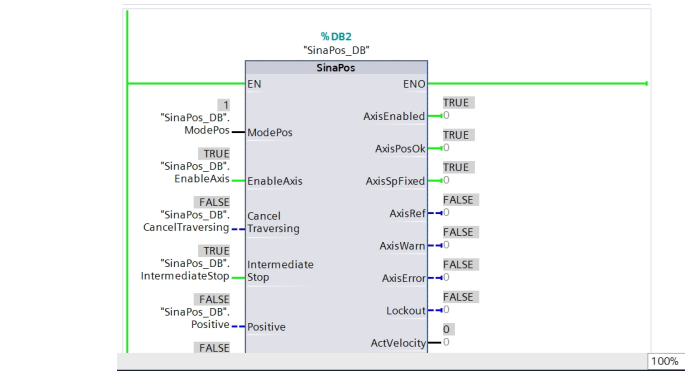
1. Set H25.04 = 200 (EPOS maximum deceleration value) and H25.06 = 300 (EPOS ramp deceleration value).



	Ax...	Param...	Description	Setting value	Current value	Defau...	Minimum v...	Maximum v...	Unit	Modified type
☐	Ax...	H25.00	EPOS max. speed	---	30000	30000	0	40000000	10...	Any modifica...
☐	Ax...	H25.02	EPOS max. acceleration	---	100	100	1	2000000	10...	Any modifica...
☑	Ax...	H25.04	EPOS max. deceleration	200	200	100	1	2000000	10...	Any modifica...
☑	Ax...	H25.06	EPOS ramp deceleration	300	300	100	1	2000000	10...	Any modifica...
☐	Ax...	H25.10	EPOS positioning rea...	---	7	7	0	2147483647	LU	Any modifica...

Figure 14-8 Setting deceleration time

2. CancelTRaversing is triggered, and the deceleration time is 560.1 ms. Calculation: H25.06=300, 10000 ×100% ÷ (60×300) = 0.5556s = 555.5 ms。



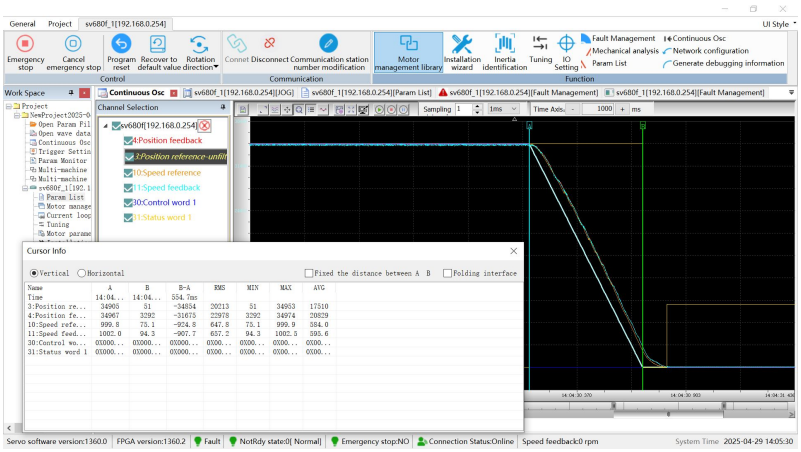


Figure 14-9 Deceleration time that triggers CancelTRaversing

3. Trigger IntermediateStop, and acquire the software waveform deceleration time 833.5 ms, as shown in the figure below. Calculation: H25.04=200 10000×100% ÷ (60×200×100%) = 0.8333s = 833.3 ms.

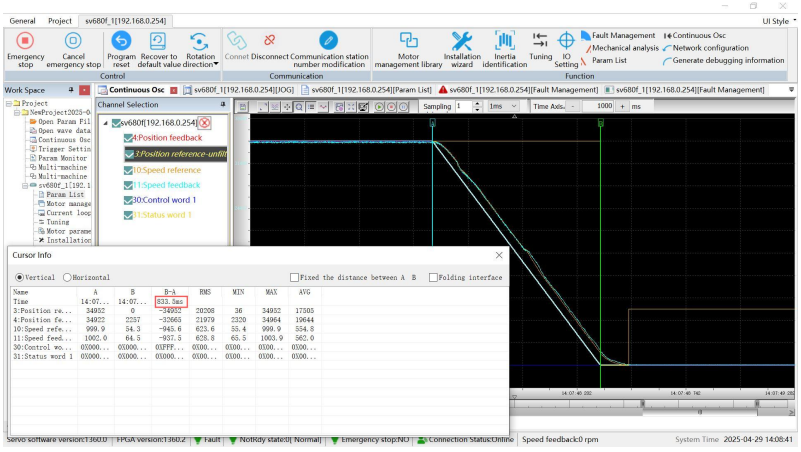


Figure 14-10 Deceleration time that triggers IntermediateStop

4. **Conclusion:**

CancelTraversing deceleration time (seconds) = Velocity pin × OverV% ÷ (60 × H25.06)

IntermediateStop deceleration time (seconds) = Velocity pin × OverV% ÷ (60 × H25.04 × OverDec %)

SINA_POS ActVelocity pin

The telegram specifies that 40000000H corresponds to the rated motor speed (H24.64). 40000000H = 1073741824D

Actual motor speed (rpm) = (H24.64 × ActVelocity) ÷ 1073741824

SINA_POS OverV, OverACC and OverDec pins

Actual motor speed (rpm) = (Velocity × 1000 × OverV% × Gear ratio) ÷ Encoder resolution

Motor acceleration time of relative/absolute positioning (seconds) = Velocity pin × OverV% ÷ (60 × H25.02 × OverAcc%)

Motor deceleration time of relative/absolute positioning (seconds) = Velocity pin × OverV% ÷ (60 × H25.04 × OverDec%)

Note

The 26-bit encoder resolution is 67108864 pls/r.

SINA_POS ConfigEPos pin

1. Telegram 111 specifies that bit14 and bit15 of the position control word 2 are soft limit and hard limit activation switches respectively. At the same time, bit2 and bit3 of the ConfigEPos pin in the SINA_POS function block have been automatically associated with soft and hard limit activation respectively.

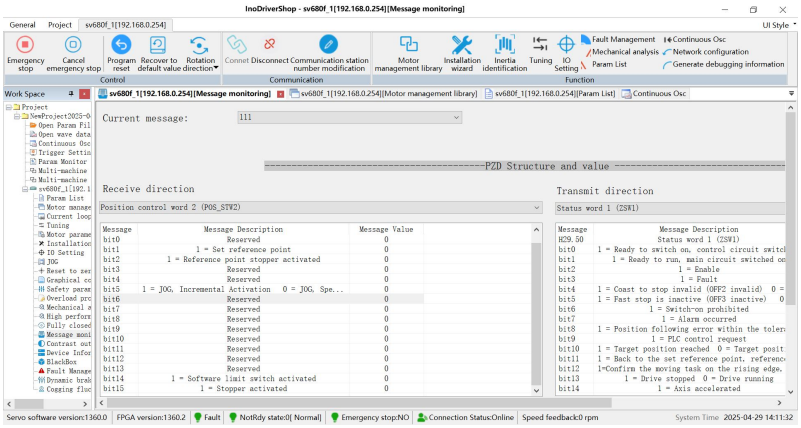


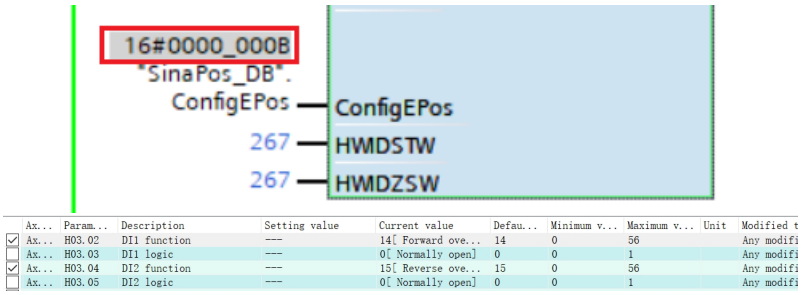
Figure 14-11 Telegram 111 control word limit

Table 14–1 Correspondence between ConfigEPos pin and limit

ConfigEPos bit	Function
ConfigEPos.%X0	OFF2 stop
ConfigEPos.%X1	OFF3 stop
ConfigEPos.%X2	Activate software limit
ConfigEPos.%X3	Activate hardware limit
ConfigEPos.%X6	Home switch
ConfigEPos.%X7	External program block switchover
ConfigEPos.%X8	Supports continuous change of setpoint with immediate effect when ModePos = 2

2. **Activate hardware limit**

Assigning 16#B to the ConfigEPos pin of the SINA_POS function block will activate the hard limit switch. You can be configure the forward and reverse limits in the H03 terminal input parameters.



	Ax...	Param...	Description	Setting value	Current value	Defau...	Minimum v...	Maximum v...	Unit	Modified t
☑	Ax...	H03.02	DI1 function	---	14[Forward ove...	14	0	56		Any modifi
☐	Ax...	H03.03	DI1 logic	---	0[Normally open]	0	0	1		Any modifi
☑	Ax...	H03.04	DI2 function	---	15[Reverse ove...	15	0	56		Any modifi
☐	Ax...	H03.05	DI2 logic	---	0[Normally open]	0	0	1		Any modifi

Figure 14-12 Hard limit configuration

3. **Activate software limit**

Assigning 16#7 to ConfigEPos in the SINA_POS function block will activate the software limit switch. You can also set H0A.01 = 1 (software limit setting takes effect). You can set the travels of forward and reverse software limits in H0A.41 (forward software limit setting) and H0A.43 (reverse software limit setting).

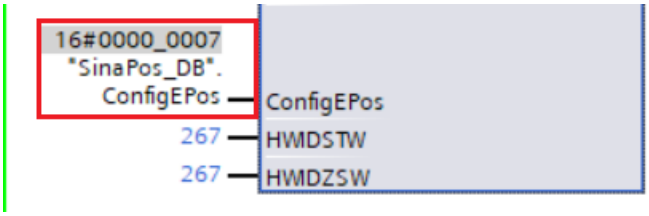


Figure 14-13 Host controller activates software limit

Or set H0A.01 = 1 (software limit setting takes effect), as shown in *"Figure 14–14" on page 293* . You can set the travels of forward and reverse software limits in H0A.41 (forward software limit setting) and H0A.43 (reverse software limit setting), as shown in *"Figure 14–15" on page 293* .

	Ax...	Param...	Description	Setting value	Current value	Defau...	Minimum v...	Maximum v...	Unit	Modified t
☐	Ax...	H0A.00	Power input phase lo...	---	0[Enable]	0	0	1		Any modifi
☐	Ax...	H0A.01	Absolute position limit		1[Enable]	0	0	2		Any modifi
☐	Ax...	H0A.04	Motor overload prote...	0[Disable]	0	100	50	300		Any modifi
☐	Ax...	H0A.08	Overspeed threshold	1[Enable]	0	0	0	20000	rpm	Any modifi
☐	Ax...	H0A.10	Threshold of excessi...	2[Enable after homing	486951	21989...	0	4294967295	en...	Any modifi

Figure 14-14 Activating software limit locally

	Ax...	H0A.40	Compensation functio...	---	0x0006	0x6	0x0	0x1F		
☑	Ax...	H0A.41	Forward position of ...	800000	800000	21474...	-2147483648	2147483647	re...	
☑	Ax...	H0A.43	Reverse position of ...	-800000	-800000	-2147...	-2147483648	2147483647	re...	
☐	Ax...	H0A.50	Encoder communicatio...	---	31	31	0	31		

Figure 14-15 Forward and reverse software limit travel setting

Relationship between actual travel and software limit setting

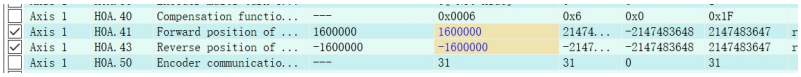
When the motor is powered on and the current position is 0 (H0b.07 = 0, H0b.17 = 0, H00.00 = 14102).

Set H0A.41 = 800000, H0A.43 = -800000, H05.07 =8388608, H05.09 = 10000. Then the motor can only rotate forward and backward for 10 turns based on the home. If the motor rotates more than 10 turns, an A950.0 alarm/E950.0 fault and A952.0 alarm/E952.0 fault will be reported.

☐	Axis 1	H05.06	Moving average filte...	---	0.0	0.0	0.0	128.0	ms	Downti
☐	Axis 1	H05.07	Electronic gear rati...	---	8388608	67108864	1	1073741824		Any mo
☐	Axis 1	H05.09	Electronic gear rati...	---	10000	10000	1	1073741824		Any mo
☐	Axis 1	H05.11	Electronic gear rati...	---	8388608	67108864	1	1073741824		Any mo
☐	Axis 1	H05.13	Electronic gear rati...	---	10000	10000	1	1073741824		Any mo

Figure 14-16 Setting electronic gear ratio

If H0A.41 and H0A.43 are changed to 1600000 and-1600000 without changing the electronic gear ratio, the motor can rotate forward and backward 20 turns based on the home.



☐	Axis 1	H0A.40	Compensation functio...	---	0x0006	0x6	0x0	0x1F	
☑	Axis 1	H0A.41	Forward position of ...	1600000	1600000	21474...	-2147483648	2147483647	r
☑	Axis 1	H0A.43	Reverse position of ...	-1600000	-1600000	-2147...	-2147483648	2147483647	r
☐	Axis 1	H0A.50	Encoder communicatio...	---	31	31	0	31	

Figure 14-17 Modifying H0A.41 and H0A.43

4. **Conclusion: relationship between software limit and actual travel**
   (H0A.41 × Gear ratio) ÷ Encoder resolution = Positive limit position corresponding to the actual number of turns the motor can rotate

   (H0A.43 × Gear ratio) ÷ Encoder resolution = Negative limit position corresponding to the actual number of turns the motor can rotate

---

Note

The 26-bit encoder resolution is 67108864 pls/r.

During the ramp stop process after triggering the pause task, when you change the running parameters, such as: target position, target speed, target acceleration/deceleration override, set the running direction, and activate a new task, the servo will not respond to these new task parameters. After the pause is canceled, motor continues running according to the old task parameters.

Common SINA_POS function block alarms

Function block alarm 16#8022: indicates that the ModePos of the function block is directly enabled without selecting a mode.

Function block alarm 16#8402: Indicates that the drive uploaded a fault to the PLC. At this time, the LockOut output pin of FB284 will be set to 1. You need to reset the drive fault and use the AckError pin of the function block to reset the function block.

14.4.3 Configuration

Operating conditions

1. Input pin ConfigEPos = 3, OFF2 and OFF3 are set to 1. If the axis is ready and driven without fault (AxisErr = "0"), the axis is enabled after EnableAxis is set to 1, and the output pin AxisEnabled signal becomes 1.
2. The input signals CancelTransing and IntermediateStop are effective for all operating modes except Jog and homing. It must be set to "1" when running EPOS. The settings are as follows:
   1: Set CancelTransing, the axis stops at the maximum deceleration, and the working data is discarded. After the axis stops, the running mode can be switched.

   2: Set IntermediateStop = 0, use the currently applied deceleration value for ramp stop, and the working data is not discarded. If you set IntermediateStop = 1, the rear axis will continue to run, which can be deemed as a pause of the axis. The switching of the operating mode can be performed after the axis is stationary.

3. If a hardware limit switch is used: Set the input pin ConfigEPos.%X3 (POS_STW2.15) of the SINA_POS function block to 1 to activate the hardware limit function of the drive. The positive and negative

hardware limit switches can be connected to the drive DI points which are defined as forward and reverse overtravel switches (DI1 to DI5 of H03 parameters, DI1 and DI2 are used by default).

4. If a software limit switch is used, you need to set the input pin ConfigEPos.%X2 (POS_STW2.14) of the SINA_POS function block to 1, activate the software limit function of the drive, and set the forward and reverse soft limit positions in the drive.
5.

Table 14–2 ConfigEPos basic positioning relationship table

ConfigEPos bit	Function
ConfigEPos.%X0	OFF2 stop
ConfigEPos.%X1	OFF3 stop
ConfigEPos.%X2	Activate software limit
ConfigEPos.%X3	Activate hardware limit
ConfigEPos.%X6	Zero switch signal
ConfigEPos.%X7	External block switching
ConfigEPos.%X8	Supports continuous change of setpoint with immediate effect when ModePos = 2

Telegram 111 configuration

1. Add the drive to the network view and create network connection with the PLC. See *"Figure 14–18" on page 295* .

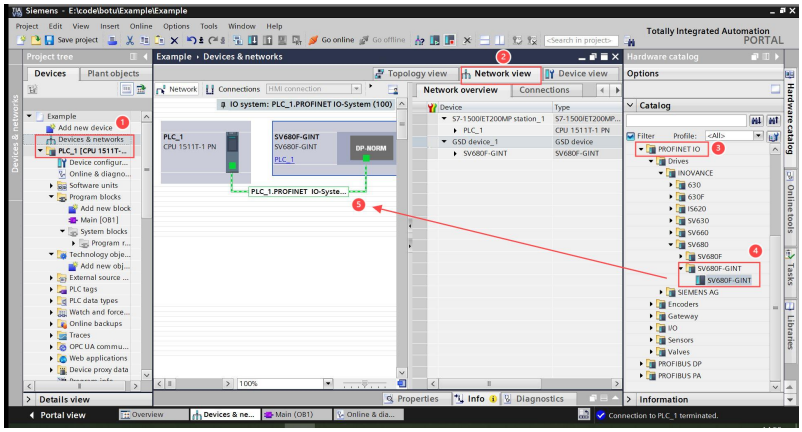


Figure 14-18 Add SV680F-INT

2. Double-click **SV680F-INT** in the device view and then double-click the drive object in **Module** on the right. The Submodles option will pop up. Delete the No. 3 telegram and replace it with telegram 111. See *"Figure 14–18" on page 295* .

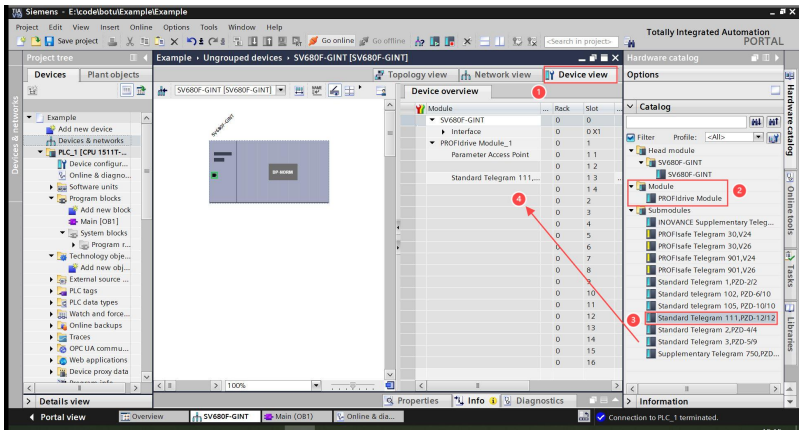


Figure 14-19 Add telegram 111

3. Set the IP addresses and PROFINET device names of PLC and SV680F-INT. See *"Figure 14–20" on page 296* .

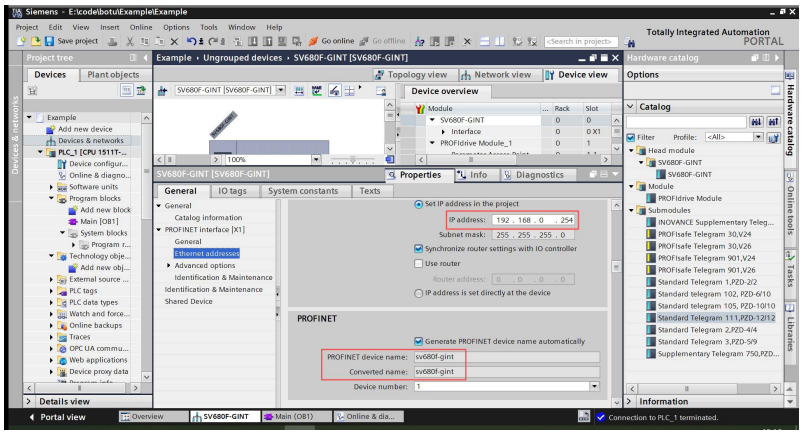


Figure 14-20 Set IP and device name of SV680F-INT

4. Apply the SinaPOS function block in the main program. See *"Figure 14–21" on page 296* .

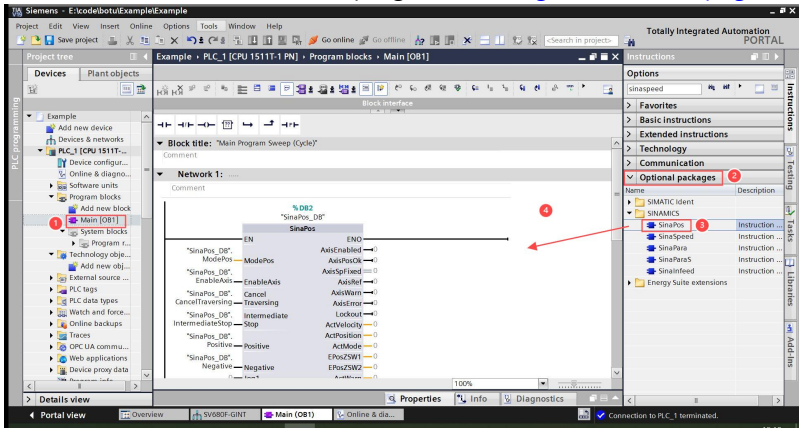


Figure 14-21 SinaPOS function block

5. For the assignment of function block pins HWI DSTW and HWI DSZW, you can double-click **SV680F-INT** in the device view, right-click **telegram 111** and select **Property**. You can find the hardware identifier in the system constants. See *"Figure 14–22" on page 297* .

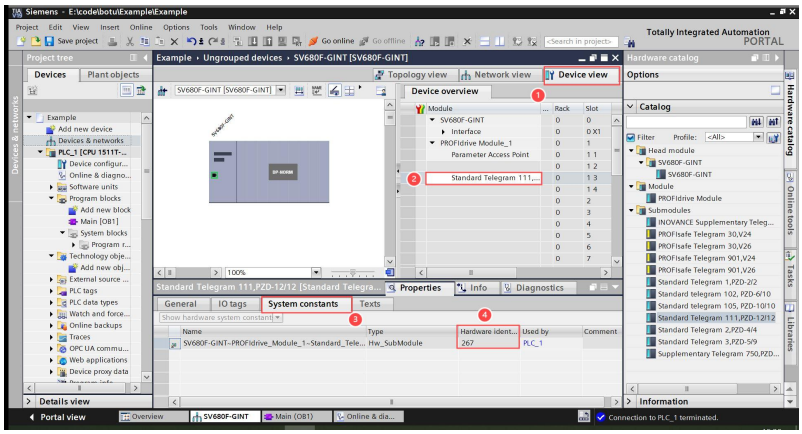
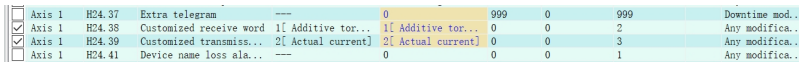


Figure 14-22 Find the hardware identifier

6. If torque limit and torque read is needed, set H24.38 and H24.39 to 1. See *"Figure 14–23" on page 297*

.



Axis 1	H24.37	Extra telegram	---	0	999	0	999	Downtime mod..
Axis 1	H24.38	Customized receive word	1[Additive tor...	1[Additive tor...	0	0	2	Any modifica..
Axis 1	H24.39	Customized transmiss...	2[Actual current]	2[Actual current]	0	0	3	Any modifica..
Axis 1	H24.41	Device name loss ala...	---	0	0	0	1	Any modifica..

Figure 14-23 Turn on torque limit and torque read function

7. Now telegram 111 configuration is completed.

Note

When you use SINA _POS, avoid switching Mode from 0 to non-0 when enabling again; When you enable on mode 0 and then switch the mode to non-0, the internal state machine of SINA_POS will trigger a disable command. If the disable command exists in the control word, it may affect the vertical axis.

14.4.4 SINA_POS Function Block

14.4.4.1 Telegram 111 Relative or Absolute Positioning (ModPos = 1 or 2)

Relative/absolute positioning

In the SINA_POS function block, the input pins CancelTransing and IntermediateStop are effective for all operating modes except jog and must be set to 1 when running EPOS.

Position unit is LU, Velocity unit is 1000 LU/min, and Velocity can only be > 0;

The currently running command can be replaced by a new command through the ExecuteMode rising edge, but only for running modes ModPOS = 1, 2.

AxisPosOK is false during positioning, and is True after positioning is completed.

Table 14–3 MDI relative/absolute positioning steps

Terminal Signal	Step 1: Prepare	Step 2: Enable	Step 3: Start
ModPos	1 = Relative positioning 2 = Absolute positioning	1 = Relative positioning 2 = Absolute positioning	1 = Relative positioning 2 = Absolute positioning
CancelTransing	1	1	1
IntermediateStop	1	1	1

Terminal Signal	Step 1: Prepare	Step 2: Enable	Step 3: Start
EnableAxis	0	0 to 1	1
ExecuteMode	0	0	0 to 1
Position	Position setpoint	Position setpoint	Position setpoint
Velocity	Velocity setpoint	Velocity setpoint	Velocity setpoint
OverV	100	100	100
OverAcc	100	100	100
OverDec	100	100	100

Formula:

Number of motor revolutions of relative/absolute positioning = (Position × Gear ratio) ÷ Encoder resolution;

Motor speed of relative/absolute positioning (rpm) = (Velocity pin × 1000 × OverV% × Gear ratio) ÷ Encoder resolution;

Motor acceleration time of relative/absolute positioning (seconds) = Velocity pin × OverV% ÷ (60 × H25.02 × OverAcc%)

Motor deceleration time of relative/absolute positioning (seconds) = Velocity pin × OverV% ÷ (60 × H25.04 × OverDec%)

Note

The encoder resolution is 8388608pls/r.

In relative/absolute positioning, you can change the speed immediately through real-time modification of OverV (1% to 199%). Note that only changing Velocity (can only > 0) is not enough.

Case

H00.00 = 14102. If H05.07 = 67108864 and H05.09 = 1000, 10000 is assigned to the Position pin and 1000 is assigned to the Velocity pin in the SINA_POS function block. After triggering the relative positioning, the motor rotates 10 turns at 1000 rpm.

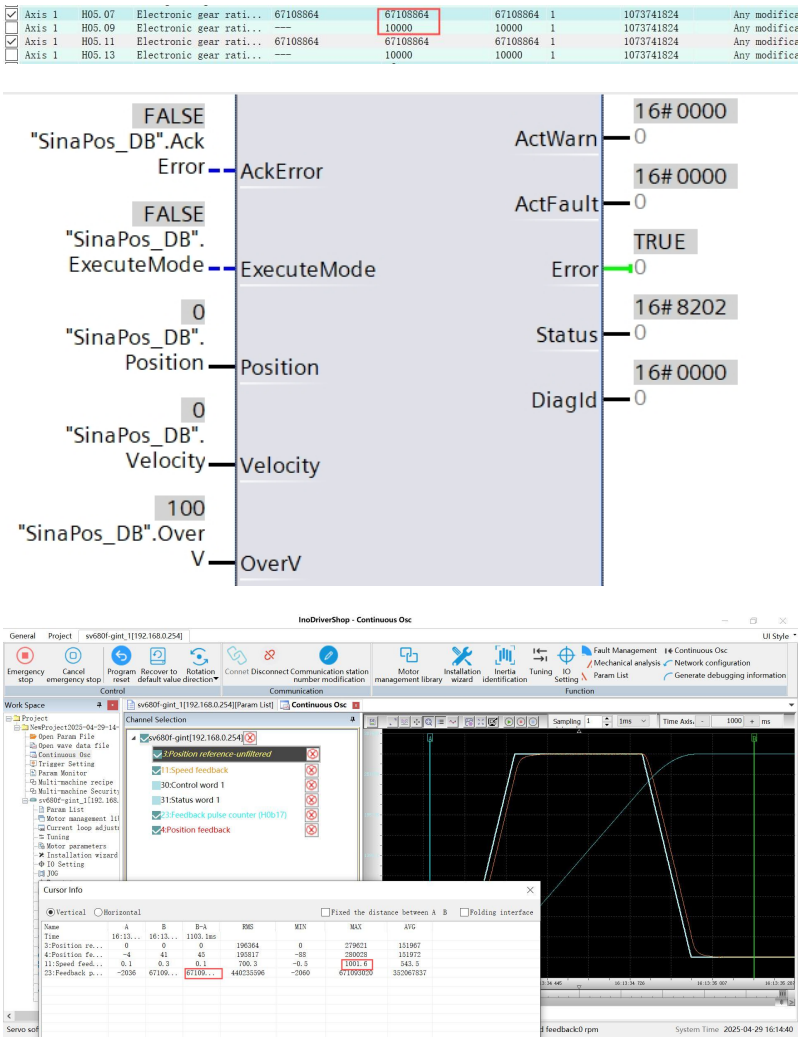


Figure 14-24 Relative positioning test case

[Verification]: Keep the above relative positioning data unchanged, and modify H25.02 and H25.04. The motor acceleration and deceleration time is consistent with the above conclusion.

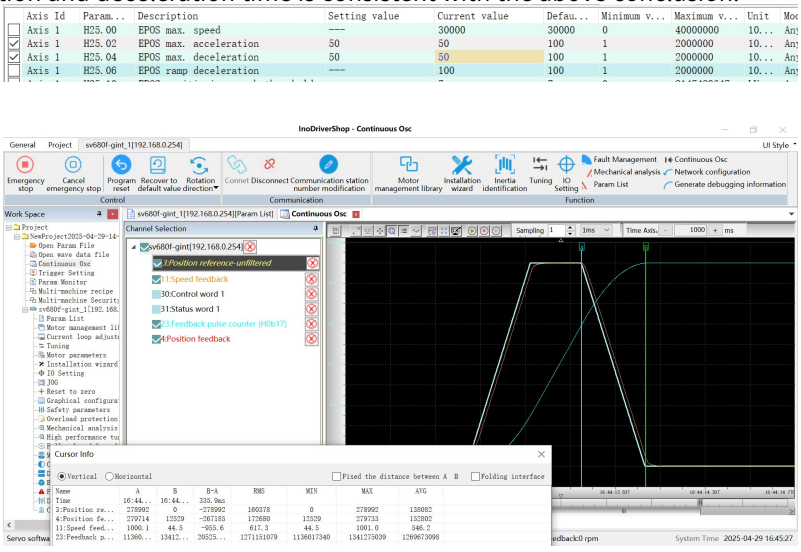


Figure 14-25 Motor acceleration and deceleration time of relative positioning

Continuous position setting in absolute positioning mode (ModePos = 2, ConfigEpos.%X8 = 1)

In ModePos = 2 (absolute positioning mode), by setting telegram 111 ConfigEPos.%X8, and updating Position, Velocity, OverV, OverAcc, and OverDec on the PLC side, you only need to trigger the ExecuteMode for the first time, and it will run immediately. Future updating of the target position and speed will take effect in real time. There is no need to trigger the ExecuteMode every time.

Case analysis

1. Use telegram 111 mode 2, assign 16#103 to ConfigEPos, assign 6000 to Velocity, and update the data of Position from -200000 to 200000.

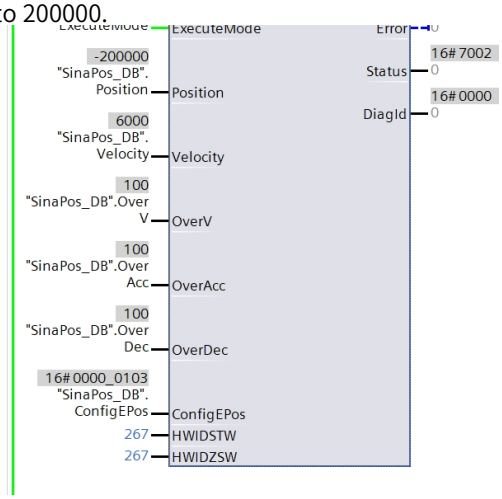
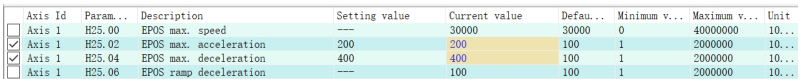


Figure 14-26 Mode 2 Continuous operation

The servo parameters to be set are as shown in *"Figure 14–27 Servo parameter" on page 300*.



	Axis Id	Param...	Description	Setting value	Current value	Defau...	Minimum v...	Maximum v...	Unit
☐	Axis 1	H25.00	EPOS max. speed	---	30000	30000	0	40000000	10...
☑	Axis 1	H25.02	EPOS max. acceleration	200	200	100	1	2000000	10...
☑	Axis 1	H25.04	EPOS max. deceleration	400	400	100	1	2000000	10...
☐	Axis 1	H25.06	EPOS ramp deceleration	---	100	100	1	2000000	10...

Figure 14-27 Servo parameter

2. First assign -200000 to Position, then the theoretical acceleration time is 500 ms. If the Position is updated to 200000 during motion, then the motor decelerates first, and the theoretical deceleration time is 250 ms, as shown in *"Figure 14–28 Acceleration time for Position = -200000" on page 300* *"Figure 14–29 Deceleration time after updating the Position value during positioning" on page 301*.

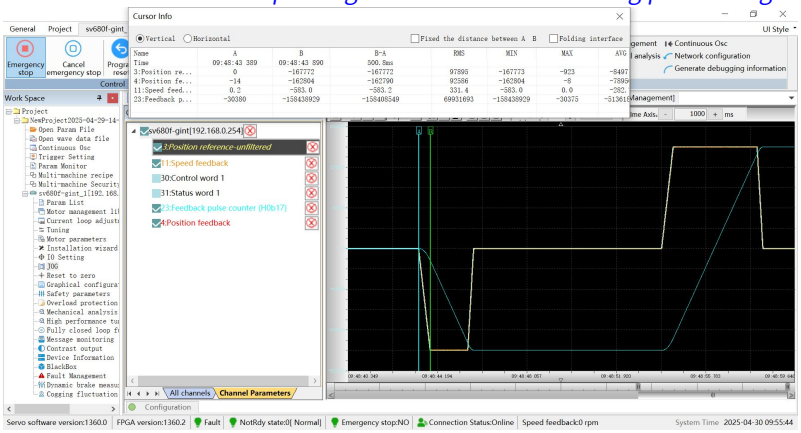


Figure 14-28 Acceleration time for Position = -200000

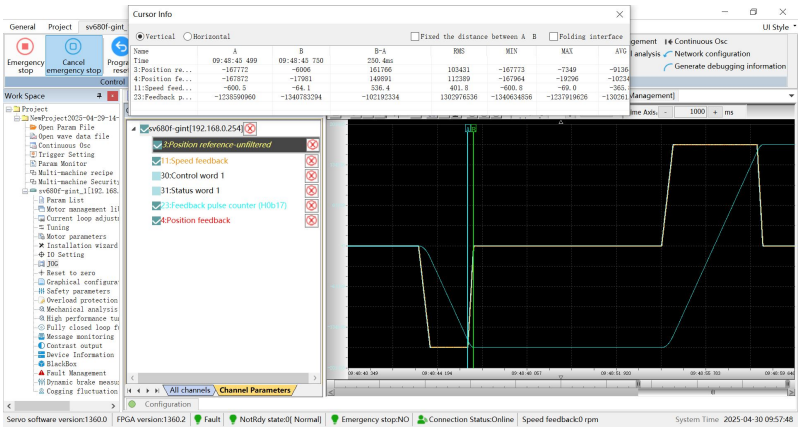


Figure 14-29 Deceleration time after updating the Position value during positioning

3. Then the motor accelerates in the reverse direction, with the acceleration time of 250 ms. The motor finally stops at the position of 200000.

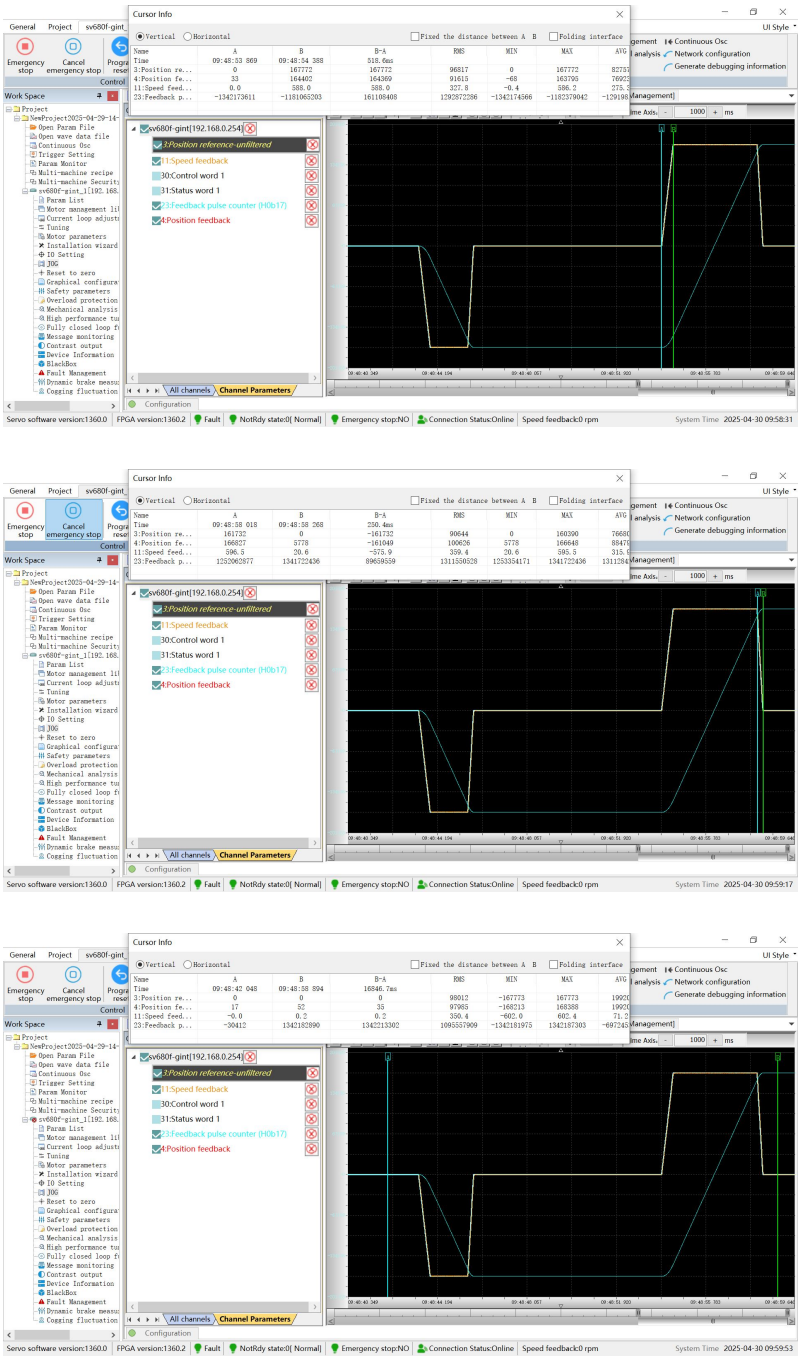


Figure 14-30 Motor final position

14.4.4.2 Telegram 111 Runs at Specified Speed (ModPos = 3)

The MDI adjustment mode allows the axis to run forward or reversely continuously in speed mode. You can specify the running speed by Velocity (>0), and specify the overrides of the speed and acceleration/deceleration by OverV, OverAcc and OverDec.

The running conditions "CancelTransing" and "IntermediateStop" must be set to 1, and JOG1 and JOG2 must be set to 0. The positioning motion is triggered through the rising edge of ExecuteMode. Every time the target speed is updated, ExecuteMode must be triggered to take effect.

Note

The running direction in the MDI mode is determined by the Positive (forward) and Negative (reverse) terminals. Positive = 1 indicates the forward direction and Negative = 1 indicates the reverse direction. When both are 1 or 0, the axis stops. Velocity must be larger than 0. Otherwise, the motor stops.

Table 14–4 MDI adjustment mode steps

Terminal Signal	Step 1: Prepare	Step 2: Enable	Step 3: Forward run	Step 3: Reverse run	Step 4: Stop	Step 4: Pause
ModPos	3	3	3	3	3	3
CancelTrans-ing	1	1	1	1	1 to 0	1
Intermediate-Stop	1	1	1	1	1	1 to 0
EnableAxis	0	0 to 1	1	1	1	1
Positive	0	1	1	0	0	0
Negative	0	0	0	1	1	1
ExecuteMode	0	0	0 to 1	0 to 1	1 to 0	1 to 0
Position	Irrelevant	Irrelevant	Irrelevant	Irrelevant	Irrelevant	Irrelevant
Velocity	Velocity setpoint	Velocity setpoint	Velocity setpoint	Velocity setpoint	Velocity setpoint	Velocity setpoint
OverV	100	100	100	100	100	100
OverAcc	100	100	100	100	100	100
OverDec	100	100	100	100	100	100

The operation timing diagram is as follows:

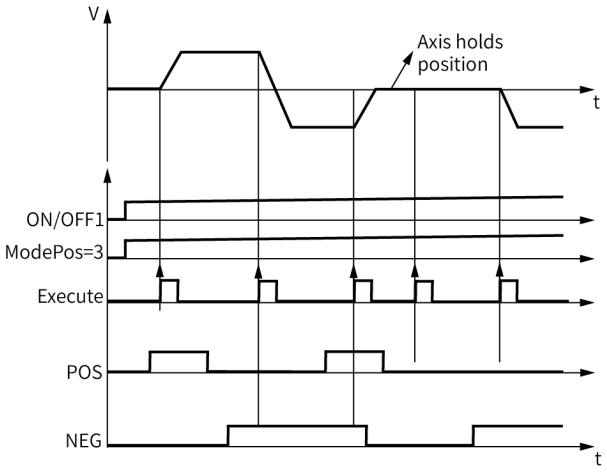


Figure 14-31 Operation timing diagram

Formula:

The encoder resolution is 67108864 pls/r.

Motor speed (rpm) = (Velocity pin × 1000 × OverV% × gear ratio) ÷ Encoder resolution

Motor acceleration time (seconds) = Velocity pin × OverV% ÷ (60 × H25.02 × OverAcc%)

Motor deceleration time (seconds) = Velocity pin × OverV% ÷ (60 × H25.04 × OverDec%)

CancelTransing deceleration time (seconds) = Velocity pin × OverV% ÷ (60 × H25.06)

IntermediateStop deceleration time (seconds) = Velocity pin × OverV% ÷ (60 × H25.04 × OverDec%)

OFF1 disable deceleration time (ms) = (Current speed rpm ÷ Rated speed rpm) × H06.40 × $10^{H06.42}$

OFF3 disable deceleration time (ms) = (Current speed rpm ÷ Rated speed rpm) × H06.41 × $10^{H06.43}$

Case analysis

H00.00 = 14102, if H05.07 = 1048576, H05.09 = 1000, H25.02 = 200, 4000 is assigned to the Velocity pin in SinaPos. After the MDI function is triggered, the rotating speed is 62.5 rpm, the acceleration time is about 333 ms, and the deceleration time is 666 ms.

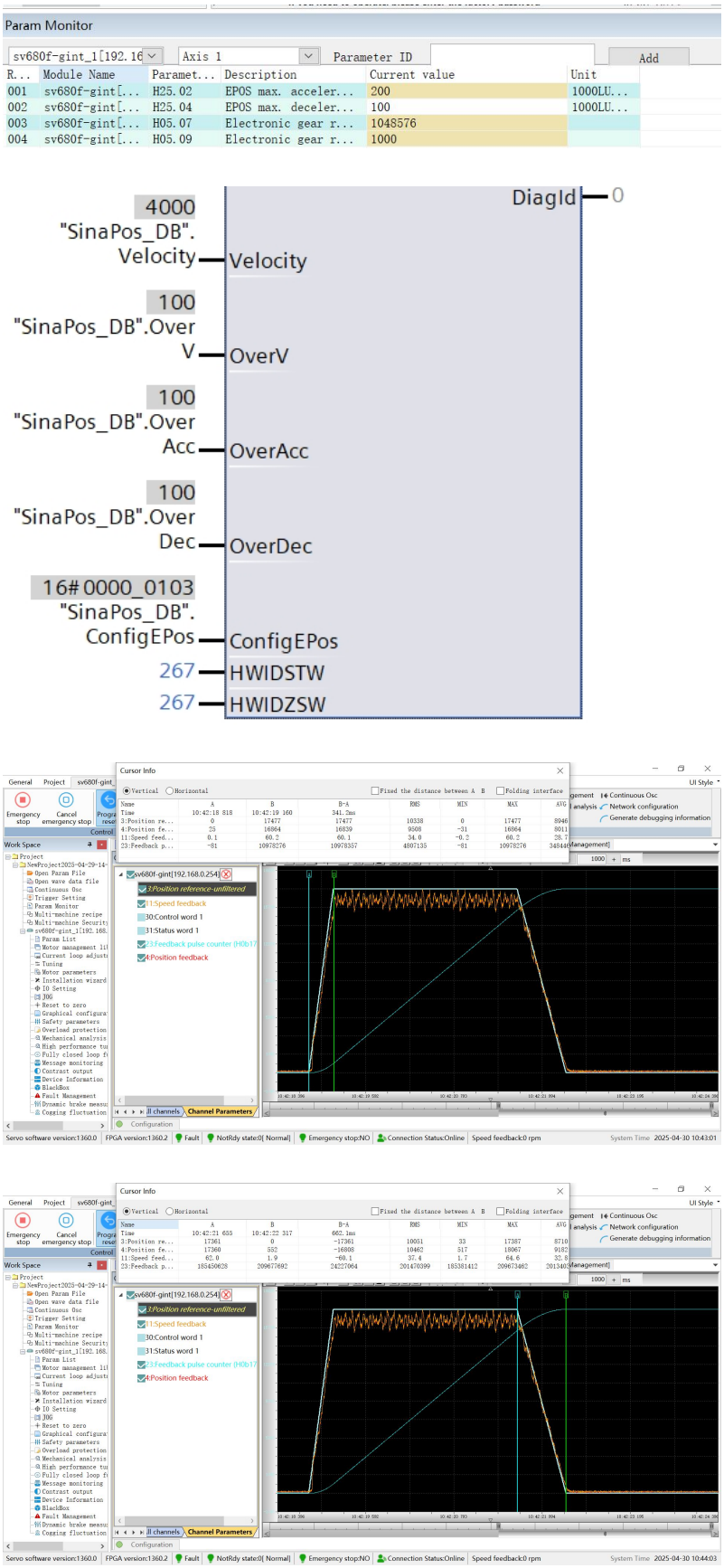
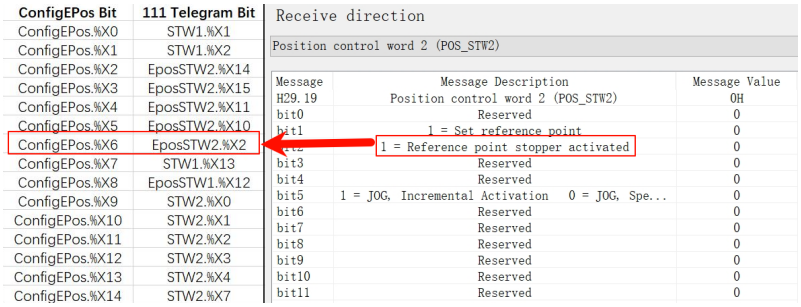


Figure 14-32 MDI mode test case

14.4.4.3 Telegram 111 Active Homing Mode (ModPos = 4)

Description of the home switch

Telegram 111 deems bit2 of position control word 2 (EPOS _ STW2) as the reference point by default. At the same time, ConfigEPOS.%x6 of the SINA _POS function block already corresponds to bit2 of POS _ STW2. See *"Figure 14–33 Corresponding bit of ConfigEPOS" on page 306*.



ConfigEPos Bit	111 Telegram Bit
ConfigEPos.%X0	STW1.%X1
ConfigEPos.%X1	STW1.%X2
ConfigEPos.%X2	EposSTW2.%X14
ConfigEPos.%X3	EposSTW2.%X15
ConfigEPos.%X4	EposSTW2.%X11
ConfigEPos.%X5	EposSTW2.%X10
ConfigEPos.%X6	EposSTW2.%X2
ConfigEPos.%X7	STW1.%X13
ConfigEPos.%X8	EposSTW1.%X12
ConfigEPos.%X9	STW2.%X0
ConfigEPos.%X10	STW2.%X1
ConfigEPos.%X11	STW2.%X2
ConfigEPos.%X12	STW2.%X3
ConfigEPos.%X13	STW2.%X4
ConfigEPos.%X14	STW2.%X7

Figure 14-33 Corresponding bit of ConfigEPOS

In the program, assigning 16#4B to the ConfigEPOS pin will activate the home, as shown in the figure below.

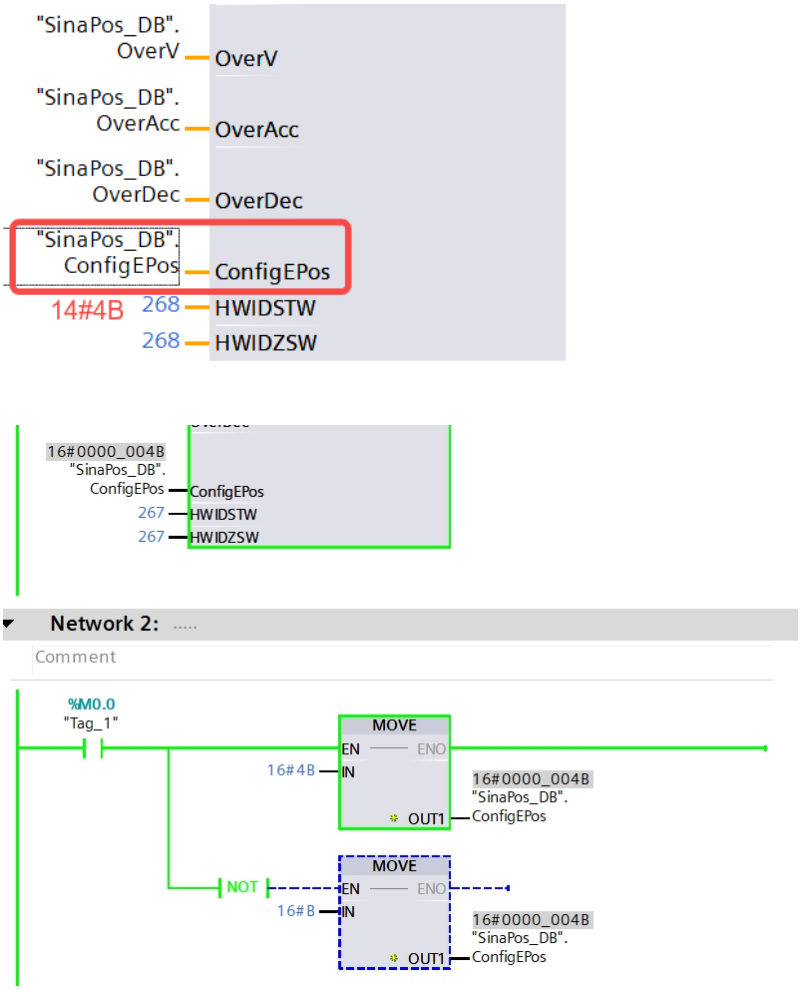


Figure 14-34 Home trigger effective

Note

You can assign 16#B to pin ConfigEPOS, and set the DI terminal as the home switch in group H03.

Homing

The homing in telegram 111 is automatically planned inside the drive (ModPos = 4). The host controller only provides the signal that triggers the homing, and configures the servo parameter H25.22 (homing type).

If you choose absolute homing (H05.40 = 0), the homing operation takes the value of H05.36 as the homed value. If you select relative homing (H05.40 = 1), the homing operation takes the value of H05.36 + the current position value as the homed position.

Before homing is completed, the ExcuteMode of the Sina_POS function block must always be TRUE to complete the homing operation. When you set H02.01 = 1, AxisRef is set to 1 after the first homing, and even if the servo drive is power cycled, AxisRef is still 1.

Table 14–5 Homing steps

Terminal Signal	Step 1: Prepare	Step 2: Enable	Step 3: Start homing
ModPos	4	4	4
CancelTransing	1	1	1
IntermediateStop	1	1	1
EnableAxis	0	0 to 1	1
ExecuteMode	0	0	0 to 1
OverV	100	100	100
Homing related parameters are set in servo parameters H25.22/H25.23/H25.25/H25.27/H05.36/H05.35/H05.66.			

Case analysis

Homing mode H25.22 = 5, homing high speed segment speed is 500 rpm, homing low speed segment speed is 30 rpm, and the acceleration and deceleration time of homing high speed segment is about 417 ms; The homing acceleration and deceleration time in the low speed segment is about 25 ms.

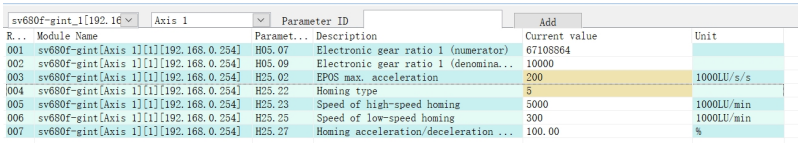


Figure 14-35 Parameters related to homing speed and acceleration/deceleration time

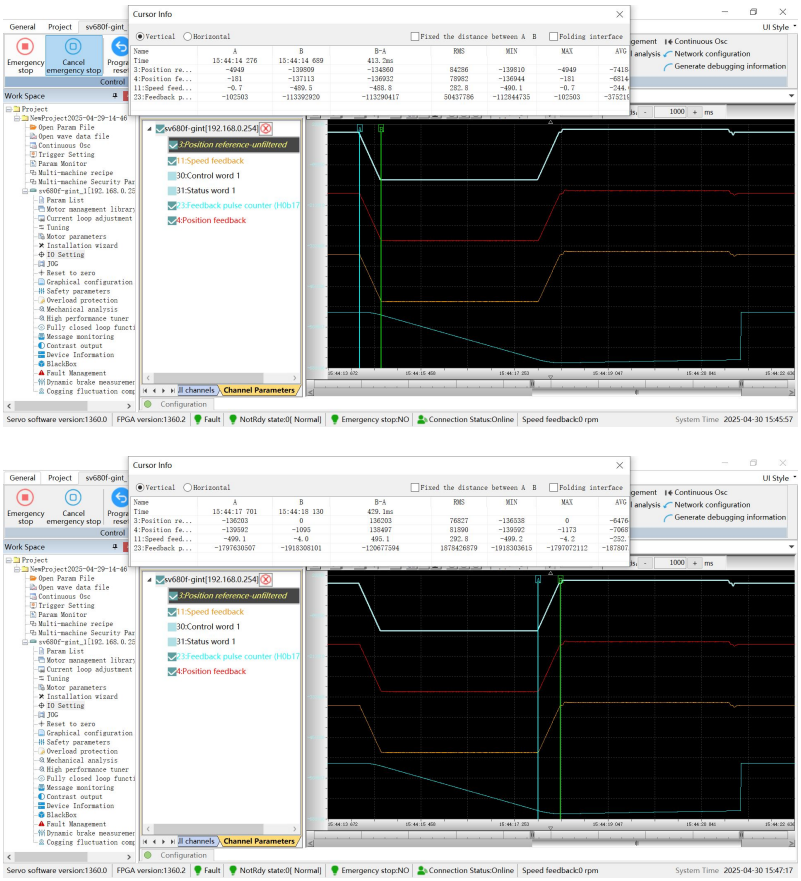


Figure 14-36 Acceleration/deceleration time of homing high speed segment

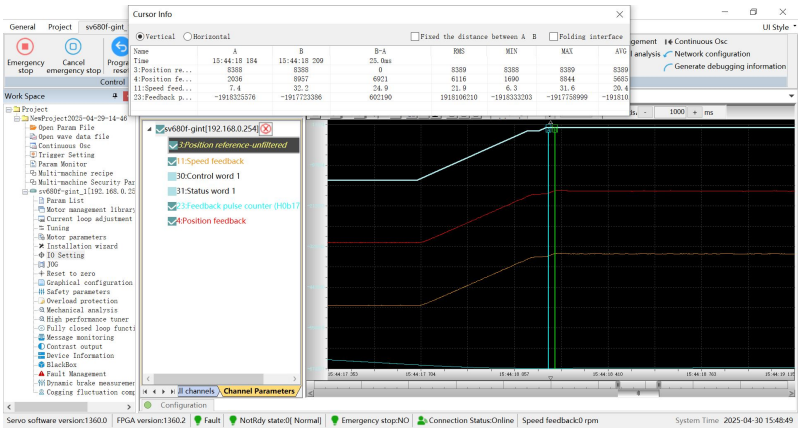


Figure 14-37 Acceleration/deceleration time of homing low speed segment

When the above homing parameters remain unchanged, only modifying the acceleration and deceleration override will also affect the acceleration and deceleration time; Modifying only the speed override of the host controller will also affect the speed of the homing.

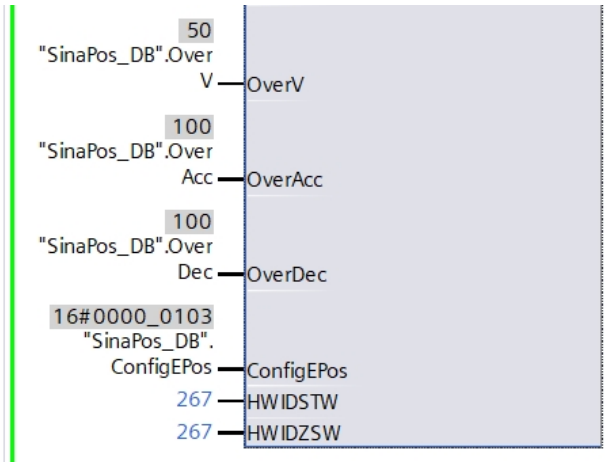


Figure 14-38 Homing acceleration/deceleration time of high speed segment after modification of acceleration and deceleration override

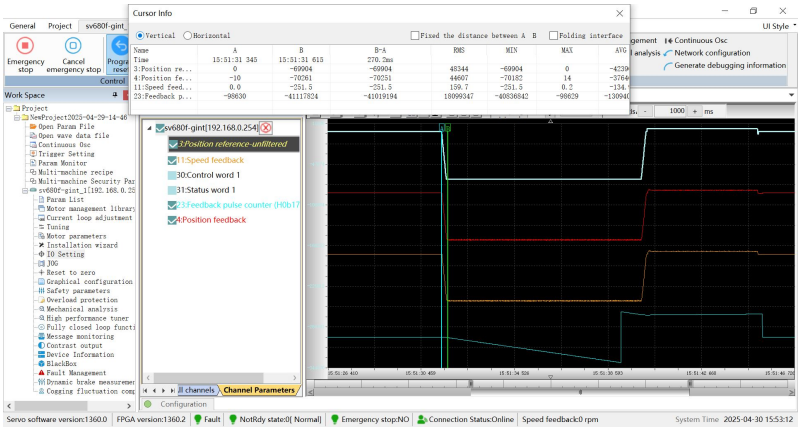


Figure 14-39 Homing speed of high speed segment after modification of speed override

Formula

Homing acceleration/deceleration time of high-speed segment (seconds) = (H25.27 × H25.23 (homing high-speed speed)) ÷ (60 × H25.02)

Homing acceleration/deceleration time of low-speed segment (seconds) = (H25.27 × H25.23 (homing low-speed speed)) ÷ (60 × H25.02)

Special homing type (torque homing)

Note

Telegram 111 supports torque homing and no overtravel switch is required.

1. H25.22 (homing type) = -1: Run in the negative direction until hitting the hard limit, then run in the opposite direction to find the first Z signal as the home.
2. H25.22 (homing type) = -2: Run in the positive direction until hitting the hard limit, then run in the opposite direction to find the first Z signal as the home.

Torque homing conditions: When the motor hits the hard limit position (and when the torque reaches H05.58 and there is a zero speed signal output (the zero speed signal is set when the speed reference is

less than H06.19), the operation will find the first Z signal in the reverse direction as the home) for 10 ms, the operation will find the first Z signal in the reverse direction as the home. When H05.58 exceeds 200%, an overload fault can easily occur. At this time, reduce H05.58 appropriately. When torque homing is used, the torque limit value during homing will be the smaller one in H07.09 and H07.10.

☆ Related parameters:

Parameter	Hex	Name	Value	Default	Unit	Change Mode	Page
H05.58	0x053A	Torque threshold in homing upon hit-and-stop	0.0% to 400.0%	100.0	%	Real-time	"H05_en.58" on page 522
H06.19	0x0613	Threshold of zero speed output signal	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	"H06_en.19" on page 527

Case: reverse torque homing

Set H25.22 =-1 ad H25.23 = 600, then the homing runs in the negative direction at high speed speed of 60 rpm. See *"Figure 14–40 Set homing mode and speed" on page 310*.

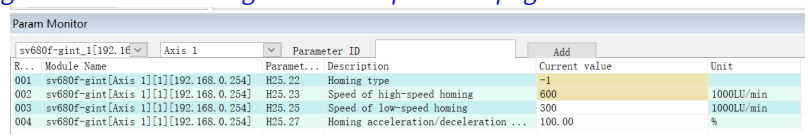


Figure 14-40 Set homing mode and speed

Then set the limit torque and threshold of the torque homing. See *"Figure 14–41 Torque homing parameter setting" on page 310*.

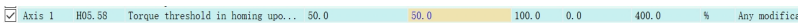


Figure 14-41 Torque homing parameter setting

Select mode 4, then trigger the homing to acquire the software waveform as follows. The motor first runs in reverse at 60 rpm. After reaching the hard limit position, the torque limit is 50%, and the speed feedback is less than H06.19.



Figure 14-42 Reverse homing hitting hard limit

Then the motor looks for the first Z signal at the speed set by H25.25 in the forward direction, and the homing is completed after the signal is found.

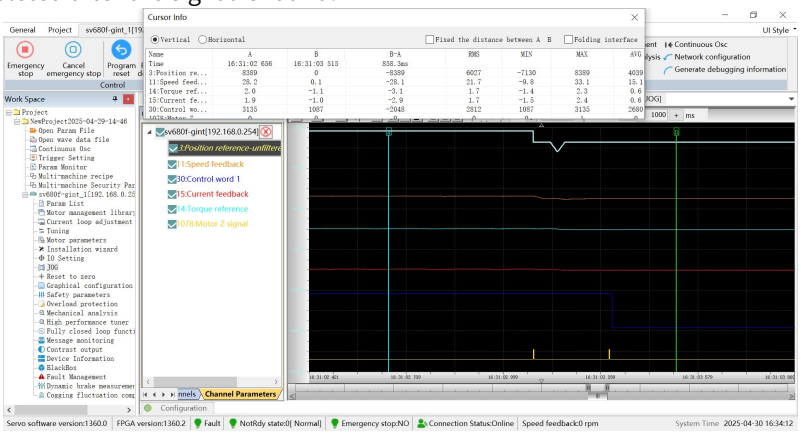


Figure 14-43 Looking for the first Z signal in forward direction After hitting the hard limit

Case: forward torque homing

On the basis of the above homing data, change H25.22 to -2 (homing type: forward torque homing). The software waveform is as follows. The motor first runs forward at 60 rpm, and the torque limit is 40% after the motor reaches the hard limit position, and the speed feedback is less than H06.19.

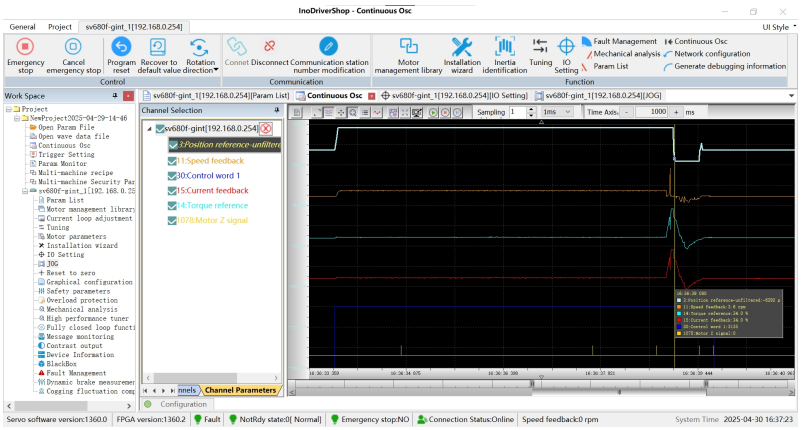


Figure 14-44 Forward homing hitting hard limit

Then the motor looks for the first Z signal at the speed set by H25.25 in the reverse direction, and the homing is completed after the signal is found.



Figure 14-45 Looking for the first Z signal at low speed in reverse direction after hitting the hard limit

Homing trajectory

- **H25.22 = 1**

  Mechanical home: Z signal

  Deceleration point: negative limit switch

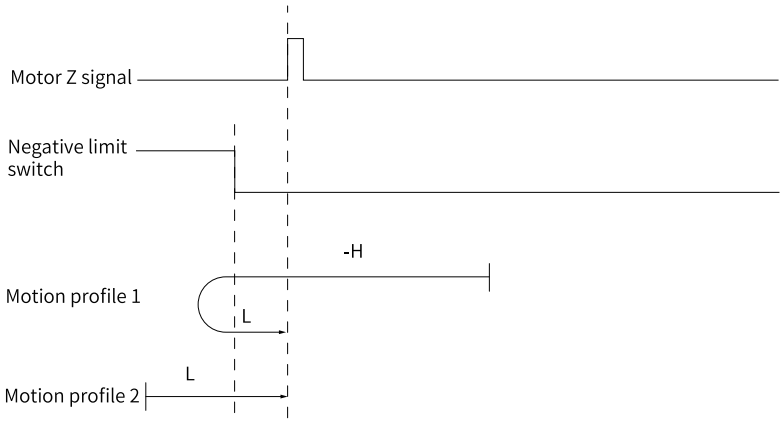


Figure 14-46 Motor running curve and speed in mode 1

  - Motion profile 1: Deceleration point signal inactive at start.

- Motion profile 2: Deceleration point signal active at start.

Note

Note: In the figure, "H" represents high speed H25.23, and "L" represents low speed H25.25, and “-” indicates reverse run.

- **H25.22 = 2**

  Home: Z signal

  Deceleration point: positive limit switch

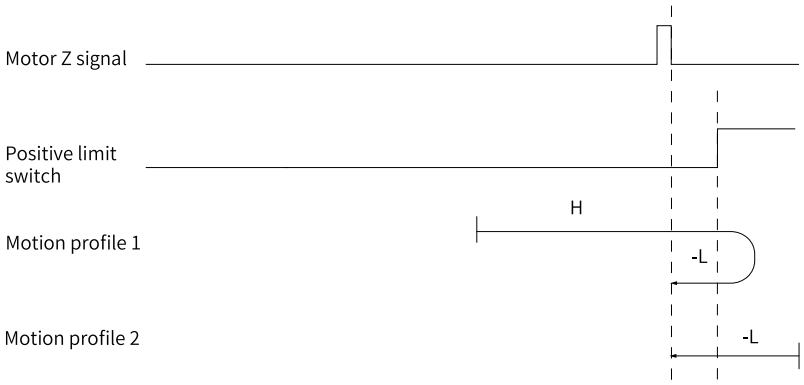


Figure 14-47 Motor running curve and speed in mode 2

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

- **H25.22 = 3**

  Home: Z signal

  Deceleration point: home switch (HW)

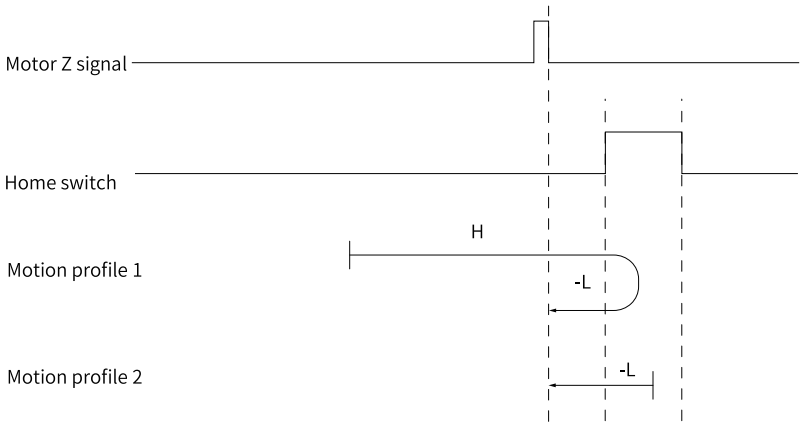


Figure 14-48 Motor running curve and speed in mode 3

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

- **H25.22 = 4**

  Home: Z signal

  Deceleration point: home switch (HW)

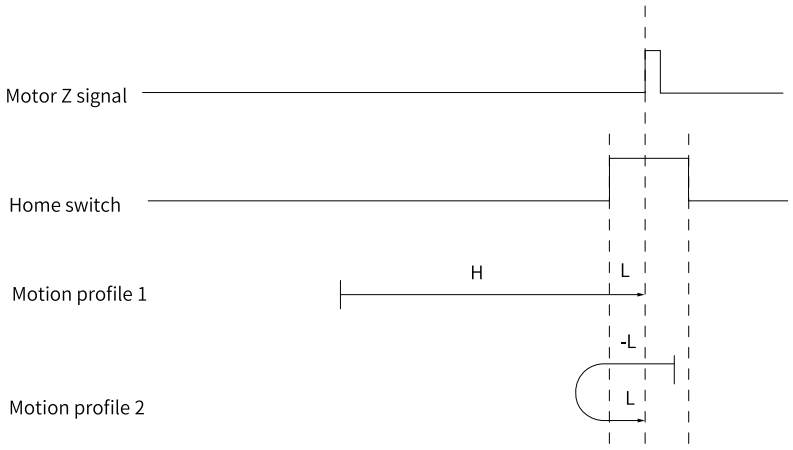


Figure 14-49 Motor running curve and speed in mode 4

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

- **H25.22 = 5**

  Home: Z signal

  Deceleration point: home switch (HW)

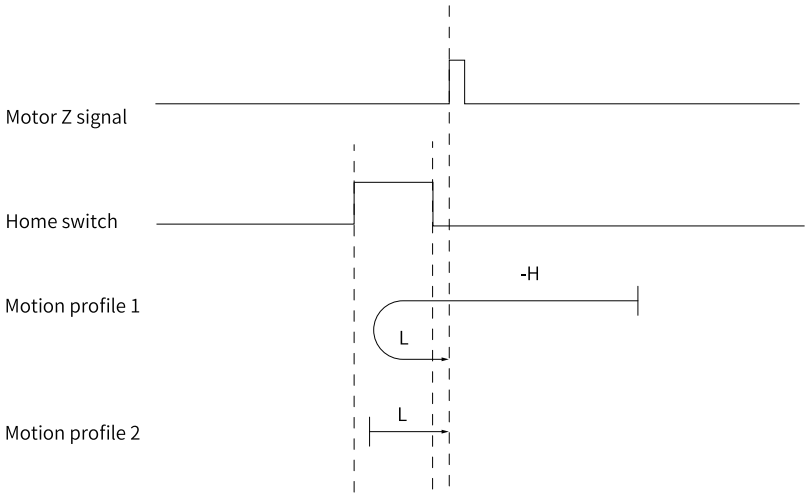


Figure 14-50 Motor running curve and speed in mode 5

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

- **H25.22 = 6**

  Home: Z signal

  Deceleration point: home switch (HW)

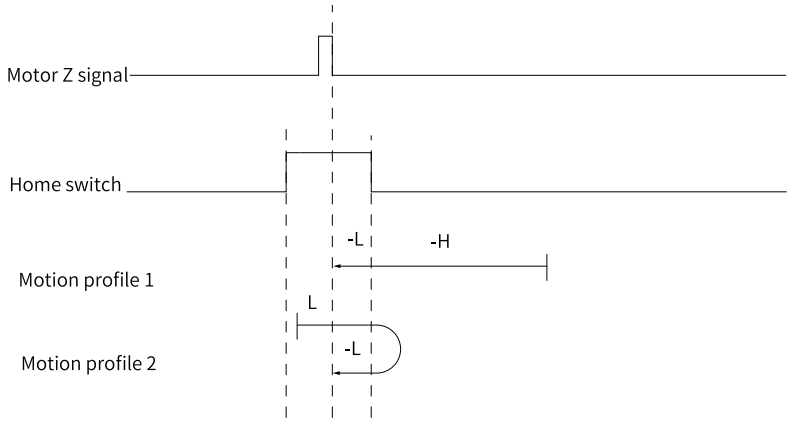


Figure 14-51 Motor running curve and speed in mode 6

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

- **H25.22 = 7**

  Home: Z signal

  Deceleration point: home switch (HW)

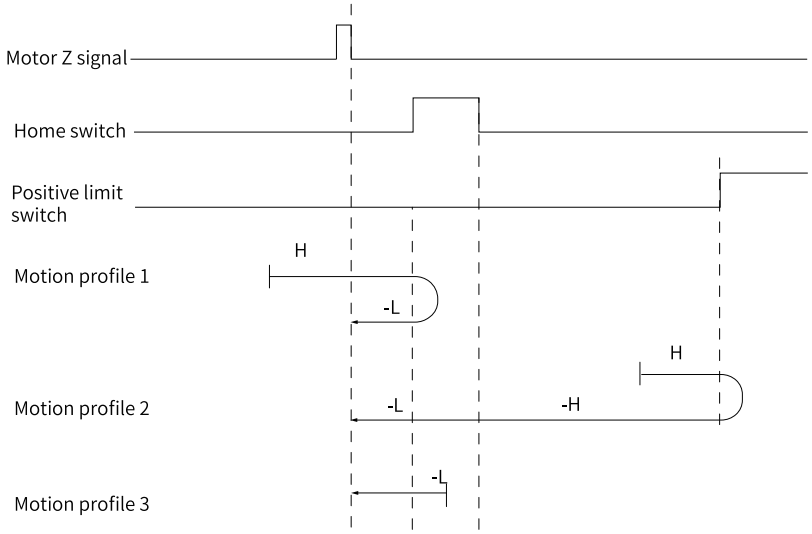


Figure 14-52 Motor running curve and speed in mode 7

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 8**

  Home: Z signal

  Deceleration point: home switch (HW)

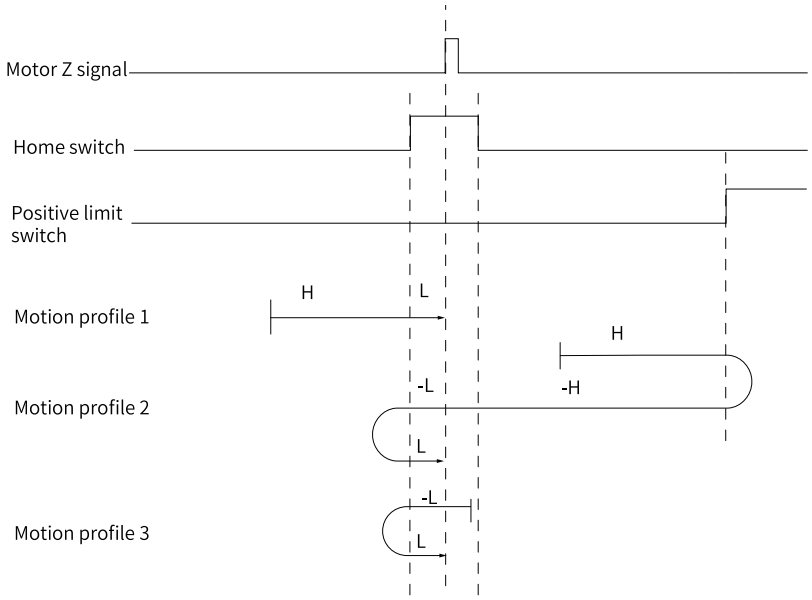


Figure 14-53 Motor running curve and speed in mode 8

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 9**

  Home: Z signal

  Deceleration point: home switch (HW)

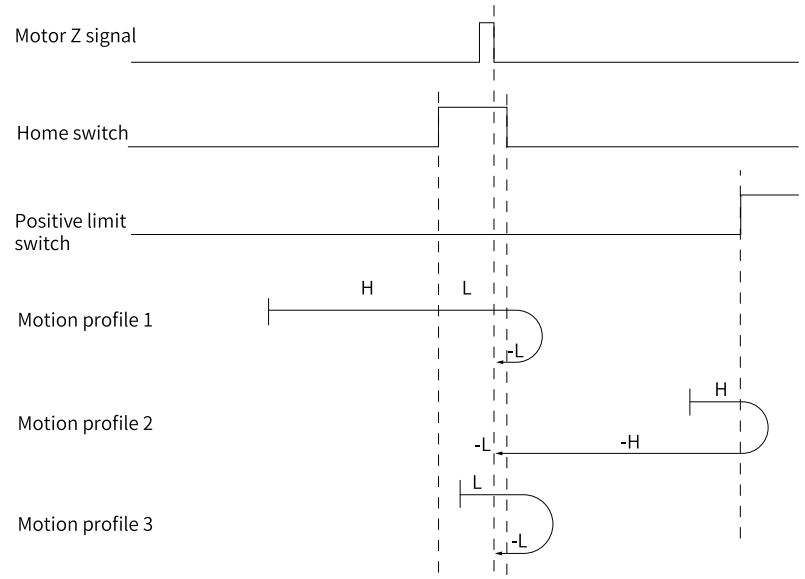


Figure 14-54 Motor running curve and speed in mode 9

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 10**

  Home: Z signal

Deceleration point: home switch (HW)

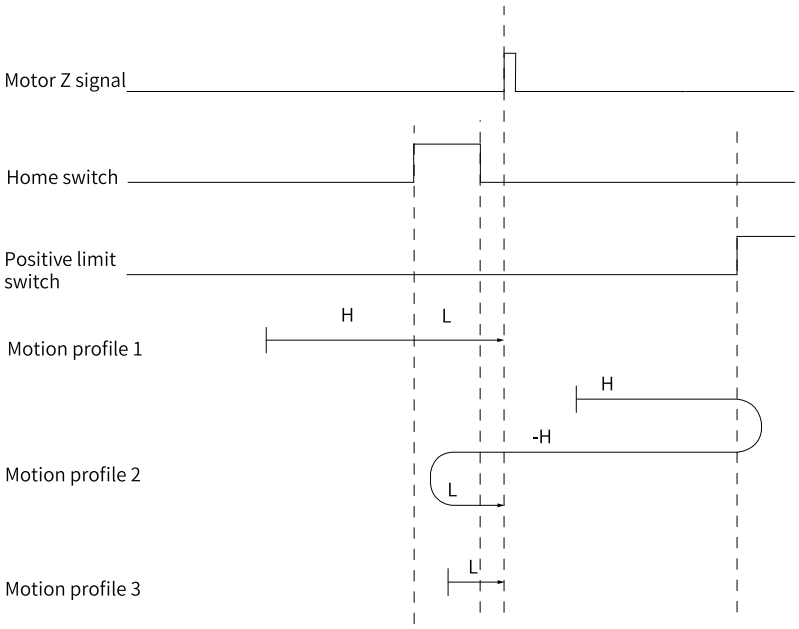


Figure 14-55 Motor running curve and speed in mode 10

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 11**

  Home: Z signal

  Deceleration point: home switch (HW)

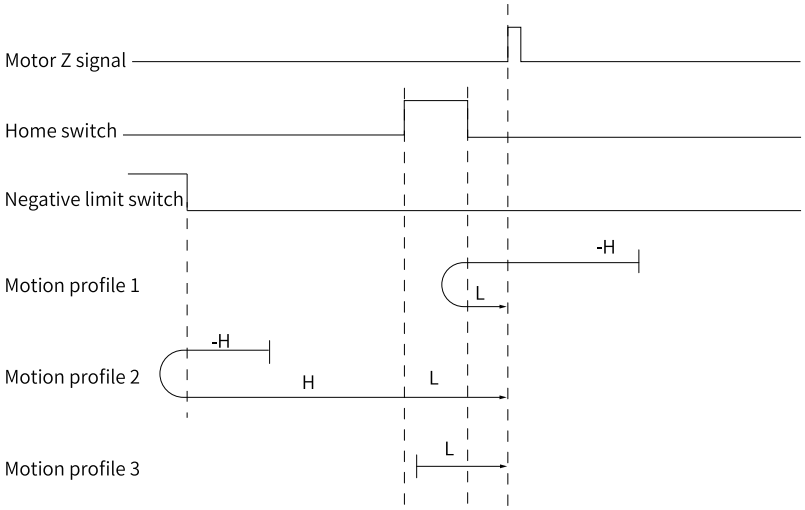


Figure 14-56 Motor running curve and speed in mode 11

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 12**

  Home: Z signal

Deceleration point: home switch (HW)

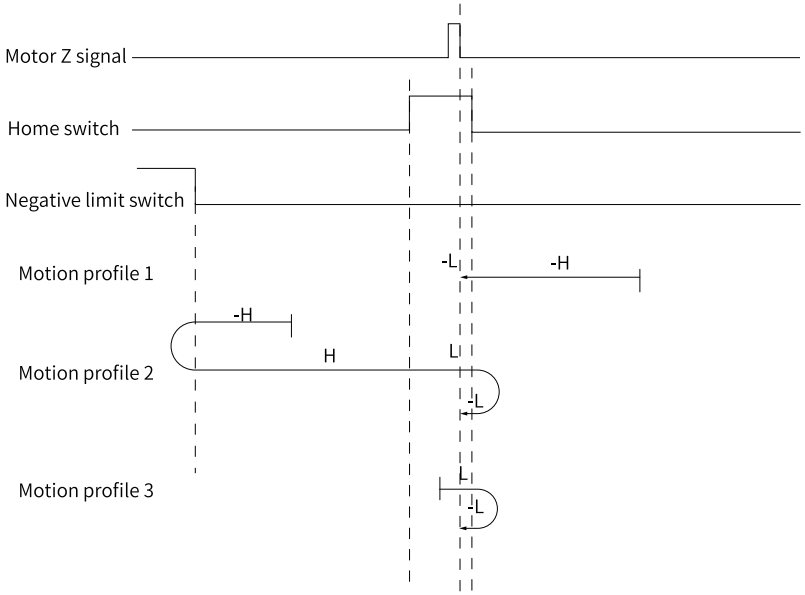


Figure 14-57 Motor running curve and speed in mode 12

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 13**

  Home: Z signal

  Deceleration point: home switch (HW)

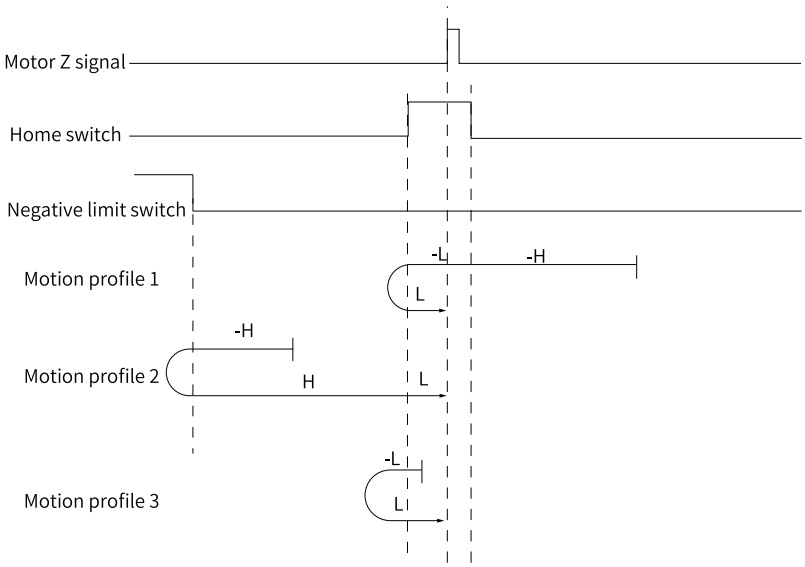


Figure 14-58 Motor running curve and speed in mode 13

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 14**

Home: Z signal

Deceleration point: home switch (HW)

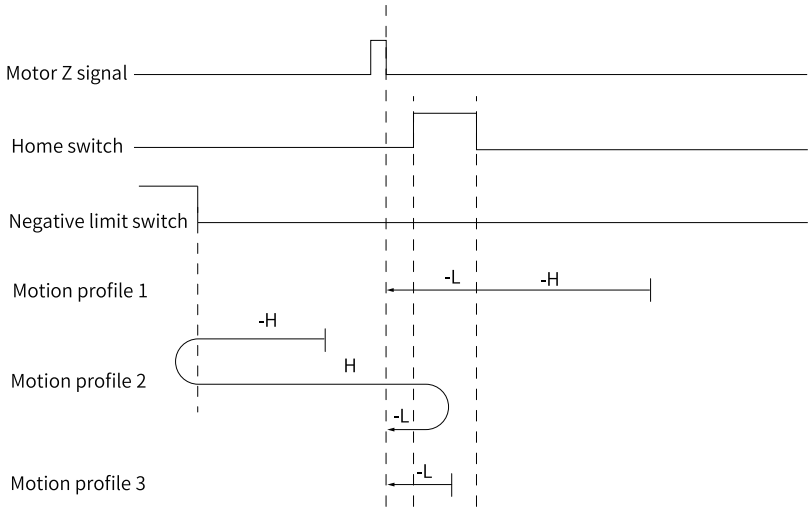


Figure 14-59 Motor running curve and speed in mode 14

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 17**

  Home: negative limit switch

  Deceleration point: negative limit switch

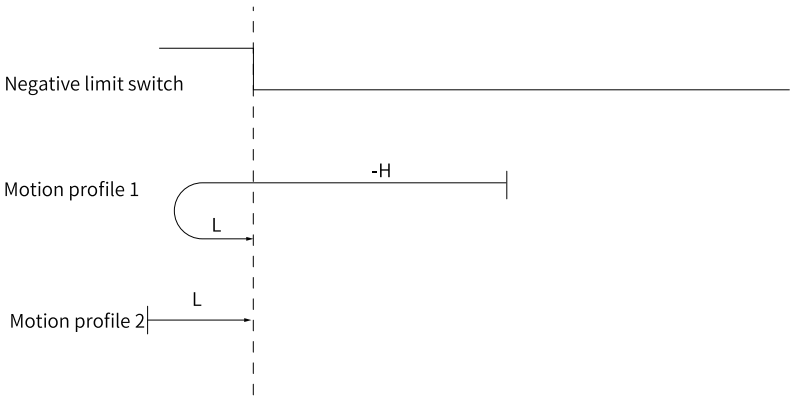


Figure 14-60 Motor running curve and speed in mode 17

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

- **H25.22 = 18**

  Home: positive limit switch

  Deceleration point: positive limit switch

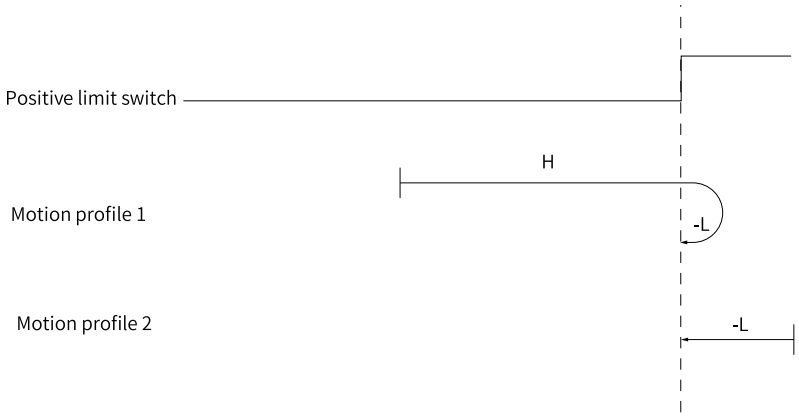


Figure 14-61 Motor running curve and speed in mode 18

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

- **H25.22 = 19**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

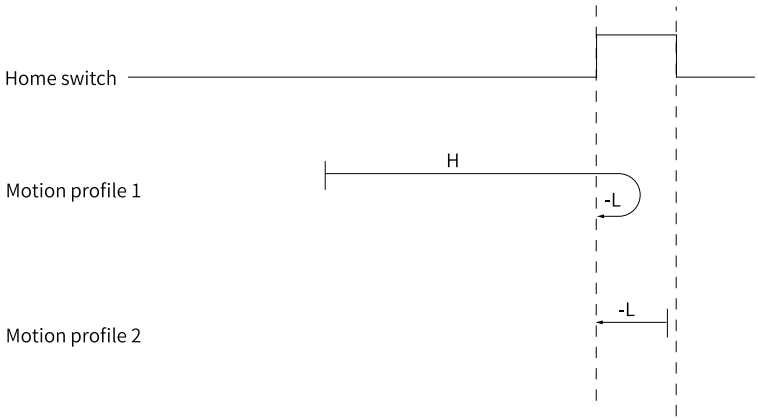


Figure 14-62 Motor running curve and speed in mode 19

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

- **H25.22 = 20**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

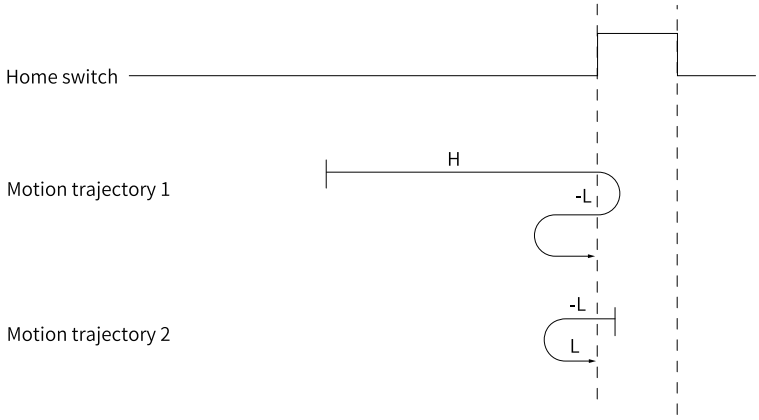


Figure 14-63 Motor running curve and speed in mode 20

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

- **H25.22 = 21**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

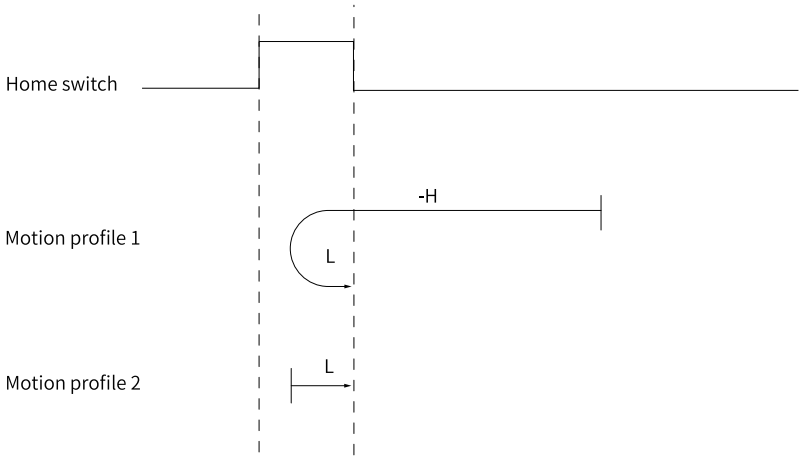


Figure 14-64 Motor running curve and speed in mode 21

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

- **H25.22 = 22**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

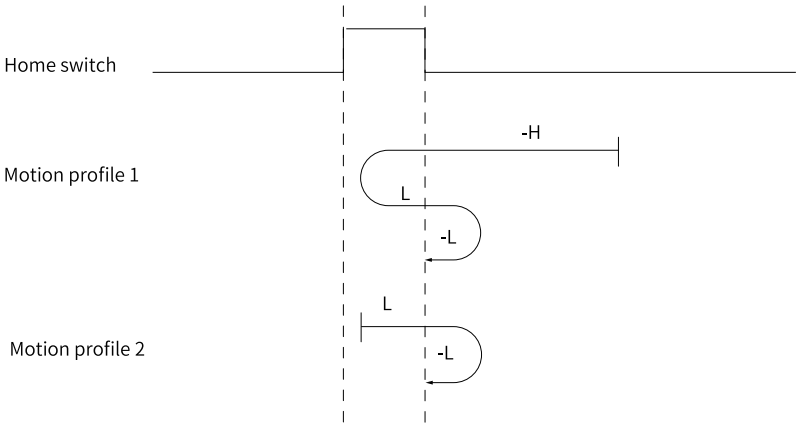


Figure 14-65 Motor running curve and speed in mode 20

- Motion profile 1: Deceleration point signal inactive at start.
- Motion profile 2: Deceleration point signal active at start.

- **H25.22 = 23**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

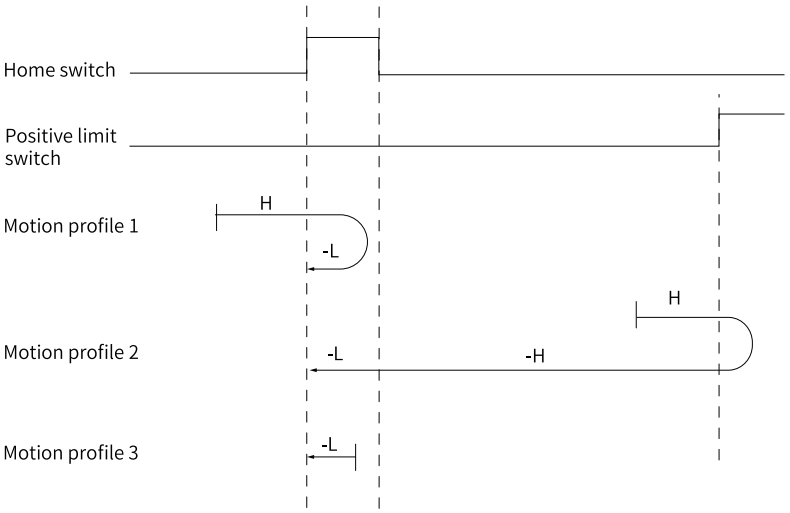


Figure 14-66 Motor running curve and speed in mode 23

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 24**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

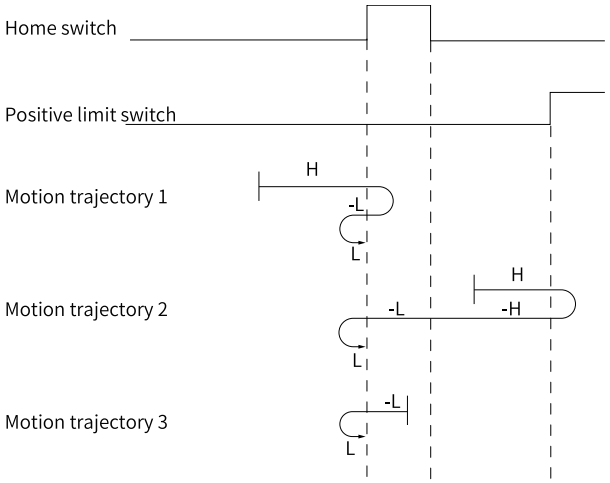


Figure 14-67 Motor running curve and speed in mode 24

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 25**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

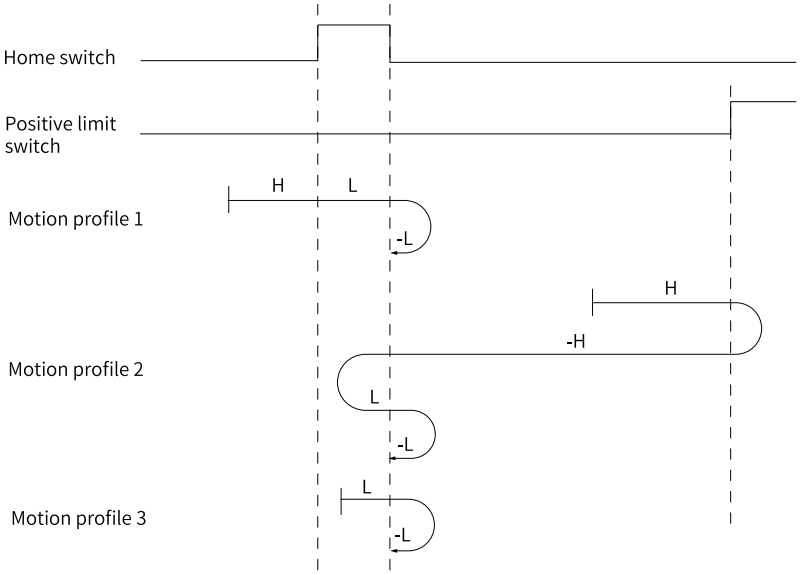


Figure 14-68 Motor running curve and speed in mode 25

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 26**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

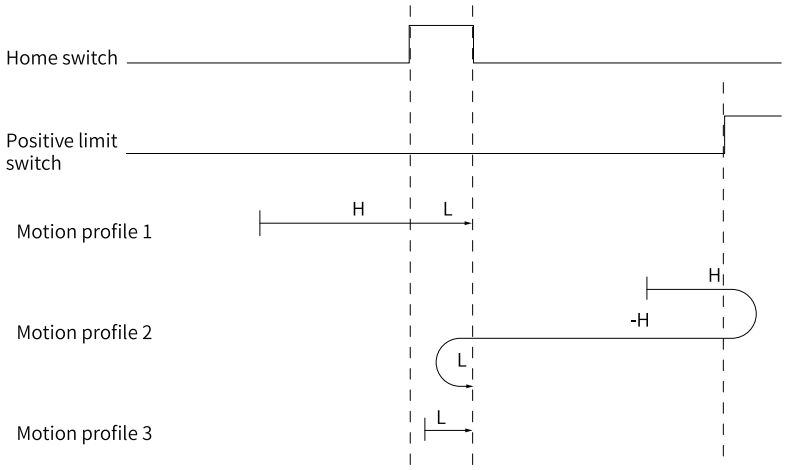


Figure 14-69 Motor running curve and speed in mode 26

- Motion profile 1: Deceleration point signal inactive at start, not hitting the positive limit switch.
- Motion profile 2: HW signal inactive at start, hitting the positive limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 27**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

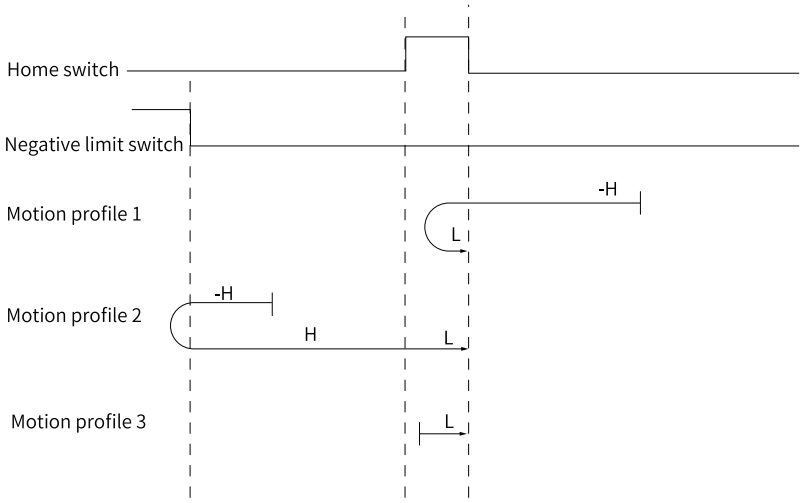


Figure 14-70 Motor running curve and speed in mode 27

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 28**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

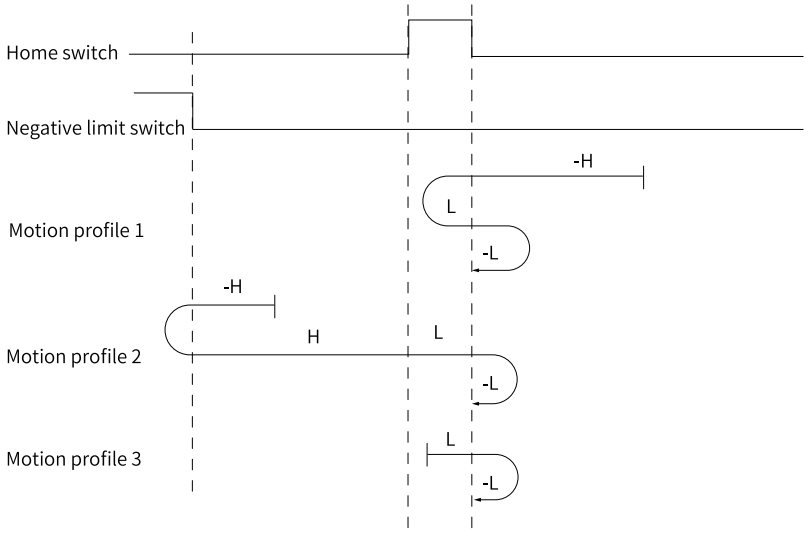


Figure 14-71 Motor running curve and speed in mode 28

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 29**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

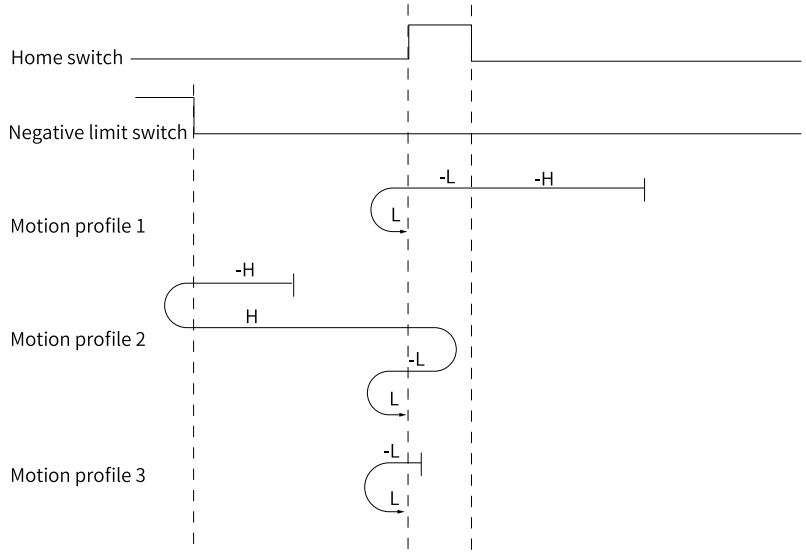


Figure 14-72 Motor running curve and speed in mode 29

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 30**

  Home: home switch (HW)

  Deceleration point: home switch (HW)

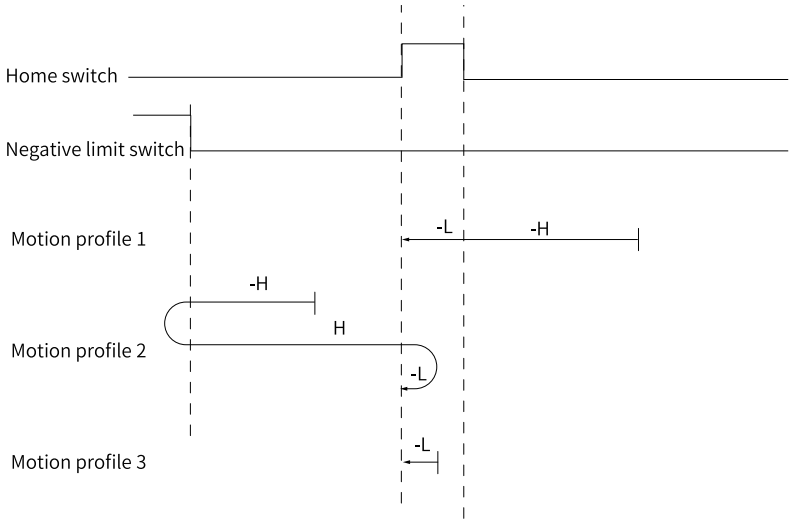


Figure 14-73 Motor running curve and speed in mode 30

- Motion profile 1: Deceleration point signal inactive at start, not hitting the reverse limit switch.
- Motion profile 2: HW signal inactive at start, hitting the reverse limit switch.
- Motion profile 3: Deceleration point signal active at start.

- **H25.22 = 31 and 32**
  Homing method is not defined.
- **H25.22 = 33/34**
  Home: Z signal

  Deceleration point: None

The homing method does not support homing at the limit switch.

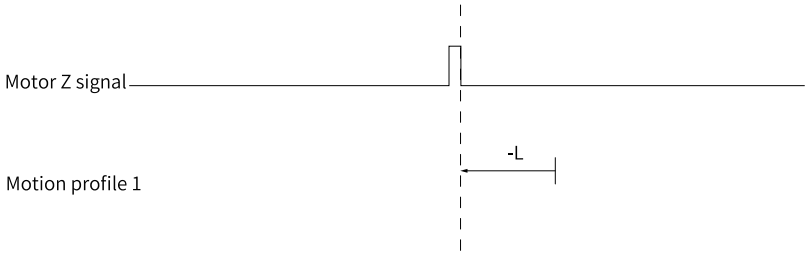


Figure 14-74 Motor running curve and speed in mode 33

- Motion profile 1: The motor runs in the reverse direction at low speed and stops at the first Z signal..

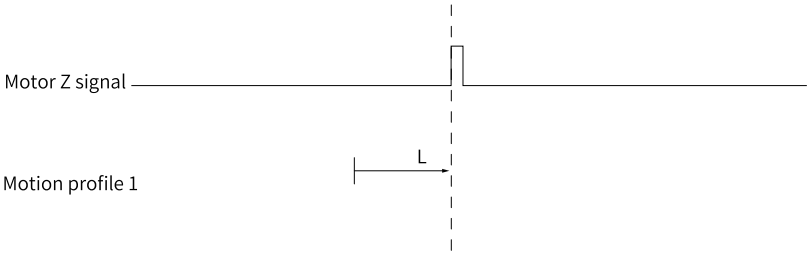


Figure 14-75 Motor running curve and speed in mode 34

- Motion profile 1: The motor runs in the forward direction at low speed and stops at the first Z signal..

- **H25.22 = 35**

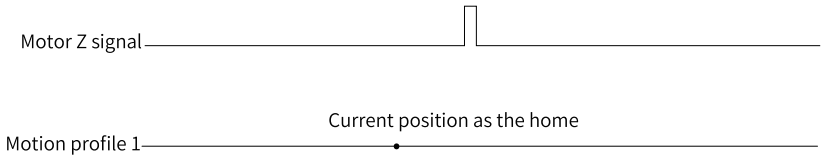


Figure 14-76 Motor running curve and speed in mode 35

The current position is the home. The motor starts homing after the homing signal is triggered.

- **H25.22 = -1**

The motor runs in the reverse direction at high speed first. If the status where the torque reaches the limit and the speed is near zero after the axis hits the mechanical limit persists, it indicates the axis has reached the mechanical limit position. In this case, the motor runs in the forward direction at low speed and stops after reaching the rising edge of the Z signal for the first time.

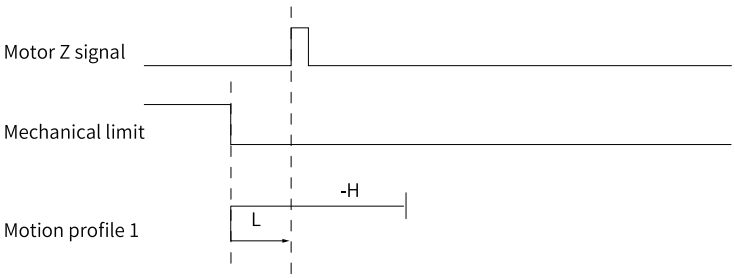


Figure 14-77 Motor running curve and speed in mode -1

- **H25.22 = -2**

The servo motor runs in the forward direction at a high speed first. If the torque reaches the limit and the speed is near zero when the motor hits the mechanical limit, and such status persists, it indicates the motor reaches the mechanical limit position. In this case, the motor runs in the reverse direction at a low speed and stops at the first Z signal after reaching the rising edge.

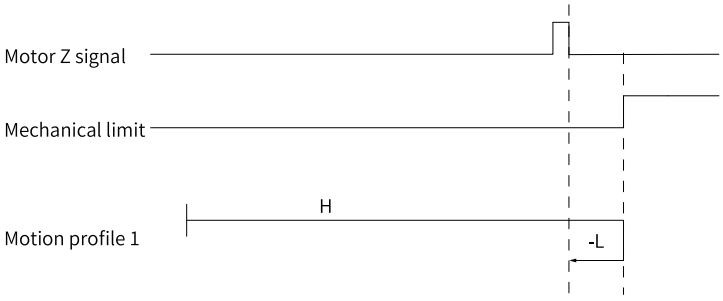


Figure 14-78 Motor running curve and speed in mode -2

14.4.4.4 Telegram 111 Sets Homing Position (ModPos = 5)

You can directly change the current position of the axis according to H05.40 (mechanical home offset and action upon active limit signal). The following table lists the steps of directly setting the reference point using Sina_Pos:

Table 14–6 Mode 5 triggering steps

Terminal Signal	Step 1: Prepare	Step 2: Set the reference point directly
ModPos	5	5
ExecuteMode	0	0 to 1

Table 14–7 Current position data after performing mode 5

H05.40 (mechanical home offset and action upon overtravel)	H05.36 (mechanical home offset)	H0b.07 current position data after triggering mode 5
0 (absolute homing)	Set the offset	H05.36
1 (relative homing)		Current position + H05.36

14.4.4.5 Telegram 111 Runs Blocks (ModPos = 6)

Overview

The program block function allows the axis to run step by step according to the steps set in advance in the servo drive. The working mode and target position are set in the servo drive operation block, and OverV scales the speed setpoint in the program block.

At the same time, the running conditions "CancelTransing" and "Intermediatestop" must be set to 1, and "JOG1" and "JOG2" must be set to 0; The start block number of the program block is set in the input parameter Position, and the value should be 0 to 15 (indicating the tasks of blocks 1–16), indicating that the program will be executed from the step of this number.

The running direction and working mode are determined by the settings in the block, regardless of the Positive and Negative parameters. It must be set to 0. After selecting a block, program running is triggered through the rising edge of ExecuteMode.

Table 14–8 Block function trigger steps

Terminal Signal	Step 1: Prepare	Step 2: Enable	Step 3: Start
ModPos	6	6	6
CancelTransing	1	1	1
IntermediateStop	1	1	1
Position	The start block number of the block to be run		
OverV	100	100	100
EnableAxis	0	0 to 1	1
ExecuteMode	0	0	0 to 1

Configuration Notes

You can configure program block parameters in the commissioning software through Graphical Configuration. You can also achieve that through parameters H27 and H28, as shown in *"Figure 14–79" on page 329* and *"Figure 14–80" on page 329* .

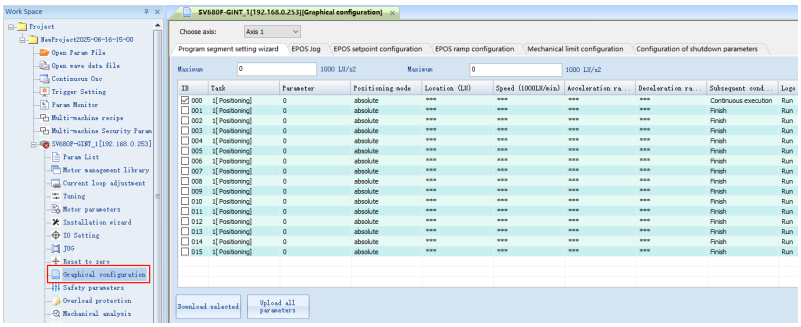


Figure 14-79 Configuration through Graphical Configuration

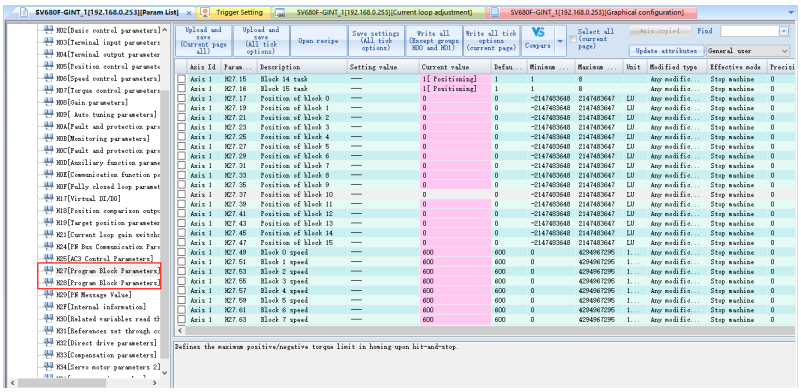
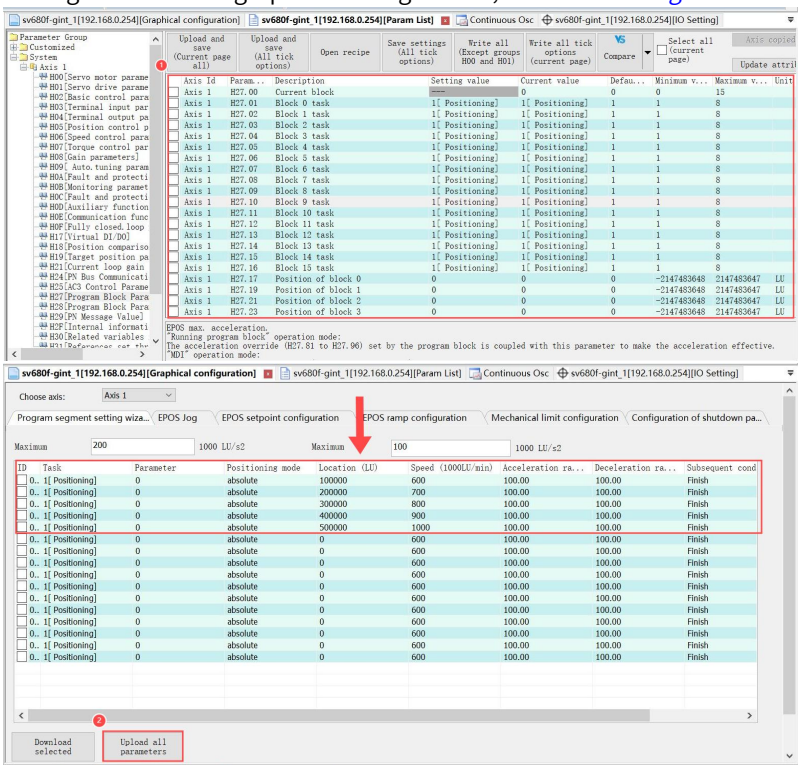


Figure 14-80 Configuration through H27 and H28

Relationship between H27 and H28 parameters in the parameter list and graphical configuration

The parameter list and the parameters of the graphical configuration are correlated.

1. After the parameter list is set, click Upload All in Graphical Configuration, that is, upload the parameter list setting values to the graphical configuration, as shown in *"Figure 14-81" on page 330* .



2. After the graphical settings are completed, click **Download selected** to download the graphical configuration parameters to the parameter list. You can view the parameters that have been changed to the graphical configuration in the parameter list, as shown in *"Figure 14–81" on page 330*
.

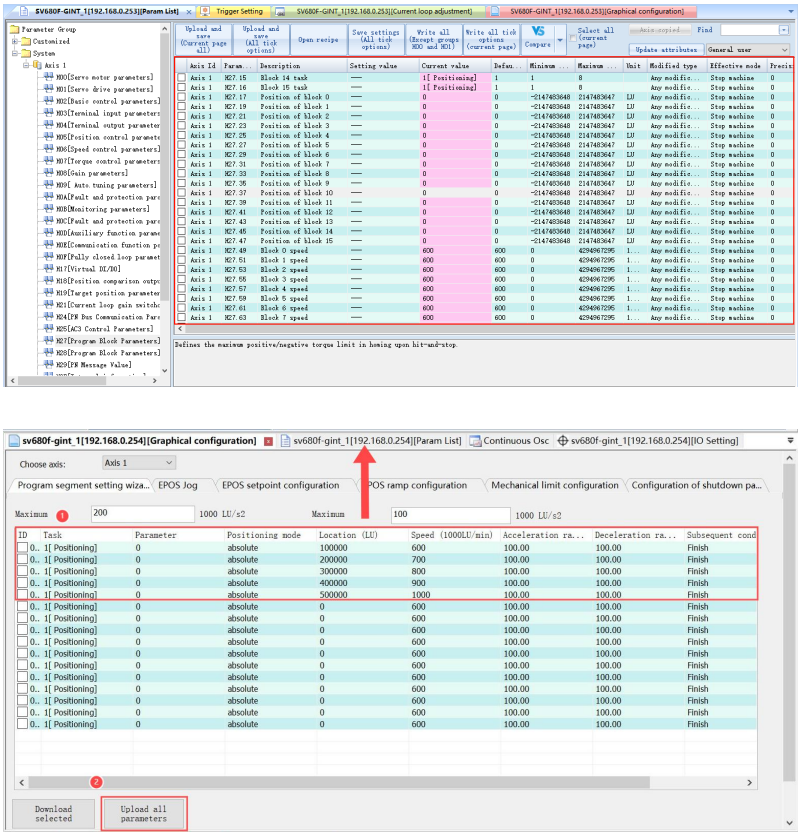


Figure 14-81 Graphical configuration taskbar

3. The parameters are set as follows:

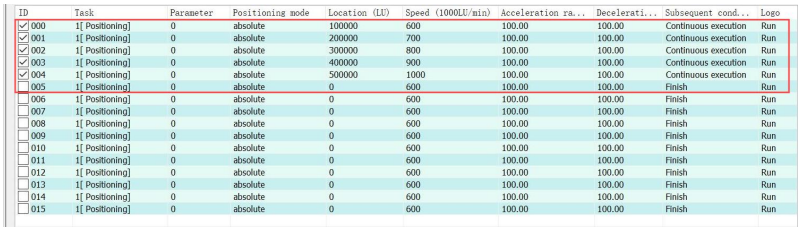


Figure 14-82 Parameter setting example

Parameter	Setting range:	Unit	Description	Remarks
H27.00	0 to 15	-	Current block	Set to the current block through the Position pin of the SinaPos_DB module. 0 to 15 is represented blocks 1 to 16 that can be set.
H27.01 to H27.16	1 to 8	-	Task of block x	See description of positioning, fixed stopper, positive cycle, negative cycle, waiting, turning to, setting O, and resetting O in *" Task setting" on page 333*.

Parameter	Setting range:	Unit	Description	Remarks
H27.17 to H27.47	-2147483648 to 2147483648	LU	Position of block x	The position value set by the block x task. Value 100000 means that the motor runs 10 revolutions. One turn corresponds to 10000LU. Note that in this case, H05.07 electronic gear ratio 1 (numerator) = 8388608, and H05.09 electronic gear ratio 2 (denominator) = 10000.
H27.49 to H27.79	0 to 4294967295	1000 LU/min	Block x speed	The speed value of the block x task. When the value is 1000, the gear ratio has the default value, and the speed override OverV given by the host controller is 100%, the actual speed is 100 rpm, and so forth.
H27.81 to H27.96	0.01 to 100	%	Block x acc. override	The acceleration override of the block x task.
H28.00 to H28.15	0.01 to 100	%	Block x dec. override	The deceleration override of the block x task.

Parameter	Setting range:	Unit	Description	Remarks
H28.16 to H28.30	0 to 65535	-	Task mode of block x	The corresponding block is relative positioning or absolute positioning, and the task ending mode, which is the subsequent condition in the graphical configuration. For details, see description of the subsequent conditions of the program block in " *Task setting*" *on page 333*. The setpoints correspond to the graphical configuration as follows: 0: Absolute positioning + end 1: Absolute positioning + end + hide mark 16: Absolute positioning + intermittent execution 17: Absolute positioning + intermittent execution + hide mark 32: Absolute positioning + continuous execution 33: Absolute positioning + continuous execution + hide mark 48: Absolute positioning + continue external execution 49: Absolute positioning + continue external execution + hide mark 64: Absolute positioning + continue external waiting 65: Absolute positioning + continue external waiting + hide mark 80: Absolute positioning + continue external alarm 81: Absolute positioning + continue external alarm + hide mark 256: Relative positioning + end 257: Relative positioning + end + hide mark 272: Relative positioning + intermittent execution 273: Relative positioning + intermittent execution + hide mark 288: Relative positioning + continuous execution 289: Relative positioning + continuous execution + hide mark 304: Relative positioning + continue external execution 305: Relative positioning + continue external execution + hide mark 320: Relative positioning + continue external waiting 321: Relative positioning + continue external waiting + hide mark 336: Relative positioning + continue external alarm 337: Relative positioning + continue external alarm + hide mark

Parameter	Setting range:	Unit	Description	Remarks
H28.32 to H28.62	0 to 214783647	Block x task parameter	Parameters need to be set for the block x task	• When the block is a fixed stopper, this parameter sets the motor clamping torque, the unit is 0.01 N·m; • When the block is a waiting command, this parameter sets the waiting time to execute the next task, in ms; • When the block is a jump, this parameter sets the block number of the block to be jumped to; • When the block is set output, this parameter is set to 1, 2 or 3, corresponding to three set outputs. • When the block is a reset output, this parameter is set to 1, 2 or 3, corresponding to three reset outputs.
H28.64	0 to 4294967295	LU	Fixed stopper monitoring window	The fluctuation range of the actual position value after the fixed stopper state is reached.
H28.66	0 to 4294967295	LU	Max. following error of fixed stopper	A comparison with the actual position difference, used to determine whether the fixed stop point has been reached.
H28.68	0 to 1	-	External trigger source	0: STW1.bit13 trigger 1: DI triggering

Task setting

Open the graphical configuration interface and select the task mode, as shown in *"Figure 14–83" on page 333*. The task modes are positioning, fixed stopper, forward cycle, reverse cycle, waiting, switching, setting O and resetting O.

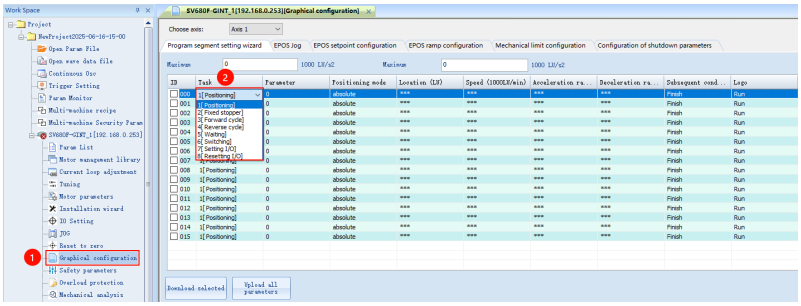


Figure 14-83 Task setting of the program block

The task modes are described as follows:

- Positioning: Positioning mode (relative or absolute positioning). The position setpoints are set in H27.17 to H27.47, unit: LU.
- Fixed stopper: The shaft runs to the stopper when the torque is reached. The percentage reference for calculating the torque limit of the fixed stopper is not H00.12 rated torque, but according to the following formula: Line back EMF coefficient × Rated current × 0.01653986, and this calculation result is taken as the rated torque (N·m), and the torque limit value (N·m) set by the user is divided by this result to calculate the percentage of torque limit to be effective. If the user setting is 1.5 N·m and the calculation result is 1.2 N·m, the torque limit takes effect at 125%. In the formula, in most cases, the rated current is the value of H00.11 and the line back EMF coefficient is the value of H00.21. However, when H00.98 ⩾ 0xA502, the value of H00.65 is used as the rated current, and when H00.98 ⩾ 0xA503, the value of H00.69 is used as the line back EMF coefficient.

Note

1. If it moves to the target position and has not reached the fixed stopper, the axis will report fault E550.8 (no fixed stopper).
2. If the actual position value fluctuates by more than H28.64 (fixed stopper monitoring window, unit: LU) after reaching the fixed stopper state, the fixed stopper state is exited and the fault E550.9 is reported (fixed stopper exceeds monitoring window Epos_ ZSW2.bit12 = 0, Epos_ZSW2.bit13 = 0).

- Forward cycle: Run in forward speed mode, accelerate to the corresponding speed of this block (H27.49 to H27.79) and run until the limit/stop command/program block is switched, unit: 1000 LU/min.
- Reverse cycle: Rotation in the reverse direction. Run in reverse speed mode, accelerate to the corresponding speed of this block (H27.49 to H27.79) and continue to run until soft and hard limit/stop command/program block is switched, unit: 1000 LU/min.
- Wait command: Sets the waiting time before executing the next task. The waiting time corresponding to this block is set in H28.32 to H28.62, and the unit is ms.
- Jump: Jump to the specified block task number set in this block (H28.32 to H28.62). If there is no program block with this number, an alarm E550.0 will be reported "The jump target in block x does not exist".
- Set O: Set OUTPUT1 and OUTPUT2 (POS_ZSW2.10 and POS_ZSW2.11)
  - If H28.32 to H28.62 are 1, OUTPUT1: POS_ZSW2.10 = 1 is output.
  - If H28.32 to H28.62 are 2, OUTPUT2: POS_ZSW2.11 = 1 is output.
  - If H28.32 to H28.62 are 3, OUTPUT1: POS_ZSW2.10 = 1 and OUTPUT2: POS_ZSW2.11 = 1 are output.
- Reset O: Reset OUTPUT1 and OUTPUT2 (POS_ZSW2.10 and POS_ZSW2.11).
  - If H28.32 to H28.62 are 1, OUTPUT1: POS_ZSW2.10 = 0 is output.
  - If H28.32 to H28.62 are 2, OUTPUT2: POS_ZSW2.11 = 0 is output.
  - If H28.32 to H28.62 are 3, OUTPUT1: POS_ZSW2.10 = 0 and OUTPUT2: POS_ZSW2.11 = 0 are output.

Block task ending method:

You can set the task ending mode in subsequent conditions in the program block, as shown in *"Figure 14-84 Subsequent condition of the program block" on page 334*.

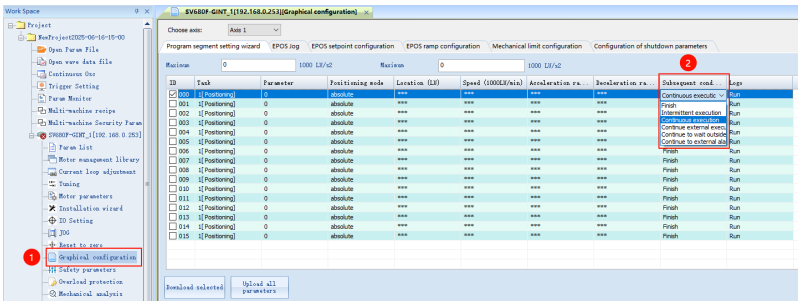


Figure 14-84 Subsequent condition of the program block

- Finish: Operation stops after the program block finishes. Can be reactivated through the rising edge of STW1.bit6.

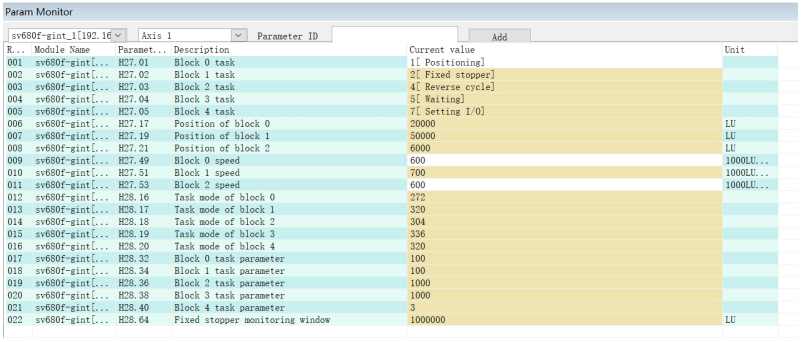
- Intermittent execution: The axis stops after reaching the target position before carrying out the next task.
- Continuous execution: The next task is executed immediately after the current task. If the running direction needs to be changed, the next task is executed after the stop state is reached.
- Continue external execution: Basically the same as "continuous execution", but it is possible to switch directly from the current task to the next task through the rising edge of the external signal (STW1.bit13), and if the "external block switch" is not triggered, the block is immediately switched on the braking point.
- Continue external waiting: It is basically the same as "continue external execution", but if there is no external signal trigger after reaching the target position, it will remain at the target position and wait for the external signal. Only an external signal will trigger the next task o be executed (the signal source is determined by H28.68, when the signal is 1, the next block will be executed).
- Continue external alarm: Similar to "continue external waiting". However, if the "external block switching" (STW1.bit13) has not been triggered before the drive stops, the alarm A550.2 "No external switching is requested in block X" is output, which can be converted into a fault with stop response, so as to interrupt the execution of the block when no control signal is given. At this time, if the external signal is triggered, the next task will continue and the alarm signal will disappear.

Note

If the function setting mark of a program block is hidden, the program step will be skipped and the task will not be executed. If the hidden function has been activated in the selected program step, alarm E550.3 will be triggered.

Case

1. Set H05.07 = 67108864, H05.09 = 10000, and set the relevant parameters of the block as shown in Figure 1. Set a total of 5 tasks, namely, positioning, fixed stopper, negative cycle, waiting, setting O, and so on, and select different ending modes;



R...	Module Name	Paramet...	Description	Current value	Unit
001	sv680f-gint[...	H27.01	Block 0 task	1[Positioning]	
002	sv680f-gint[...	H27.02	Block 1 task	2[Fixed stopper]	
003	sv680f-gint[...	H27.03	Block 2 task	4[Reverse cycle]	
004	sv680f-gint[...	H27.04	Block 3 task	5[Waiting]	
005	sv680f-gint[...	H27.05	Block 4 task	7[Setting I/O]	
006	sv680f-gint[...	H27.17	Position of block 0	20000	LU
007	sv680f-gint[...	H27.19	Position of block 1	50000	LU
008	sv680f-gint[...	H27.21	Position of block 2	6000	LU
009	sv680f-gint[...	H27.49	Block 0 speed	600	1000LU...
010	sv680f-gint[...	H27.51	Block 1 speed	700	1000LU...
011	sv680f-gint[...	H27.53	Block 2 speed	600	1000LU...
012	sv680f-gint[...	H28.16	Task mode of block 0	272	
013	sv680f-gint[...	H28.17	Task mode of block 1	320	
014	sv680f-gint[...	H28.18	Task mode of block 2	304	
015	sv680f-gint[...	H28.19	Task mode of block 3	336	
016	sv680f-gint[...	H28.20	Task mode of block 4	320	
017	sv680f-gint[...	H28.32	Block 0 task parameter	100	
018	sv680f-gint[...	H28.34	Block 1 task parameter	100	
019	sv680f-gint[...	H28.36	Block 2 task parameter	1000	
020	sv680f-gint[...	H28.38	Block 3 task parameter	1000	
021	sv680f-gint[...	H28.40	Block 4 task parameter	3	
022	sv680f-gint[...	H28.64	Fixed stopper monitoring window	1000000	LU

Figure 14-85 Drive block parameter setting

2. Set the number of start blocks and activate them through the Position pin of the SINA_POS function block, as shown in *"Figure 14–86 SINA_POS function block" on page 336*.

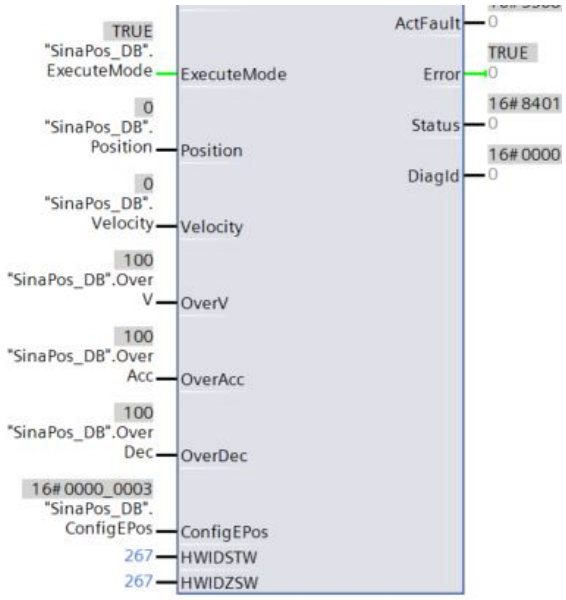


Figure 14-86 SINA_POS function block

3. In block 0 positioning task, set the rotating speed to 50 rpm, target position to 20000 LU, and running waveform is as shown in *"Figure 14–87 Positioning waveform" on page 336*



Figure 14-87 Positioning waveform

4. After the positioning task is finished, since the ending condition is set to intermittent execution, the speed will slow down to 0rpm and then re-accelerate to the target speed of the next task; The fixed stopper task is mainly used for extrusion and screwing and requires relevant signal judgment, as shown in *"Figure 14–88 Fixed stopper waveform" on page 337*. When the drive runs in position mode, the torque limit of the fixed stop point is 100 (unit 0.01 N·m), which is 1 ÷ (33.87 × 2.4 × 0.01653986) × 100%) ≈ 74. 4%, so the drive output will be limited to 74.4% and when the position follow-up deviation is equal to the value set by H28.66, the position status word 2 outputs the fixed stopper completion signal.

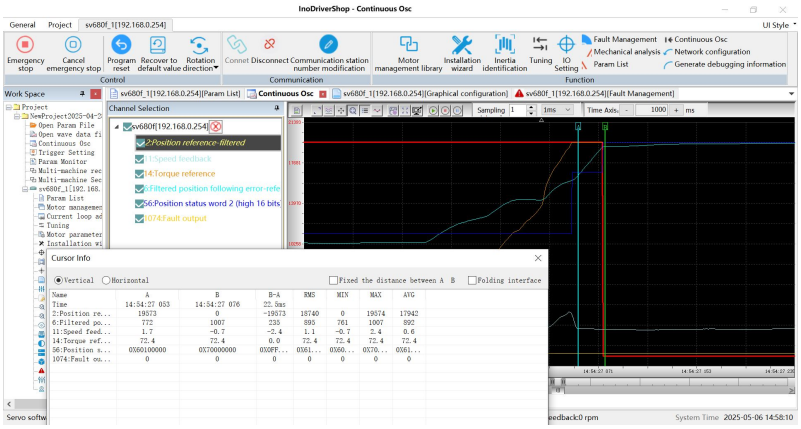


Figure 14-88 Fixed stopper waveform

5. After the fixed stopper completes signal output, the drive will maintain the fixed stopper task with a torque limit of 74.4%. After activating the control word bit13, it enters the next task negative cycle, and the speed = (600 × 1000 × (67108864 ÷ 10000)) ÷ 67108864 = 60 rpm, so the negative cycle is-60 rpm. See *“Figure 14–89 Negative cycle waveform” on page 337*.

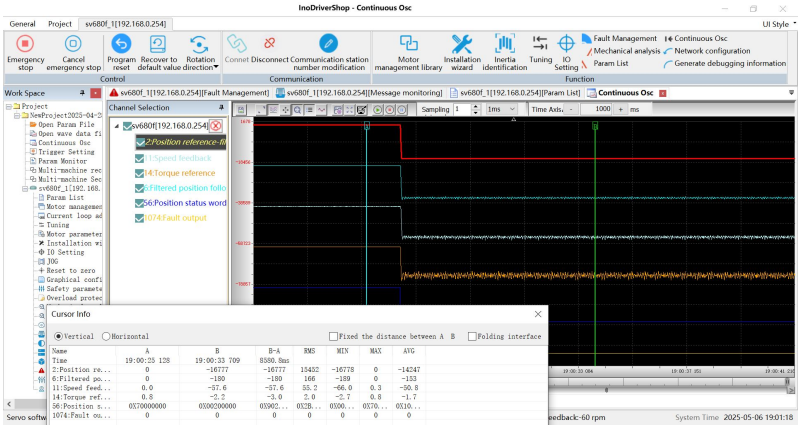


Figure 14-89 Negative cycle waveform

6. The end condition of the negative cycle is "continue external execution", so only when bit13 of control word 1 is set to 1 from 0, the block task will switch to the next block, as shown in *“Figure 14–90 Continue external execution” on page 337*.

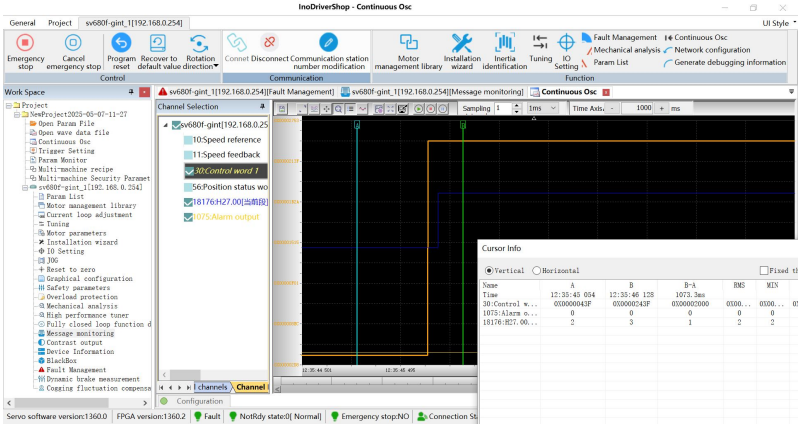


Figure 14-90 Continue external execution

7. When the block task switches to the third task and waits, the task parameter setting 1000 represents 1000 ms, and the end condition is "wait for an external alarm". According to the waveform, the drive alarm will be output after waiting for 1000 ms, and the panel reports an A550.2 alarm, as shown in *"Figure 14–91 Waiting task" on page 338*.

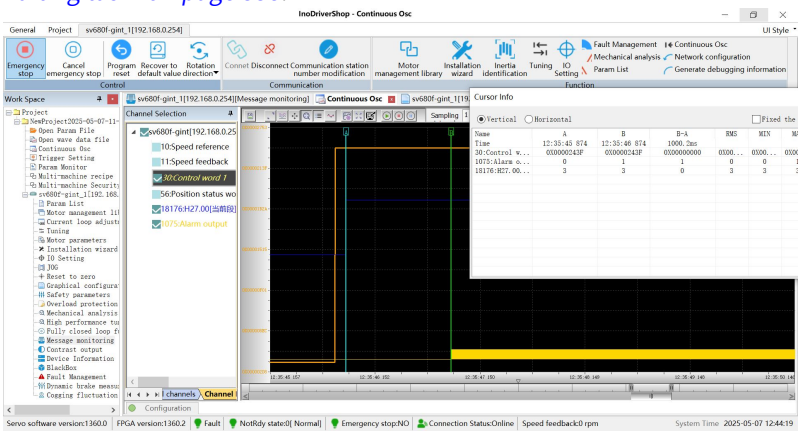


Figure 14-91 Waiting task

8. The end condition of the waiting task is "continue external alarm". In this case, after bit13 of control word 1 is set to 1 from 0, the servo alarm is eliminated and the block task is switched to the fourth block. Since the task parameter of the block 4 task is set to 3, bit10 and bit11 of position status word 2 are set at this time, as shown in

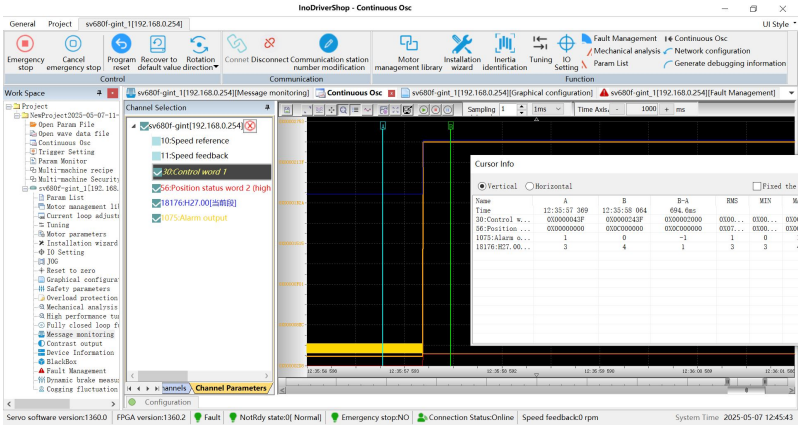


Figure 14-92 Setting task

Conclusion

Number of motor revolutions of relative/absolute positioning = (H27.17 to H27.47 × Gear ratio) ÷ Encoder resolution

Motor speed = (H27.49 to H27.79 × 1000 × Gear ratio) ÷ Encoder resolution

Fixed stopper torque limit = (H28.32 to H28.62 × 0.01) ÷ (H00.21 × H00.11 × 0.01653986) × 100% (H00.98 < 0xA502)

Fixed stopper torque limit = (H28.32 to H28.62 × 0.01) ÷ (H00.21 × H00.65 × 0.01653986) × 100% (H00.98 = 0xA502)

Fixed stopper torque limit = (H28.32 to H28.62 × 0.01) ÷ (H00.69 × H00.65 × 0.01653986) × 100% (H00.98 ⩾ 0xA503)

Block function alarm fault description

Error code	Fault Description
E550.0	Block No. exceeds maximum limit
E550.1	Position mode reference point error
A550.2	Position control external alarm
E550.3	Task mode error
A550.6	Reached the fixed stop point but not the tightening torque
E550.7	Wrong block type
E550.8	Fixed Stop point not reached (end position reached in block with Fixed Stop task, but no fixed stop point detected)
E550.9	Fixed stop point is outside the monitoring window (When the fixed stop point is reached, the axis moves outside the monitoring window)
E551.1	Block did not end the task
E551.3	Invalid block

14.4.4.6 Telegram 111 Speed Jog (ModPos = 7)

ModePos = 7 is the speed jog function. The jog speed is set in the servo parameters H25.14 and H25.16. The jog direction is determined by the positive or negative sign of the jog speed, irrelevant to Positive and Negative.

Table 14–9 Speed jog steps

Terminal Signal	Step 1: Enable	Step 2: Reverse jog	Step 2: Forward start
ModPos	7	7	7
OverV	100	100	100
EnableAxis	0 to 1	1	1
JOG1	0	0 to 1	0
JOG2	0	0	0 to 1
Jog speed is set in servo parameters H25.14 and H25.16			

Formula

JOG1 speed (rpm) = (H25.14 × 1000 × OverV% × (H05.07 ÷ H05.09)) ÷ Encoder resolution

JOG1 acceleration time (seconds) = (H25.14 × OverV%) ÷ (60 × H25.02)

JOG1 deceleration time (seconds) = (H25.14 × OverV%) ÷ (60 × H25.04)

JOG2 speed (rpm) = (H25.16 × 1000 × OverV% × (H05.07 ÷ H05.09)) ÷ Encoder resolution

JOG2 acceleration time (seconds) = (H25.16 × OverV%) ÷ (60 × H25.02)

JOG2 deceleration time (seconds) = (H25.16 × OverV%) ÷ (60 × H25.04)

The jog speed can take effect in real time by modifying OverV (1% to 199%) or by modifying H25.14 and H25.16. The encoder resolution is 67108864pls/r.

Case

Calculate the conversion and acceleration and deceleration time of telegram 111 JOG1 (reverse jog) and JOG2 (forward jog) speeds, drive parameter H00.00 = 14102.

1. Use the default electronic gear ratio as H05.07 = 67108864, H05.09 = 10000, as shown in

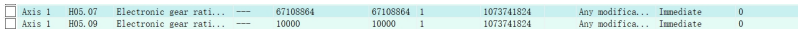


Figure 14-93 Electronic gear ratio conversion

2. Set H25.02 = 2, H25.04 = 5, H25.14 =-600, H06.19 = 1. After JOG1 reverse jog is triggered, the actual speed of the motor is-60 rpm, and the acceleration time is 5s. If JOG1 is canceled, the zero speed signal is output after the motor speed reaches the threshold set by H06.19, and the deceleration time is 2s.

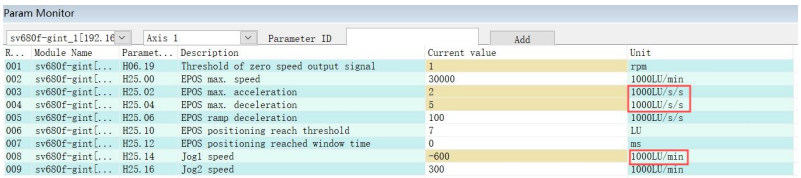


Figure 14-94 JOG1 reverse jog acceleration and deceleration time and speed setting

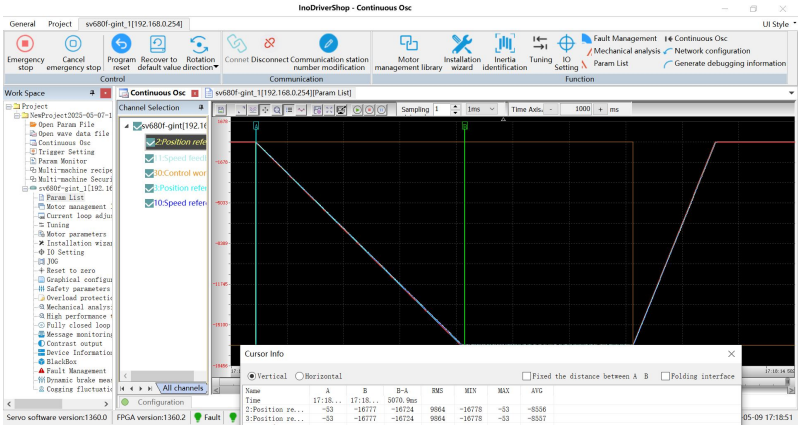


Figure 14-95 JOG1 reverse jog acceleration time 5s

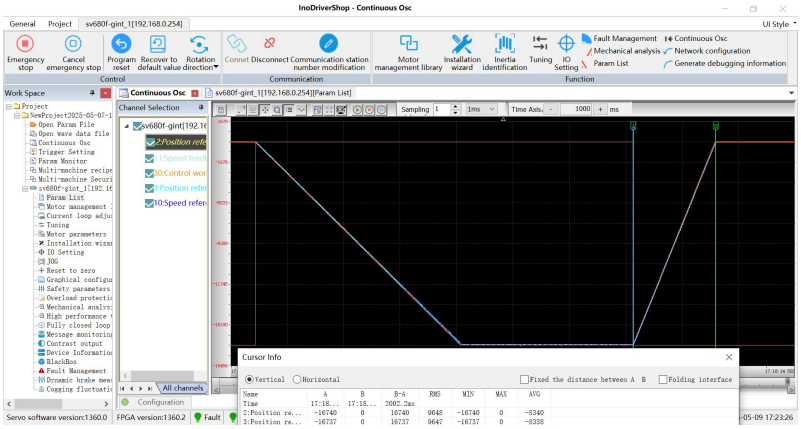


Figure 14-96 JOG1 reverse jog deceleration time 2s

3. When H05.09 = 1000, the actual speed of the motor is the value of H25.14, that is, -600 rpm, as shown in the figure below.

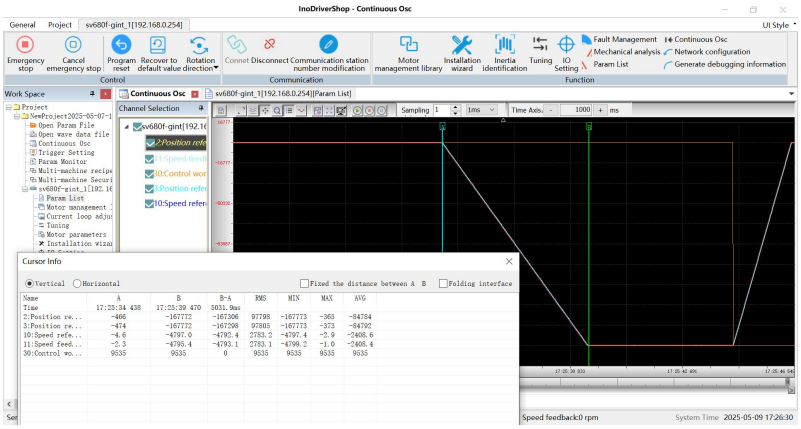


Figure 14-97 H05.09 has been modified

14.4.4.7 Telegram 111 Incremental Jog (ModPos = 8)

ModPos = 8 is the jog increment mode, the jog speed is set in the drive, the speed override OverV scales the setpoint of the jog speed, the running direction is determined by the positive or negative sign of the jog speed, and the running conditions "CancelTransing" and "IntermediateStop" are independent of the jog operation mode. By default, JOG1 is reverse incremental jog and JOG2 is forward incremental jog.

Table 14–10 Incremental jog steps

Terminal Signal	Step 1: Enable	Step 2: Reverse increment jog	Step 2: Forward increment start
ModPos	8	8	8
OverV	100	100	100
EnableAxis	0 to 1	1	1
JOG1	0	0 to 1	0
JOG2	0	0	0 to 1
Jog speed and jog increment are set in H25.14 to H25.20			

Formula

JOG1 position increment = (H25.18 × Gear ratio)/Resolution

JOG1 speed = H25.14 × OverV% unit (1000 LU/min)

JOG1 acceleration time (seconds) = (H25.14 × OverV%) ÷ (60 × H25.02)

JOG1 deceleration time (seconds) = (H25.14 × OverV%) ÷ (60 × H25.04)

JOG2 position increment = (H25.20 × Gear ratio)/Resolution

JOG2 speed = H25.16 × OverV% unit (1000 LU/min)

JOG2 acceleration time (seconds) = (H25.16 × OverV%) ÷ (60 × H25.02)

JOG2 deceleration time (seconds) = (H25.16 × OverV%) ÷ (60 × H25.04)

Case

1. Set H25.02 = 60, H25.04 = 40, H25.14 =-5000, H25.16 = 8000, H25.18 = 200000, H25.20 = 400000, H05.07 = 67108864, H05.09 = 10000, and set OverV = 60%, as shown in *“Figure 14–98 Position increment parameter setting” on page 342*.

☐	Axis 1	H25.00	EPOS max. speed	---	30000	30000	0	40000000	10...	Any modifica...	Immediate
☑	Axis 1	H25.02	EPOS max. acceleration	60	60	100	1	2000000	10...	Any modifica...	Immediate
☑	Axis 1	H25.04	EPOS max. deceleration	40	40	100	1	2000000	10...	Any modifica...	Immediate
☑	Axis 1	H25.06	EPOS ramp deceleration	20	20	100	1	2000000	10...	Any modifica...	Immediate
☐	Axis 1	H25.10	EPOS positioning rea...	---	7	7	0	2147483647	LU	Any modifica...	Immediate
☐	Axis 1	H25.12	EPOS positioning rea...	---	0	0	0	2147483647	ms	Any modifica...	Immediate
☑	Axis 1	H25.14	Jog1 speed	-5000	-5000	-300	-40000000	40000000	10...	Any modifica...	Immediate
☑	Axis 1	H25.16	Jog2 speed	8000	8000	300	-40000000	40000000	10...	Any modifica...	Immediate
☑	Axis 1	H25.18	Jog1 position increment	200000	200000	1000	0	2147483647	LU	Any modifica...	Immediate
☑	Axis 1	H25.20	Jog2 position increment	400000	400000	1000	0	2147483647	LU	Any modifica...	Immediate

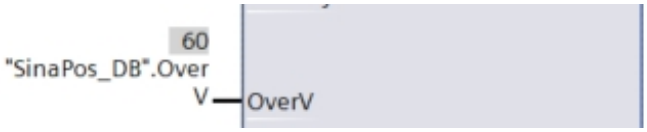


Figure 14-98 Position increment parameter setting

2. The theoretical JOG1 speed is -300 rpm, the JOG1 motor rotates 20 turns, the acceleration time is 0.83 s, and the deceleration time is 1.25 s. The actual test results are as shown in *“Figure 14–99 JOG1 acceleration/deceleration time” on page 343*.

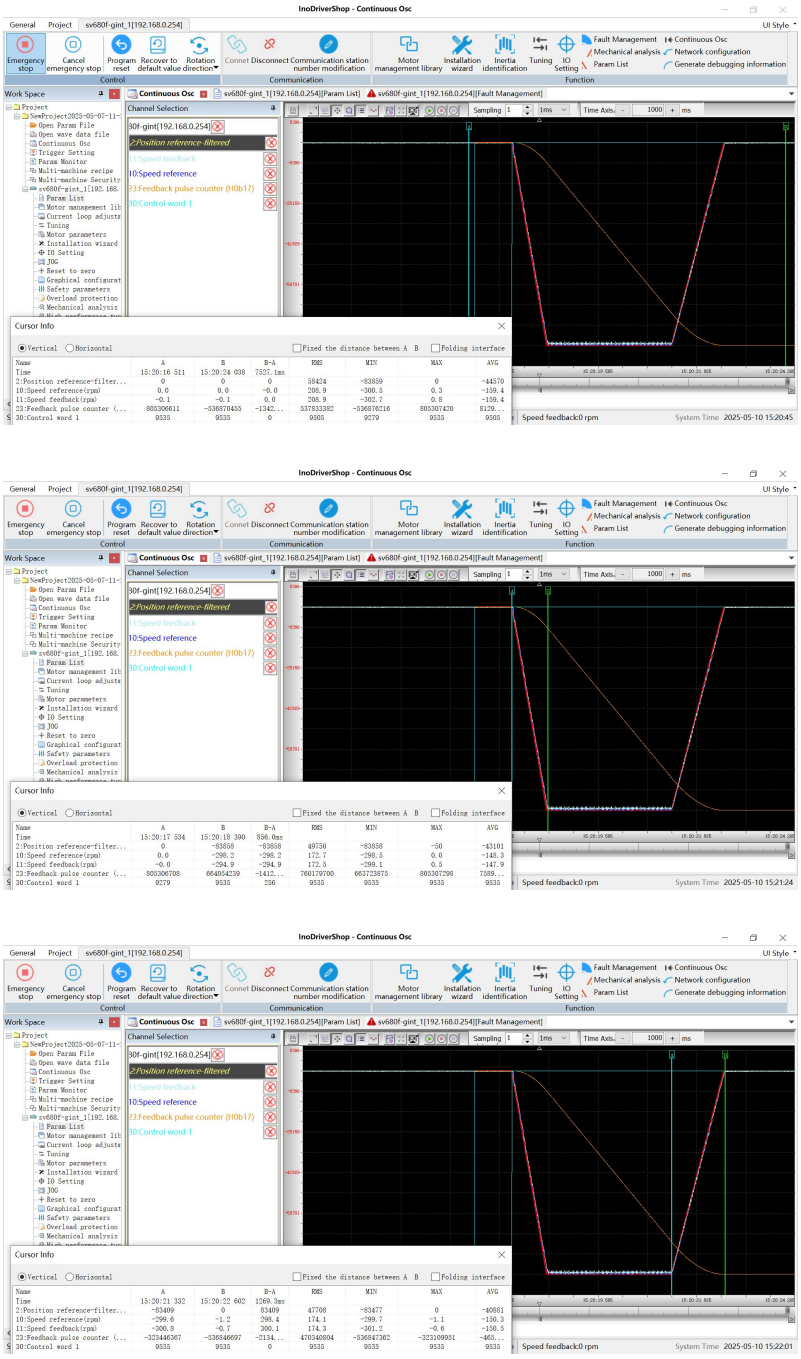


Figure 14-99 JOG1 acceleration/deceleration time

3. The theoretical JOG2 speed is 480 rpm, the JOG2 motor rotates 40 turns, the acceleration time is 1.3 s, and the deceleration time is 2 s. The actual test results are as shown in *"Figure 14–100 JOG2 acceleration/deceleration time" on page 344*.

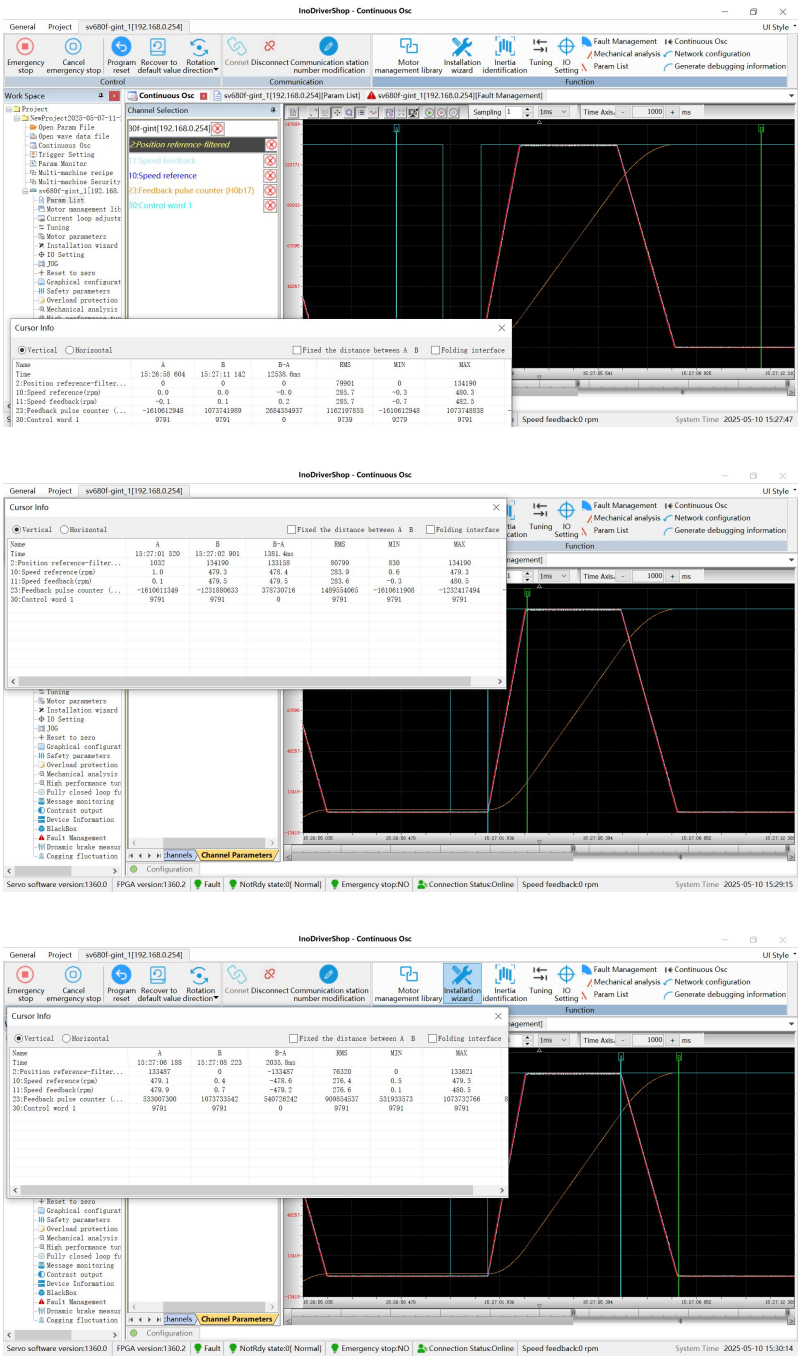


Figure 14-100 JOG2 acceleration/deceleration time

14.4.5 Telegram 111 User-defined Area

Additional torque limit and real-time torque reading function

After the torque limit function of telegram 111 is turned on, if the torque of the motor reaches the limit value, no position reference should be given when the motor is no longer running, otherwise the motor will report EB00.0 (large position deviation). The position deviation threshold is set by H0A.10, with a default of 3.2 turns.

1. Set H24.38, H24.39 = 1 to set the additional torque, as shown in *"Figure 14–101 Enabling torque limit" on page 345*.

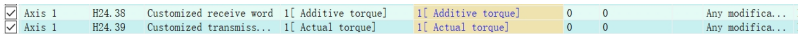
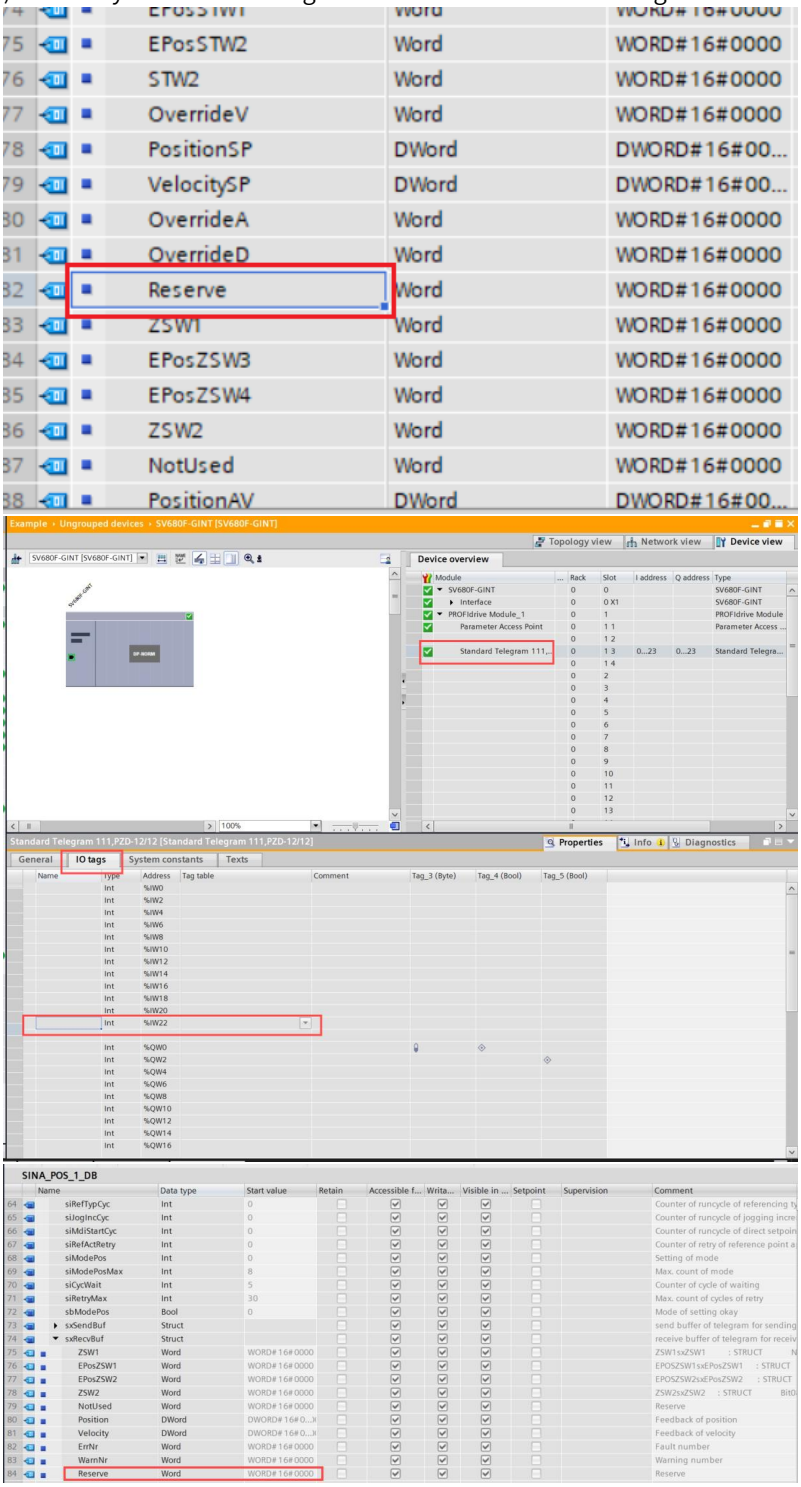
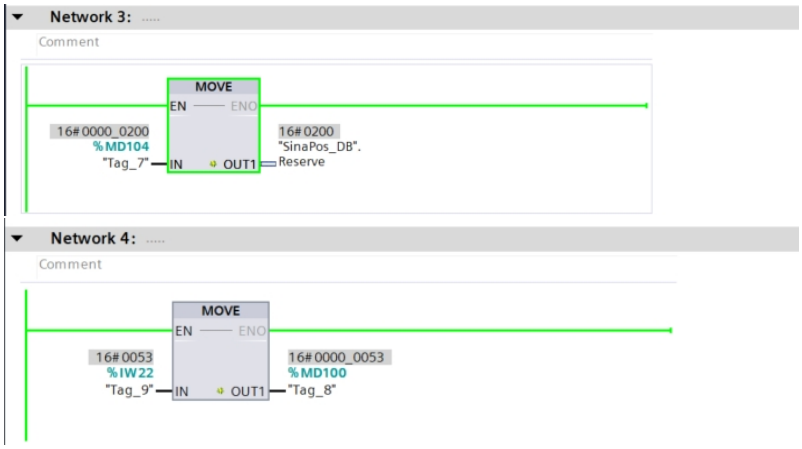


Figure 14-101 Enabling torque limit

2. The torque is set by Reserve of the SINA_POS data block, the torque of FB284 (the library file to be installed) is read by SxRecvBuf.Reserve, and the torque of FB300 (a function block included in Portal V16 and above) is read by IW22 of the telegram channel as shown in the figure below.



3. Write the following program to limit and read the torque. The additional torque in the custom receiving word acts as torque limit. As shown below.



Note

The torque limit values 0 to 0x4000 linearly correspond to 0 to 3 times of the rated torque of the motor. When the torque limit is set to 0, the motor outputs no torque.

Case

1. When there is no torque limit, when the motor rotates at -30 rpm JOG speed, the software acquired current feedback is 9.9%, as shown in *"Figure 14–102" on page 346* .

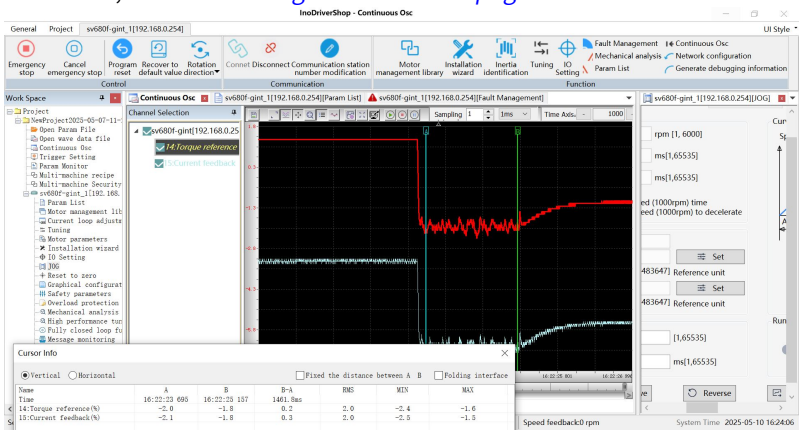


Figure 14-102 30 rpm current feedback

2. After torque reading, the display value is 16#FF6B, as shown in *"Figure 14–103" on page 346* .



Figure 14-103 Torque reading

3. Because 16#FE13 = 10#-493 and 16#4000 = 10#16384, current feedback (%) = (4.46 ÷ 1.4) × (-493 ÷ 16384) = -2.73%, which is consistent with the value read by the software. Real-time torque (N · m) = Current feedback (%) × H00.12 (rated torque).

Conclusion

Real-time torque reading (N · m) = Current feedback (%) × H00.12 (rated torque)

FB284: Real-time current feedback reading (%) = H00.13 ÷ H00.12 × "SinaPos_DB". Reserve in decimal ÷ 16384 × 100%

FB300: Real-time current feedback reading (%) = H00.13 ÷ H00.12 × IW address area value in decimal ÷ 16384 × 100%

If the torque limit is 50%, then (0.5 × 16384) ÷ (4.46 ÷ 1.4) = 2571D = A0BH, so if you write 16#A0B to SinaPos_DB.Reserve, the torque limit of the motor is 50%.

User-defined area reading DI status

Set H24.39 = 3 (user-defined transfer DI status), and the PLC side judges the corresponding DI status by reading "SinaPos_DB".Reserve.

sv680f-gint_1[192.16 | Axis 1 | Parameter ID | Add

Row Index	Module Name	Parameter ID	Description	Current value	Unit
001	sv680f-gint[Axis...	H03.02	DI1 function	14[Forward overtravel switch]	
002	sv680f-gint[Axis...	H03.03	DI1 logic	0[Normally open]	
003	sv680f-gint[Axis...	H03.04	DI2 function	15[Reverse overtravel switch]	
004	sv680f-gint[Axis...	H03.05	DI2 logic	0[Normally open]	
005	sv680f-gint[Axis...	H03.06	DI3 function	31[Home switch]	
006	sv680f-gint[Axis...	H03.07	DI3 logic	0[Normally open]	
007	sv680f-gint[Axis...	H03.08	DI4 function	34[Emergency stop]	
008	sv680f-gint[Axis...	H03.09	DI4 logic	0[Normally open]	
009	sv680f-gint[Axis...	H03.10	DI5 function	38[Touch probe 1]	
010	sv680f-gint[Axis...	H03.11	DI5 logic	0[Normally open]	
011	sv680f-gint[Axis...	H24.39	Customized transm...	3[DI state]	

Figure 14-104 DI terminal function settings

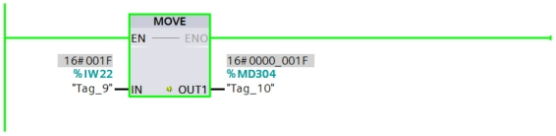


Figure 14-105 DI terminal function read

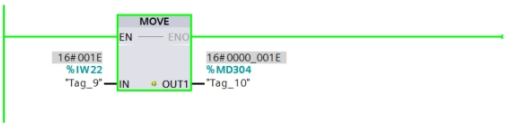


Figure 14-106 DI1 positive limit active

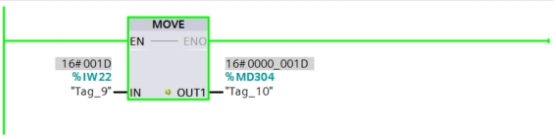


Figure 14-107 DI2 negative limit active

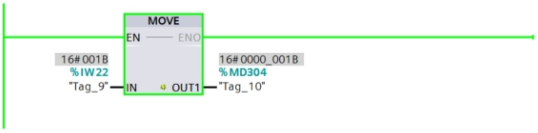


Figure 14-108 DI3 home signal active

User-defined area forced DO

1. Set H24.38 = 2 (Forced DO) and H0d.17 will automatically change to 2 (DO is forcibly enabled, DI is not). Then set the DO functions that need to be forced to undefined.

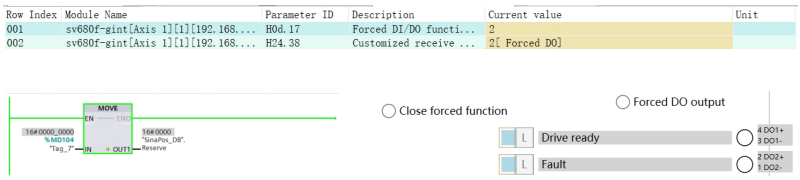


Figure 14-109 Force DO function settings

2. Assigning 16#1 to the user-defined area will force DO1 output.



Figure 14-110 Forced DO1

3. Assigning 16#2 to the user-defined area will force DO2 output.



Figure 14-111 Forced DO2

4. If you need not the forced DO function, you have to manually set H24.38 = 0 and H0D.17 = 0.

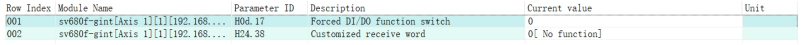


Figure 14-112 Cancel the Forced DO function

14.4.6 Telegram 111 Works with Inovance Telegram 850

Telegram 111 works with Inovance telegram 850 to clear position deviation

This function is mainly used for continuous extrusion of a workpiece in position mode. In this case, the position deviation needs to be cleared, otherwise the motor may have an alarm of excessive position deviation or the motor may run rapidly. The following text describes how to use the S7-1500PLC and telegrams 111 +850 to clear the position deviation in real time.

1. First, import telegram 111 and Inovance telegram 850 into the device view.

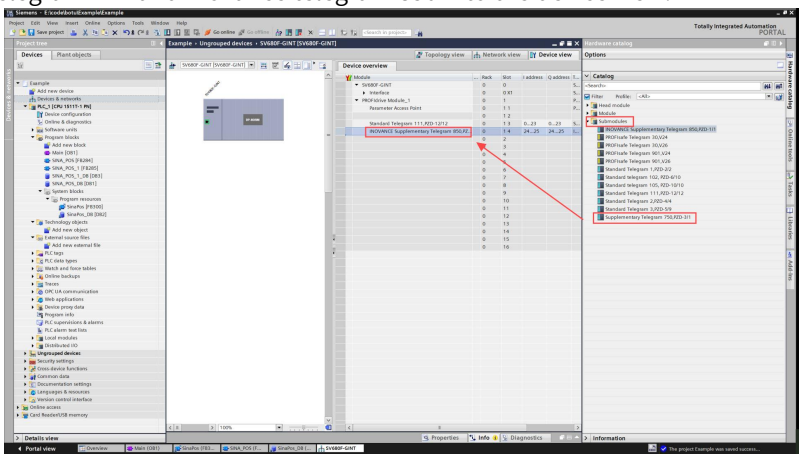


Figure 14-113 Importing Inovance telegram 850

2. Set the following servo parameters: H05.16 = 2, H17.90 = 1, H24.36 = 1, H17.00 = 35.

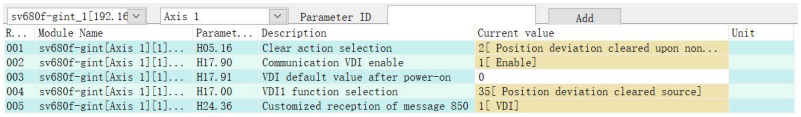


Figure 14-114 Setting servo parameters

3. Interpret telegram 850: QW24 corresponds to H31.00.



Figure 14-115 Inovance telegram 850 configuration

4. Let the motor run at 30 rpm, and then assign 1 to QW114 (clear position deviation function) and clear the position deviation. Since the waveform channel cannot acquire VDI, this feature is demonstrated using physical DI.

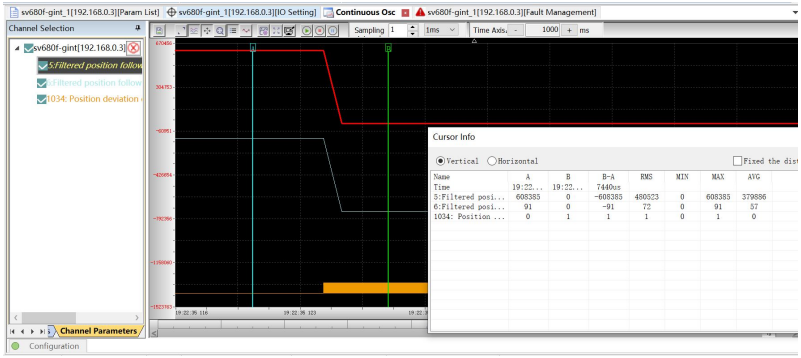


Figure 14-116 Position deviation cleared

Telegram 111 works with Inovance telegram 850 for forced DO function

1. After configuring telegram 850 in the configuration, set H04.22 = 3 and H24.36 = 2.

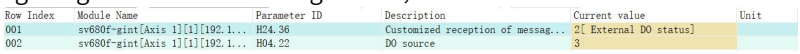


Figure 14-117 Related Parameter Settings

2. Interpret telegram 850: QW24 corresponds to H31.00.

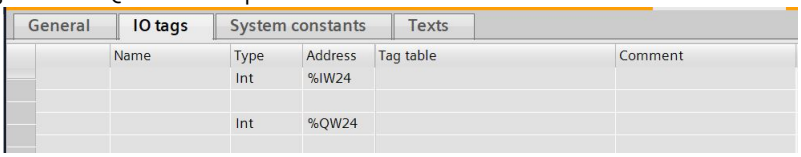


Figure 14-118 Inovance telegram 850 configuration

3. At this time, assigning a value to the QW24 address can achieve forced brake function. Assigning 1 will enable forced DO1 output.



Figure 14-119 Forced DO1 output

14.5 AC4 Mode

14.5.1 Overview

Axis technology objects are configured in the PLC. The drive uses standard telegrams 3, 102 or 105 for control through PLC Open standard program blocks such as MC_Power and MC_MoveAbsolute. Below is a configuration example of S7-1500PLC telegram 3.

14.5.2 Configuration Notes

1. Configure SV680F-INT and add telegram 3.

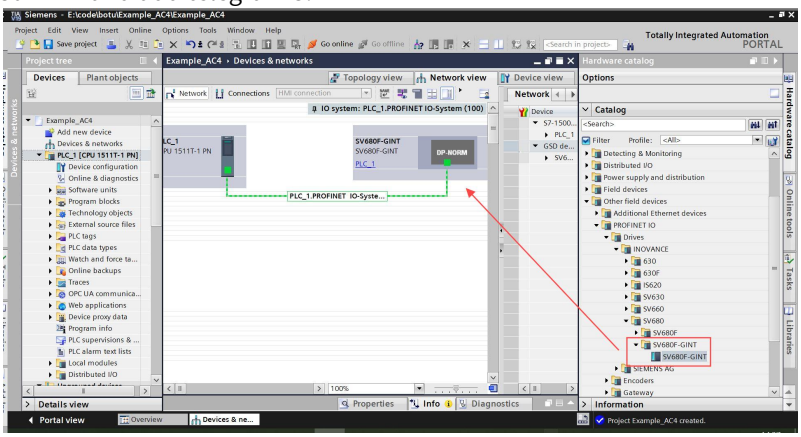


Figure 14-120 Configuring SV680F-INT

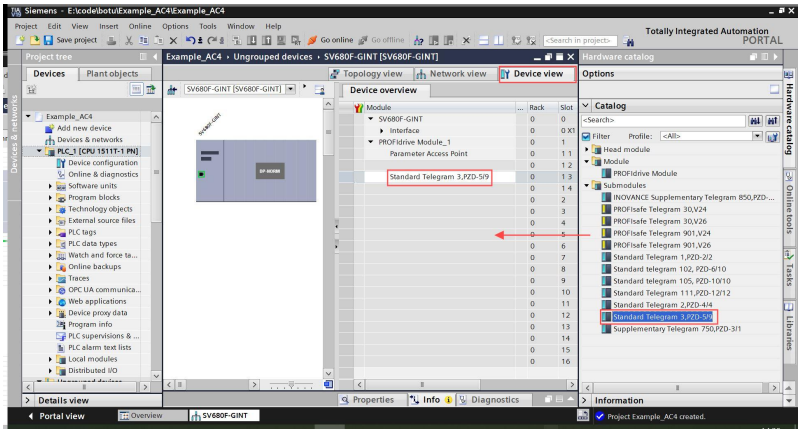


Figure 14-121 Adding telegram 3

2. Connect PLC to SV680F-INT in the Network view.

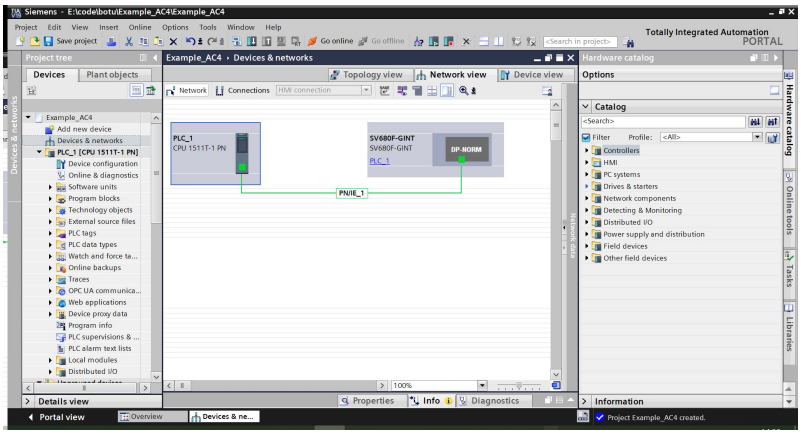


Figure 14-122 Network view connection

3. If you need IRT communication (telegram 105 only) between the PLC and drive, you must make connection in the topology view, which must be consistent with the actual physical connection. If only RT communication is performed (default), you need not topology view connection.

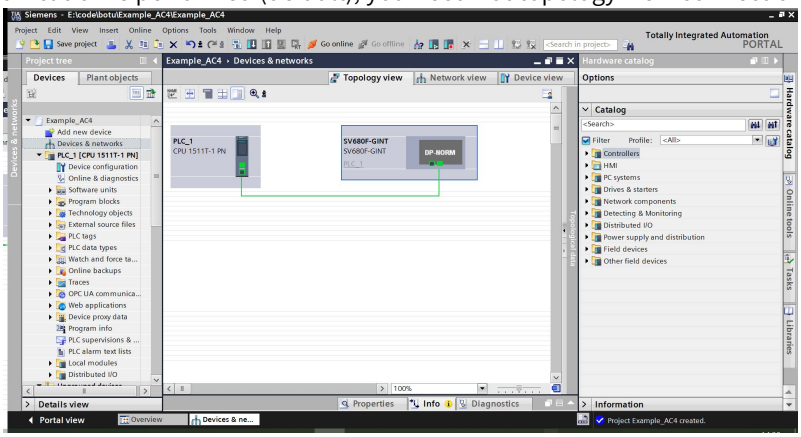


Figure 14-123 Topology view connection

4. Add the technology object.

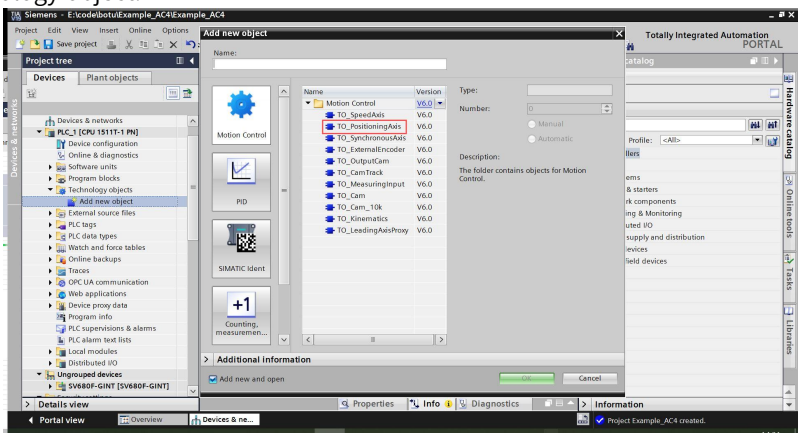


Figure 14-124 Adding the technology object

5. From networking configuration, select PROFIdrive and Standard telegram 3.

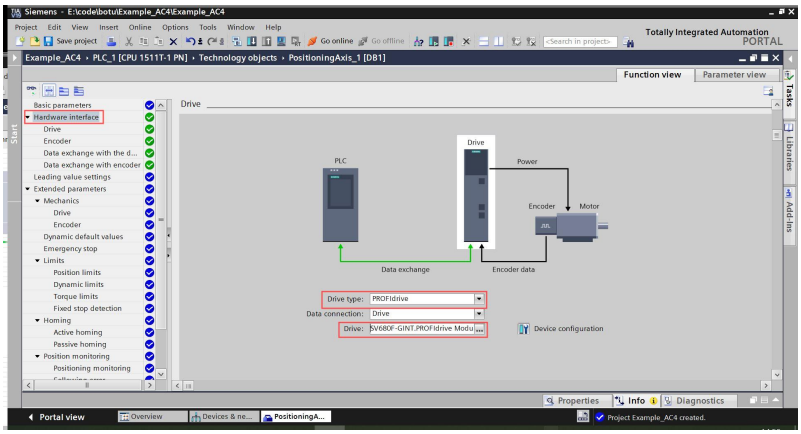


Figure 14-125 Selection of PROFIdrive and telegram

6. If H02-01 is set to 0 (Incremental position mode), select "Incremental" from the drop-down list of "Encoder type". If H02-01 is set to 1 (Absolute position linear mode), select "Cyclic absolute" from the drop-down list of "Encoder type".

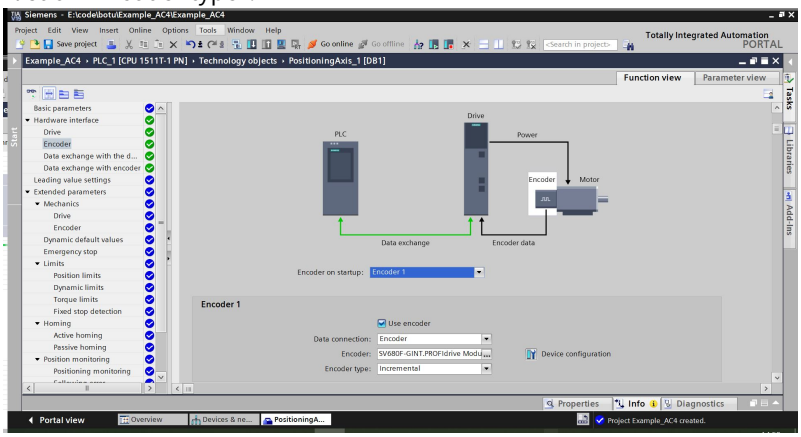


Figure 14-126 Selecting an encoder type

7. If "Automatically apply drive values at runtime" cannot be selected for reference speed, maximum speed, and base torque of the motor, manually set them according to the drive parameters. The reference torque is the maximum torque of the drive, corresponding to parameter H00.13; The reference speed is the reference speed of the drive parameter, corresponding to parameter H24.64. The maximum speed is 2 x H26.24 or H00.15. The speed configuration usually has the following two cases (take a 400W motor as an example).
   Case 1: The actual running speed ⩽ H00.14 (rated speed) × 2, and the reference speed and maximum corresponds to H24.64 and 2 x H26.24 respectively.

   Case 2: The actual running speed > H00.14 (rated speed) × 2. At this time, it is necessary to change H24.60.bit3 to 1 and set the reference speed H24.64 to half of H00.15, and set the reference speed and maximum speed to H24.64 and H00.15 respectively.

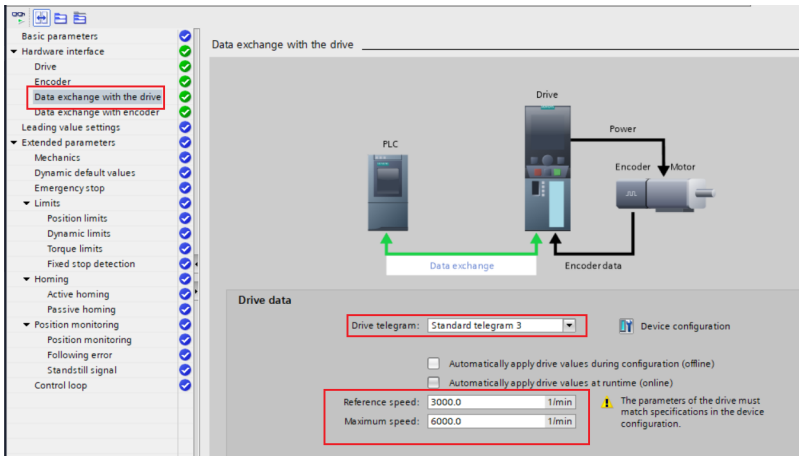


Figure 14-127 Setting drive parameters manually

8. During "exchanging data with encoder", you can select "Auto apply encoder value during operation". If checked, the PLC will read servo-related parameters and automatically apply them to take effect. If it is not checked, the filled value takes effect. The recommended values are as follows:
   Increment per revolution: value of H24.10

   Bit in Gx_XIST1: value of H24.12

   Bit in Gx_XIST2: value of H24.14

   Number of revolutions: value of H24.16

After modifying the parameters related to the encoder resolution, power cycle the drive. The parameters related to the encoder resolution are H00.00, H00.31, H00.39, and H00.43.

If "Encoder values applied automatically during operation" are not checked after the drive is restarted, you need to update the configuration of the process object according to the new encoder resolution parameters.

- When H02.01 = 0 (incremental position mode), the encoder configuration interface is as follows:

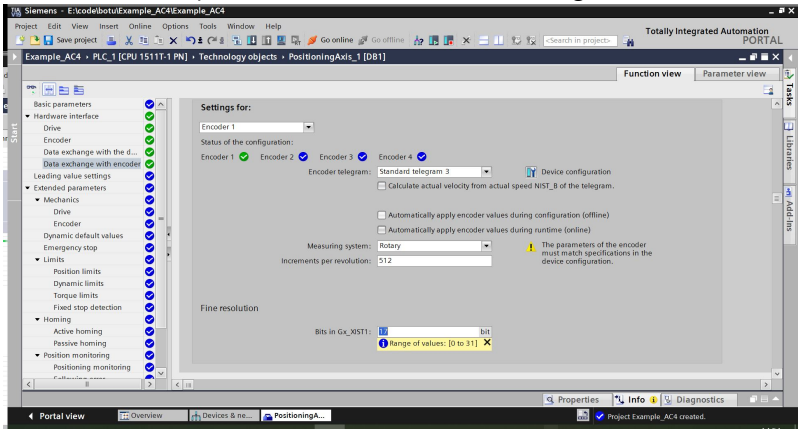


Figure 14-128 Encoder configuration in incremental position mode

- When H02.01 = 1 (absolute position linear mode), the configuration interface of the encoder is as follows:

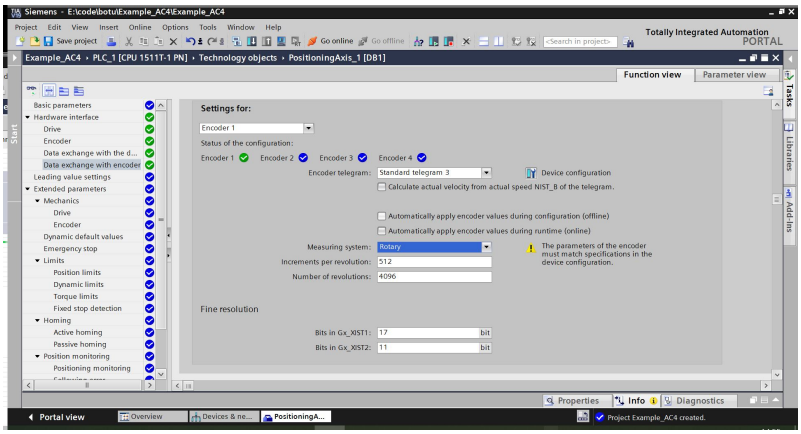


Figure 14-129 Encoder configuration in absolute position linear mode

9. In the "Extended parameters" section, select "On motor shaft" from the drop-down list of "Encoder mounting type", and set the position.

Caution

Do not select "Reverse encoder direction" or "Reverse drive rotating direction" unless you really need to. Check the application conditions and servo parameter configuration carefully. Failure to comply may result in safety risks such as runaway.

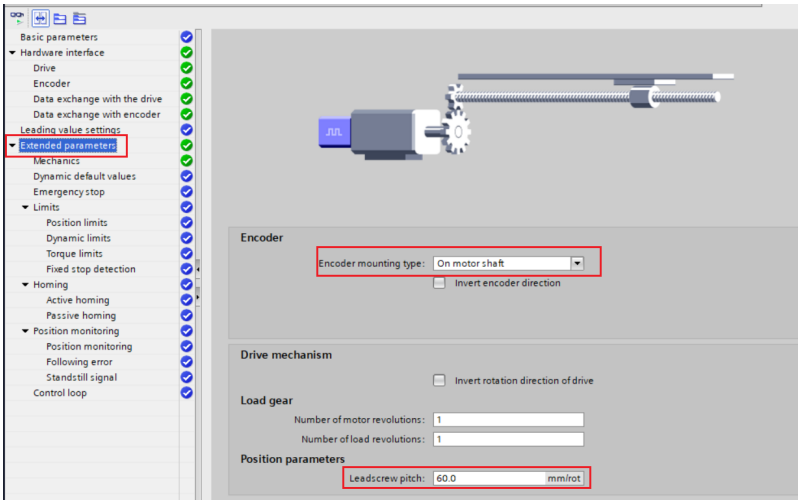


Figure 14-130 Setting the encoder mounting type

10. Due to the large follow-up deviation during acceleration and deceleration, you can decide whether to enable follow-up error monitoring according to the actual situation. It is recommended to tick this option if you use safety features.
    If there are no special requirements for deviations during operation, such as point control, you can uncheck "Enable following error monitoring". Turning off this function will not affect positioning accuracy.

    If there is a requirement for deviation during operation, such as trajectory control, you can check "Enable following error monitoring", adjust the parameters in the control loop according to the actual needs, and monitor the peak value of the "TO". StatusPositioning.FollowingError variable at

the same time, and take the margin left on the basis of the peak value of this variable as the "Following Error".

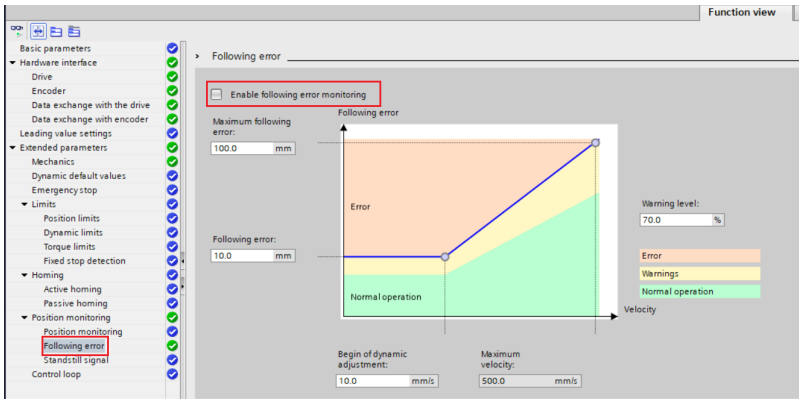


Figure 14-131 Unselecting following error monitoring

11. Write a program in the main program.

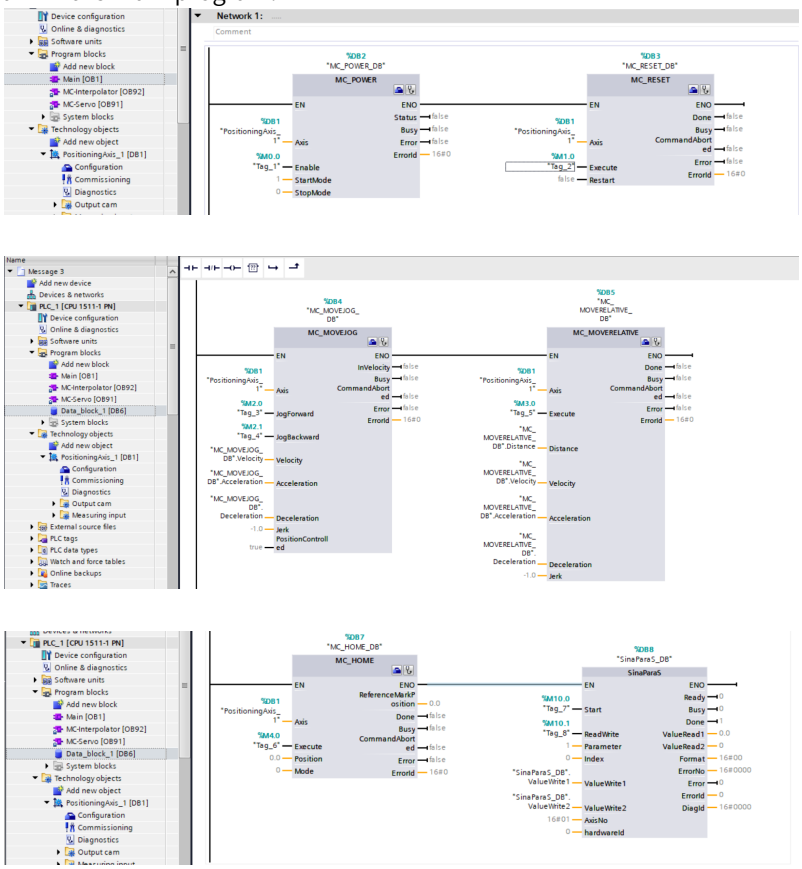


Figure 14-132 Writing the motion control program

12. Go to the "Device view" section, double-click **SV680F-INT**, and set the IP address and PROFINET device name for the servo drive.

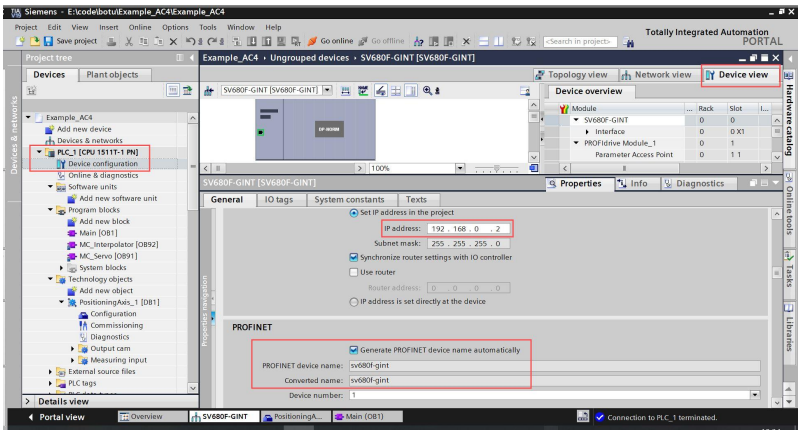


Figure 14-133 Configuring the IP address and device name

13. Download the PLC program.

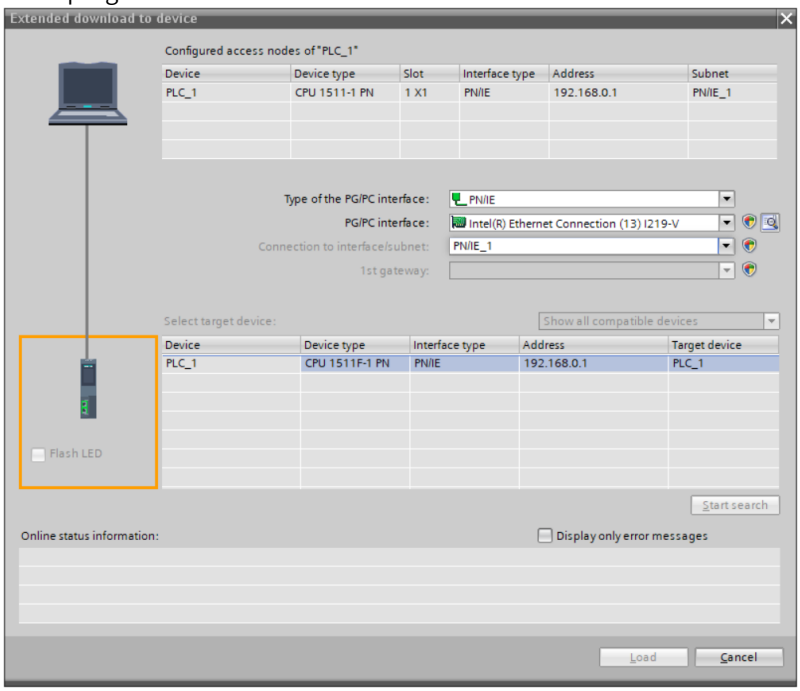


Figure 14-134 Downloading the PLC program

14. After the program is downloaded, check whether the PLC reports an error or the servo panel switches to the 44ry status. If any problem exists, right-click SV680F-INT in the device view, and select "Assign device name”.

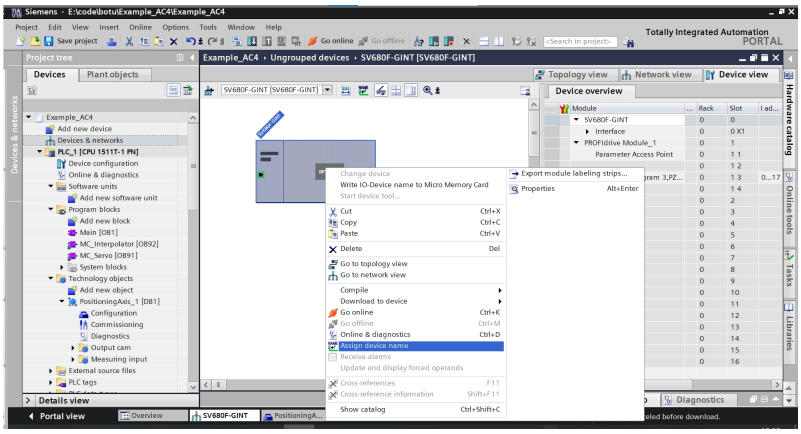


Figure 14-135 Assign a device name.

15. To assign a name for SV680F-INT, click "Update list", select the servo drive for which you want to assign a name, and then click "Assign device name". After assigning a name for the device, click "Update list", check whether the device name is updated, and whether the servo drive status and PLC status errors are cleared.

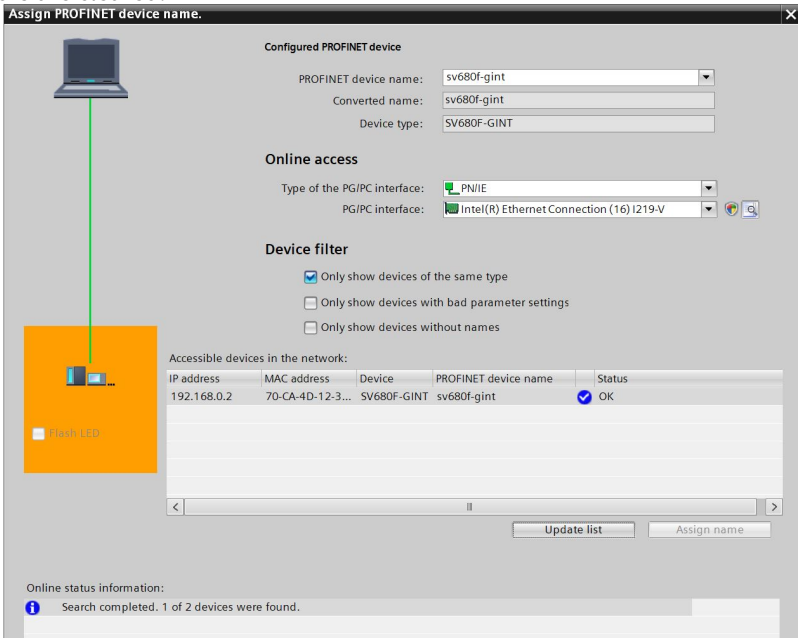


Figure 14-136 Assign a device name.

16. Telegram 3 networking and programming are completed.

Note

In AC4 mode, it is not recommended to use the following functions when the PLC performs position closed loop, otherwise abnormal phenomena will easily occur, which may lead to safety risks. It is recommended that the hardware limit switch be connected to the PLC, and the limit function logics are processed by the PLC process object.

- Setting speed reference acceleration/deceleration ramp time (H24.50 and H24.52) to non-0 will lead to No. 2 fault EE19.5.
- Using the servo local setting reference point function (H05.30 = 6) will lead to No. 2 fault EE19.5.
- Setting servo local DI limit function (this function is set by default) and soft limit function will lead to No. 2 fault EE19.6. Turning off the soft limit function (H0A.01 = 0) and defining DI as a non-overtravel switch cancels the fault.

When using telegram 105 to turn on DSC in AC4 mode, if XERR overflows when it reaches the upper limit (2147483647) or lower limit (-2147483648) of int32, the servo drive cannot work normally at this time, and there is a safety risk. It is recommended to monitor the XERR when DSC is turned on and it is necessary to switch to torque mode or speed mode to ensure that there is no risk of overflow during operation.

14.6 Example of Non-periodic Read and Write

14.6.1 Aperiodic Read-Write Rules

Defining PN aperiodic read and write parameter strategy

ABBCC (decimal)

A = 1 represents the manufacturer's parameters, the bias base in the group is 0, and the bias range in the group is between 04 + CC = (0 to 99);

A = 2 represents the manufacturer's parameters, the bias base in the group is 100, and the bias range in the group is between 100 + CC = (100 to 199);

BB represents a parameter group number;

CC represents parameter offset in the group.

Example of PN aperiodic read and write parameters

eg1: When reading H2419, the aperiodic read and write parameter number is: 13619 = H2419 A = 1; BB = 24 (hex) = 36 (dec); CC = 19 (dec);

eg2: When reading H19102, the aperiodic read and write parameter number is: 22502 = H19102 A = 2; BB = 19 (hex) = 25 (dec); CC = 02 (dec);

Conversion of parameter number and aperiodic access parameter number

Parameter number: H YY.XX(x)	Description
H	Fixed character
YY	Parameter group number, in hexadecimal
XX(x)	Parameter offset, in decimal

Parameter No.: ABBCC	Description
A	Fixed value, A = 1 means... A = 2 means...
BB	Parameter group number, in decimal, so YY needs to be converted from hexadecimal to decimal to get BB
CC	Parameter offset, in decimal, so when A = 1, CC = XX; When A = 2, CC = XX(x)-100

14.6.2 Aperiodic Read and Write of S7 1500 and PN servo through Sina_Para S (single parameter read and write)

1. Calling the Sina_Para_S function block

   On the basis of the original configuration, you only need to call the Sina_Para_S function block in the program, as shown in Figure 1:

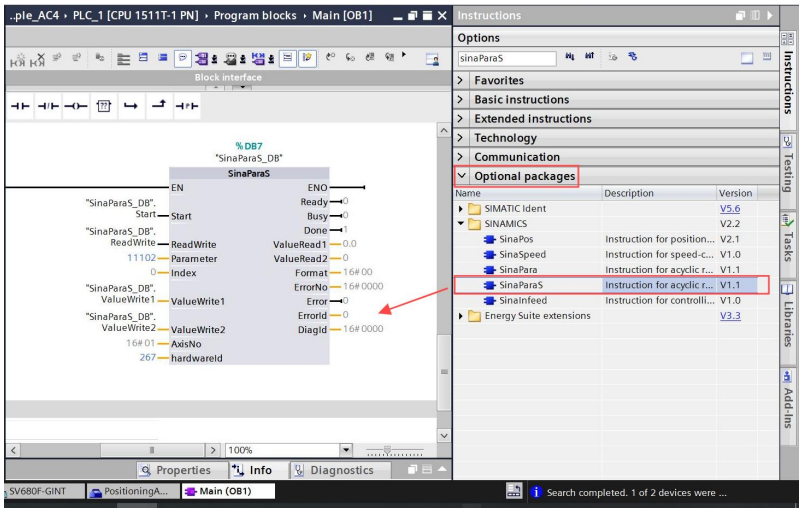


Figure 14-137 S7 1500 aperiodic read/write function block

2. The description of the Sina_Para_S function block is shown in the following table:

   Input:

Table 14–11 Description of Sina_Para_S function block input pins

Input signal	Type	Default	Description
Start	BOOL	0	Start job (0 = no job or job canceled; 1 = start and execute job)
ReadWrite	BOOL	0	Job type 0 = read, 1 = write
Parameter	UINT	1	Parameter No.
Index	UINT	0	Parameter Index
ValueWrite1	REAL	0.0	Parameter value (REAL format)
ValueWrite2	DINT	0	Parameter value (DINT format)

Input signal	Type	Default	Description
AxisNo	INT	1	Axis number in multi-axis system
hardwareId	HW IO	0	Hardware ID of the actual value telegram slot of the module access point axis or drive

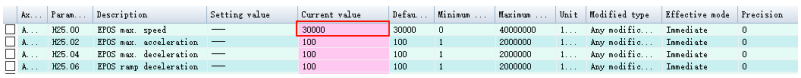
Output:

Table 14–12 Description of Sina_Para_S function block output pins

Output Signal	Type	Default	Description
Ready	BOOL	0	Feedback signals connected in the LAcycCom environment; 1 = job ended or job canceled (one cycle)
Busy	BOOL	0	Ongoing job (if "Busy" = 1
Done	BOOL	0	If the job ends correctly, it means that the edge has changed from 0 to 1
ValueRead1	REAL	0.0	Read parameter value (REAL format)
ValueRead2	DINT	0	Read parameter value (DINT format)
Format	INT	0	Read parameter format
ErrorNo	INT	0	Error No. compliant with PROFIdrive protocol
Error	BOOL	0	Activate group failure → "Error" = 1
Status	DWORD	0	The first word–> mark which parameter access fault occurred in the form of binary encoding. The second word: fault type
DiagId	WORD	0	Extended communication error –> SFB call error

3. Case:

1. Read an integer parameter, such as H25.00; Then the address of the servo parameter number is 13700. After the start task is triggered for reading operation, the parameter reading area 2 displays 30000. The value read from H25.00 is correct.



Ax...	Param...	Description	Setting value	Current value	Defau...	Minimum ...	Maximum ...	Unit	Modified type	Effective mode	Precision
A...	H25.00	EPOS max. speed	—	30000	30000	0	40000000	1...	Any modific...	Immediate	0
A...	H25.02	EPOS max. acceleration	—	100	100	1	2000000	1...	Any modific...	Immediate	0
A...	H25.04	EPOS max. deceleration	—	100	100	1	2000000	1...	Any modific...	Immediate	0
A...	H25.06	EPOS ramp deceleration	—	100	100	1	2000000	1...	Any modific...	Immediate	0

Figure 14-138 Value of H25.00

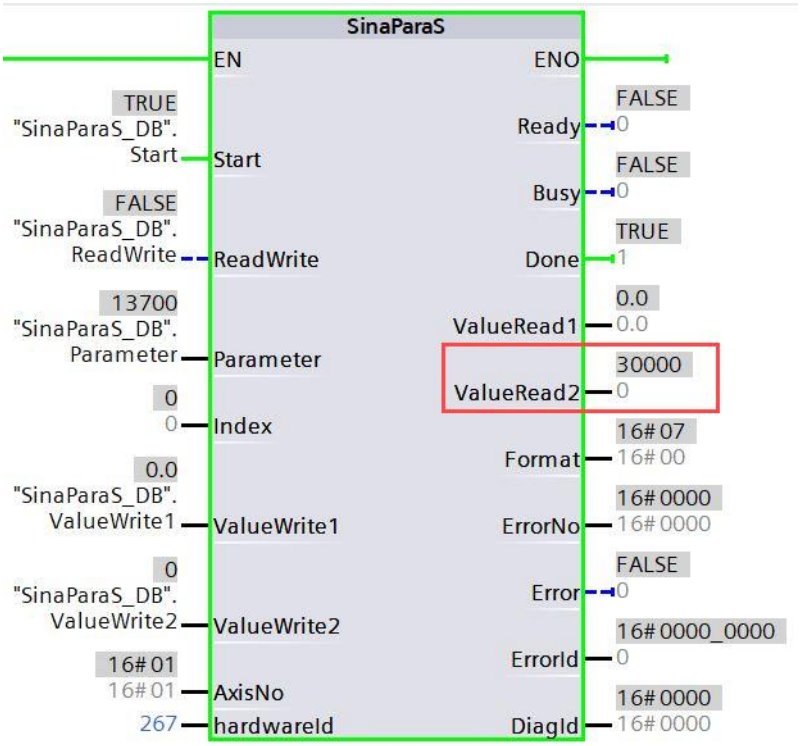


Figure 14-139 Reading H25.00 value aperiodically

2. Read a float point parameter, such as H0B.26; Then the address of the servo parameter number is 11126. After the start task is triggered for reading operation, the parameter reading area 1 displays 30000. The value read from H0B.26 is correct.

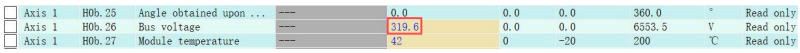


Figure 14-140 Value of H0B.26

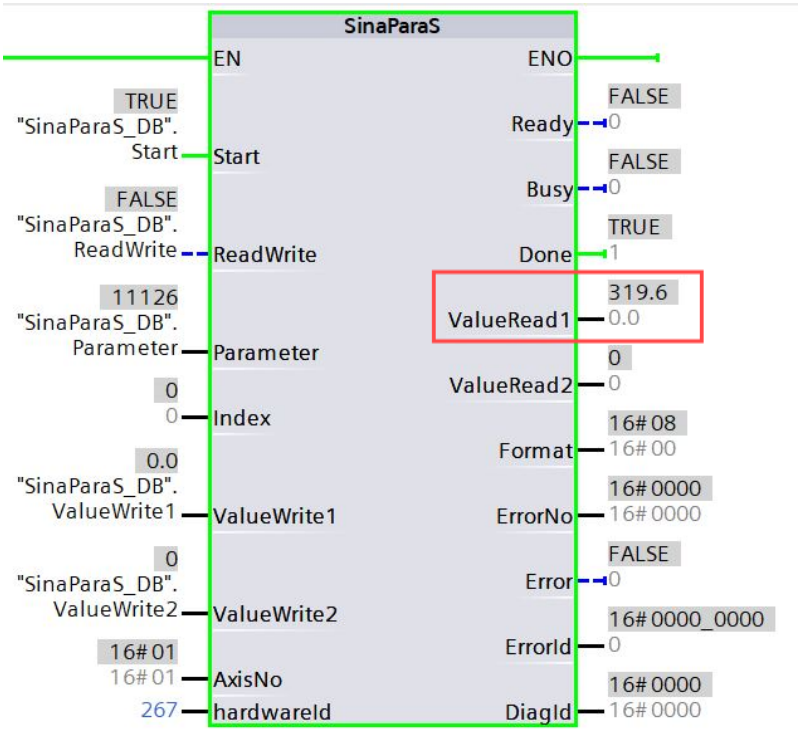


Figure 14-141 Reading H0B.26 value aperiodically

3. Write an integer parameter, such as H25.00; Then the address of the servo parameter number is 13700. Assigning 2500 in the parameter write area 2 will read or write variable 1. Switch to write mode and the start task is triggered to perform the write operation.

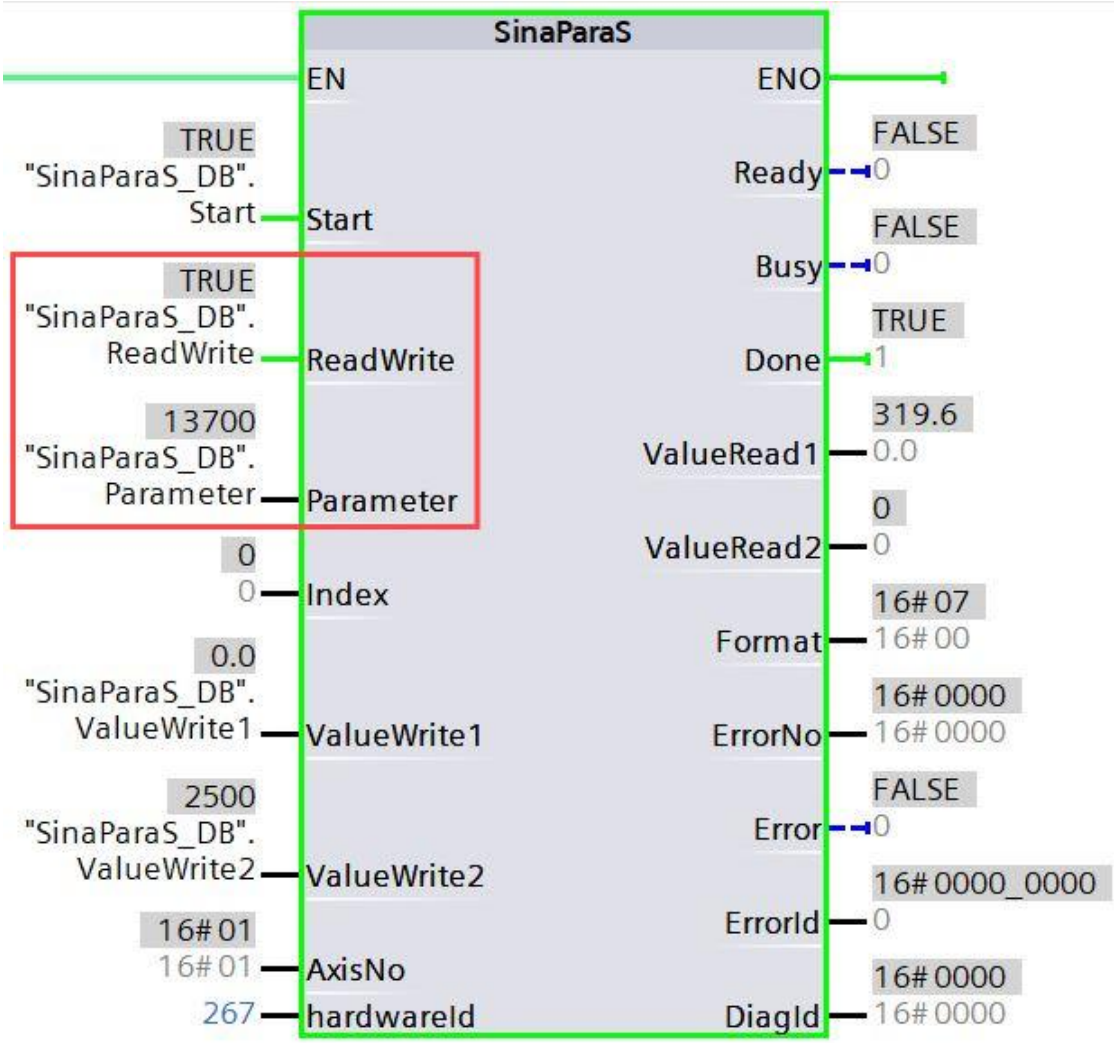
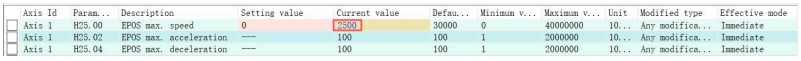


Figure 14-142 Writing H25.00 value aperiodically



	Axis Id	Param...	Description	Setting value	Current value	Defau...	Minimum v...	Maximum v...	Unit	Modified type	Effective mode
☐	Axis 1	H25.00	EPOS max. speed	0	2500	30000	0	40000000	10...	Any modifica...	Immediate
☐	Axis 1	H25.02	EPOS max. acceleration	---	100	100	1	2000000	10...	Any modifica...	Immediate
☐	Axis 1	H25.04	EPOS max. deceleration	---	100	100	1	2000000	10...	Any modifica...	Immediate

Figure 14-143 Value of H25.00

4. Write a float point parameter, such as H08.00; Then the address of the servo parameter number is 10800. Assigning 50.5 in the parameter write area 1 will read or write variable 1. Switch to the write mode, and the start task is triggered to perform the write operation.

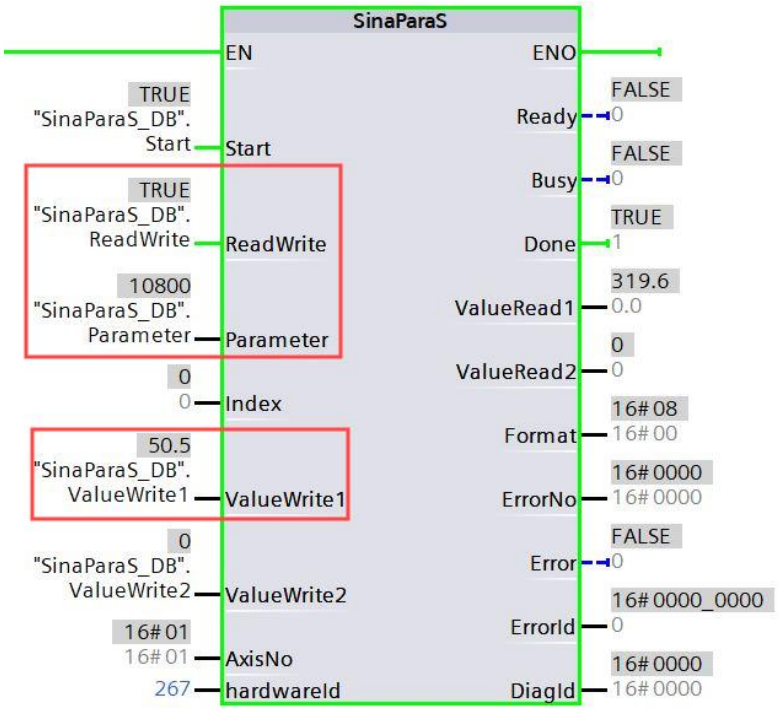
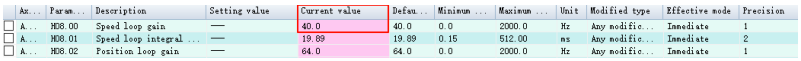


Figure 14-144 Writing H08.00 value aperiodically



Ax...	Param...	Description	Setting value	Current value	Defau...	Minimum ...	Maximum ...	Unit	Modified type	Effective mode	Precision
A...	H08.00	Speed loop gain	—	40.0	40.0	0.0	2000.0	Hz	Any modific...	Immediate	1
A...	H08.01	Speed loop integral ...	—	19.89	19.89	0.15	512.00	ms	Any modific...	Immediate	2
A...	H08.02	Position loop gain	—	64.0	64.0	0.0	2000.0	Hz	Any modific...	Immediate	1

Figure 14-145 Value of H08.00

4. Precautions

[Note 1]: AxisNO in SINA_PARA_S starts from 1 by default. No matter how many SV680F-INT servo drives are used, AxisNO is always set to 1, and the axes are distinguished through the hardware ports.

[Note 2]: The input parameter Parameter_No of the function block is set as follows: the address of host controller Parameter_NO (decimal) is set to ABBCC (decimal). Where A is a fixed value, A = 1 means it is a manufacturer's parameter. The offset base number within the group is 0, and the offset range within the group is between: 04 + CC = (0 to 99); A = 2 means it is a manufacturer parameter. The offset base number within the group is 100, the offset range within the group is: 100 + CC = (100 to 199). BB represents the parameter group number in decimal. Therefore, YY needs to be converted from hexadecimal to decimal to get BB. CC represents parameter offset in decimal, so when A = 1, CC = XX; When A = 2, CC = XX(x)-100

[Note 3]: valueWriter1 is a 16-bit data write area, valueWriter2 is a 32-bit data write area, ValueRead1 is a 16-bit data read area, and ValueRead2 is a 32-bit data read area. When the data of the servo parameter is within the 16-bit data range, assign the value in valueWriter1. When the data of the servo parameter is outside the 16-bit data range, assign the value in valueWriter2.

Table 14–13 Fault code list

Fault Code	Description
0x00	The accessed parameter does not exist.
0x01	The parameter cannot be modified. A read-only parameter has been modified

0x02	The parameter value exceeds the upper limit or lower limit
0x04	Not array type data
0x09	Description data does not exist, access to description information is not supported
0x0F	Text data does not exist, access to text information is not supported
0x11	You have modified a parameter taking effect only at stop
0x14	You have accessed a reserved parameter
0x15	Response frame is too long, reduce the number of accessed or modified parameters
0x16	Disallowed parameter address, you have accesses data other than a parameter
0x17	Illegal format, unsupported parameter format
0x19	The axis does not exist, the axis number is incorrect
0x21	Unsupported service, not an access or modification request
0x22	Request parameters are too long, too many parameters are accessed or modified
0x65	You have accessed 32-bit data high bit, change access or modify request data address
0x66	Request frames are too long, too many parameters are accessed or modified
0x67	Mixed access to profile parameters and function parameters is not supported

14.6.3 Aperiodic Read and Write of S7 1500 and PN servo through Sina_Para (multi-parameter read and write)

1. Overview

   In Portal, you can read and write the SV680F-INT drive parameters through the SinaPara function block. With this function block, up to 16 parameters can be read or written to the drive.

2. Calling the Sina_Para function block

   On the basis of the original configuration, you only need to call the Sina_Para function block in the program, as shown in Figure 1:

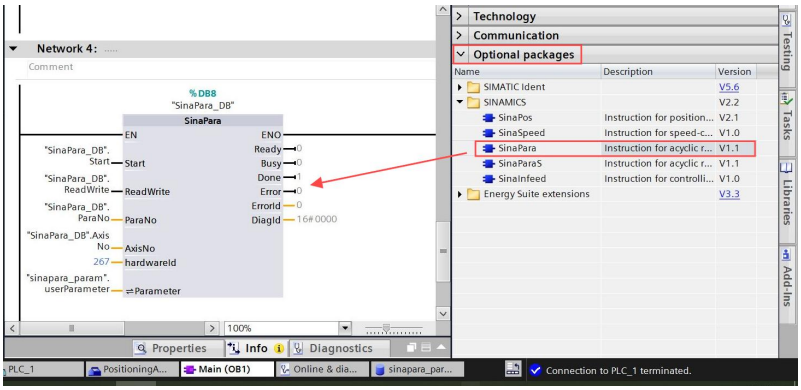


Figure 14-146 S7 1500 aperiodic read/write function block

3. The description of the Sina_Para function block is shown in the following table:

Input:

Table 14–14 Description of Sina_Para function block input pins

Input signal	Type	Default	Description
Start	BOOL	0	Start job (0 = no job or job canceled; 1 = start and execute job)
ReadWrite	BOOL	0	Job type 0 = read, 1 = write
ParaNo	INT	1	Number of parameters → 1 to 16
AxisNo	INT	1	Axis number in multi-axis system
hardwareId	HW IO	0	Hardware ID of the actual value telegram slot of the module access point axis or drive

Table 14–15 Description of Sina_Para S function block output pins

Output Signal	Type	Default	Description
Ready	BOOL	0	Feedback signals connected in the LAcycCom environment; 1 = job ended or job canceled (one cycle)
Busy	BOOL	0	Ongoing job (if "Busy" = 1
Done	BOOL	0	Job completion indicates edge from 0 → 1
Error	BOOL	0	Group failure activated "Error" → 1
Status	DWORD	0	The first word–> mark which parameter access fault occurred in the form of binary encoding. The second word: fault type
DiagId	WORD	0	Extended communication error –> SFB call error

Definition method and data structure of "Parameter"

- 1. First add the sinapara instruction in the option package to the program, then add a new global DB block, named sinapara_param (you can name it at will), open the newly created background data editor, and add an element named userParameter. The first step is to select "Array[0..1] of" as shown in Figure 1:



Figure 14-147 Selecting data type

- 2. Select Array[0..1]of"SinaParameter", as shown in Figure 2:



Figure 14-148 Selecting Array[0..1]of"SinaParameter"

- 3. Change the index value of the array element to 1 to 16. Pay special attention here that the parameter index starts from 1, not from 0, as shown in Figure 3:

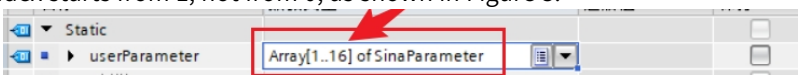


Figure 14-149 Modifying the index value

The resulting DB data table is shown in Figure 4 below:

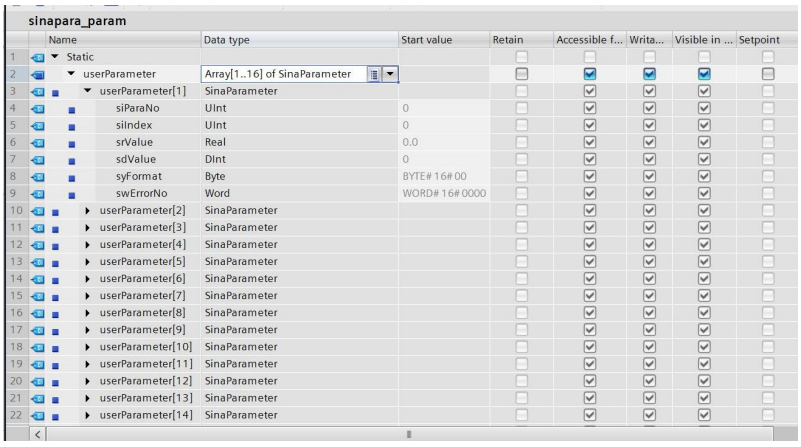


Figure 14-150 DB data sheet

Data structure of the "Parameter" area

Parameter[x].siParaNo: = Parameter number (value range: 1–65535)

Parameter[x1].siIndex: = Parameter index (value range: 1–65535)

Parameter[x].srValue: = Parameter value (value range: 1.175495e-38 to 3.402823e+38)

Parameter[x].sdValue: = Parameter value (value range:-214748364810 (-2^{31}) to +214748364710 (2^{31}))

Note that all driver parameters of type DWORD or DINT must be written to Parameter [x].sdValue. For all other types of parameters, use Parameter[x].srValue. Before manipulating driver

parameters, it must be clear whether the type of the parameters to be read/written is DWORD/DINT, or other types (byte, word, real, INT, and so on)

Parameter[x].syFormat: = Parameter format

() Value range: 0x40 = Zero 0x41/0x02/0x05 = Byte 0x42/0x03/0x06 = Word 0x43/0x04/0x07/0x08 = DWord 0x44 = Error

Parameter[x].swErrorNo: = Parameter error number (value range: 0x0000–0x00FF)

4. Case

① Read a parameter whose value can be integer and floating-point, such as H25.14 and H08.00; Then userParameter[1].siParaNo needs to be assigned a value of 13714, and userParameter[2].siParaNo needs to be assigned a value of 10800. After triggering the start task to perform a read operation, userParameter[1].sdValue is displayed as 30000, and userParameter[2].sdValue is displayed as 50.5; If they are consistent with the servo parameters, the reading is correct. See Figure 1 and Figure 2 below:

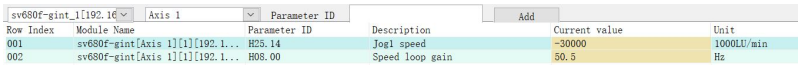


Figure 14-151 Servo parameter

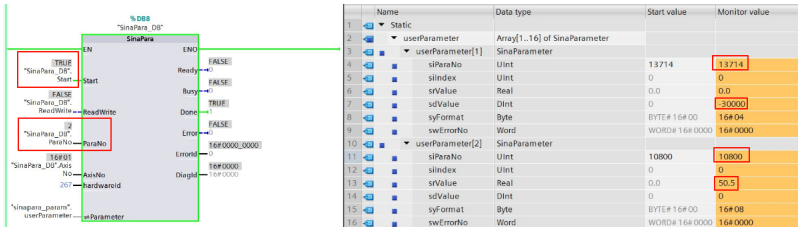


Figure 14-152 SinaPara function block

② Write a parameter whose value can be integer and floating-point, such as H25.14 and H08.00; Then userParameter[1].siParaNo needs to be assigned a value of 13714, and userParameter[2].siParaNo needs to be assigned a value of 10800. userParameter[1].sdValue is assigned a value of 5000, and userParameter[2].sdValue is displayed as 10.5; After triggering the start task to perform a write operation, if they are consistent with the servo parameters, the reading is correct. See Figure 3 and Figure 4 below:

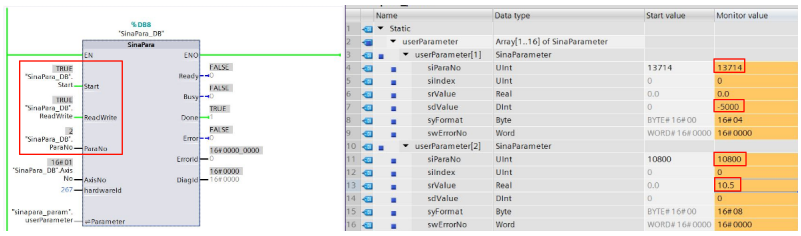


Figure 14-153 SinaPara function block

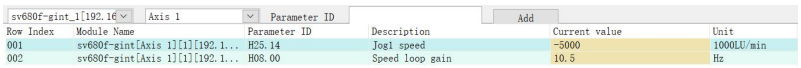


Figure 14-154 Servo parameter

5. Precautions

[Note 1]: AxisNO in SinaPara starts from 1 by default. No matter how many Inovance PN servo drives are used, AxisNO is always set to 1, and the axes are distinguished through the hardWare ports.

[Note 2]: The function block input parameter userParameter[X].siParaNo is set as follows: the address of the host controller userParameter [X]. siParaNo (decimal) is set to ABBCC (decimal). Where A is a fixed value, A = 1 means it is a manufacturer's parameter. The offset base number within the group is 0, and the offset range within the group is between: 04 + CC = (0 to 99); A = 2 means it is a manufacturer parameter. The offset base number within the group is 100, the offset range within the group is: 100 + CC = (100 to 199). BB represents the parameter group number in decimal. Therefore, YY needs to be converted from hexadecimal to decimal to get BB. CC represents parameter offset in decimal, so when A = 1, CC = XX; When A = 2, CC = XX(x)-10

[Note 3]: The ParaNo pin needs to be assigned a value every time a parameter is read or written; Inovance technical parameters need not the userParameter[X].siIndex pin, so the default value of 0 is maintained;

15 Parameter List

15.1 H00 Servo Motor Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H00.00	0x0000	Motor SN	20002: Rotary motor-pulse encoder 14000: Rotary motor-Inovance 20-bit encoder 14101: Rotary motor-Inovance 23-bit encoder 14102: Rotary motor-Inovance 26-bit encoder 14140: Rotary motor-Endat2.2 encoder 14150: Rotary motor-SSI encoder 14160: Rotary motor-BiSS-C encoder	14102	-	At stop	"H00_en.00" on page 487
H00.02	0x0002	Customized No.	0.00 to 42949672.95	0.00	-	Unchangeable	"H00_en.02" on page 487
H00.04	0x0004	Encoder version	0.0 to 6553.5	0.0	-	Unchangeable	"H00_en.04" on page 487
H00.05	0x0005	Serial-type motor code	0 to 65535	0	-	Unchangeable	"H00_en.05" on page 488
H00.06	0x0006	FPGA customized SN	0.00 to 655.35	0.00	-	Unchangeable	"H00_en.06" on page 488
H00.07	0x0007	STO version	0.0 to 6553.5	0.0	-	Unchangeable	"H00_en.07" on page 488
H00.08	0x0008	Bus encoder type	0 to 65535	0	-	At stop	"H00_en.08" on page 488
H00.14	0x000E	Rated speed	50rpm to 10000rpm	3000	rpm	At stop	"H00_en.14" on page 488
H00.15	0x000F	Maximum speed	50rpm to 10000rpm	6000	rpm	At stop	"H00_en.15" on page 489
H00.40	0x0028	Motor control type	0: General-purpose rotary motor ROT	2	-	At stop	"H00_en.40" on page 489
H00.41	0x0029	Master encoder configuration	0: CN2 1: CN7	1	-	Unchangeable	"H00_en.41" on page 489
H00.43	0x002B	Number of BiSS-C/SSI/EnDat2.2 data bits	0 to 40	32	-	At stop	"H00_en.43" on page 489
H00.44	0x002C	Number of BiSS-C/SSI fault bits	0 to 31	2	-	At stop	"H00_en.44" on page 490
H00.54	0x0036	BiSS-C/SSI CRC	0 to 1	1	-	At stop	"H00_en.54" on page 490

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H00.59	0x003B	Encoder counting direction	0: Forward 1: Reverse	0	-	At stop	"H00_en.59" on page 490
H00.65	0x0041	Motor rated current	0.00 A to 42949672.95 A	1.00	A	At stop	"H00_en.65" on page 490
H00.69	0x0045	Linear back EMF coefficient	0.00[V/(m/s)]/[100mV/rpm]–42949672.95[V/(m/s)]/[100mV/rpm]	33.00	[V/(m/s)]/[100mV/rpm]	At stop	"H00_en.69" on page 490

15.2 H01 Servo Drive Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H01.00	0x0100	MCU software version	0.0 to 6553.5	0.0	-	Unchangeable	"H01_en.00" on page 491
H01.01	0x0101	FPGA software version	0.0 to 6553.5	0.0	-	Unchangeable	"H01_en.01" on page 491
H01.02	0x0102	Servo drive series No.	0 to 65535	0	-	Unchangeable	"H01_en.02" on page 491
H01.06	0x0106	Board software version	0.0 to 6553.5	0.0	-	Unchangeable	"H01_en.06" on page 491
H01.10	0x010A	Drive series No.	2: S1R6 3: S2R8 5: S5R5 6: S7R6 7: S012 8: S018 9: S022 10: S027 10001: T3R5 10002: T5R4 10003: T8R4 10004: T012 10005: T017 10006: T021 10007: T026	3	-	At stop	"H01_en.10" on page 492
H01.11	0x010B	DC-AC voltage class	0 V to 65535 V	220	V	Unchangeable	"H01_en.11" on page 492
H01.12	0x010C	Drive rated power	0.00 kW–42949672.95 kW	0.40	kW	Unchangeable	"H01_en.12" on page 492
H01.14	0x010E	Max. output power of the drive	0.00 kW–42949672.95 kW	0.40	kW	Unchangeable	"H01_en.14" on page 493
H01.16	0x0110	Rated output current of the drive	0.00 A to 42949672.95 A	2.80	A	Unchangeable	"H01_en.16" on page 493

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H01.18	0x0112	Max. output current of the drive	0.00 A to 42949672.95 A	10.10	A	Unchangeable	"H01_en.18" on page 493
H01.40	0x0128	DC bus overvoltage protection threshold	0 V to 2000 V	420	V	Real-time	"H01_en.40" on page 493
H01.88	0x0158	Junction temperature parameter version 1	0.0 to 6553.5	0.0	-	Unchangeable	"H01_en.88" on page 493
H01.89	0x0159	Junction temperature parameter version 2	0 to 65535	0	-	Unchangeable	"H01_en.89" on page 494

15.3 H02 Basic Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.00	0x0200	Control mode	11: PN communication mode	11	-	At stop	"H02_en.00" on page 494
H02.01	0x0201	Absolute system selection	0: Incremental mode 1: Absolute position linear mode 2: Absolute position rotation mode 3: Absolute position linear mode (without encoder overflow warning) 4: Absolute position single-turn mode 5: Absolute position rotational mode, modal axis single modal revolution absolute command	0	-	At stop	"H02_en.01" on page 494
H02.02	0x0202	Rotation direction selection	0: Counterclockwise (CCW) as forward direction 1: Clockwise (CW) as forward direction	0	-	At stop	"H02_en.02" on page 495
H02.03	0x0203	Output pulse phase	0: Phase A leads phase B 1: Phase A lags behind phase B	0	-	At stop	"H02_en.03" on page 495

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.05	0x0205	Stop mode at S-ON OFF	-5: Stop in PN communication state (ramp-to-stop/quick stop/coast-to-stop), keeping dynamic braking state -4: Stop based on ramp 2, keeping dynamic braking state -3: Stop at zero speed, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Dynamic braking stop, keeping de-energized state 3: Stop in PN communication state (ramp-to-stop/quick stop/coast-to-stop), keeping de-energized state	3	-	Real-time	"H02_en.05" on page 495
H02.06	0x0206	Stop mode at No. 2 fault	-5: Stop at zero speed, keeping dynamic braking state -4: Stop at emergency stop torque, keeping dynamic braking state -3: Stop based on ramp 2, keeping dynamic braking state -2: Stop based on ramp 1, keeping dynamic braking state -1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Stop based on ramp 1, keeping de-energized state 2: Stop based on ramp 2, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state	2	-	Real-time	"H02_en.06" on page 496
H02.07	0x0207	Stop mode at overtravel	1: Stop at zero speed, keeping position lock state 4: Stop at ramp 2, keeping position lock state 7: Not respond to overtravel	1	-	At stop	"H02_en.07" on page 496

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.08	0x0208	Stop mode at No.1 fault	0: Coast to stop, keeping de-energized state 1: Dynamic braking stop, keeping de-energized state 2: Dynamic braking stop, keeping dynamic braking state	2	-	At stop	"H02_en.08" on page 497
H02.09	0x0209	Delay from brake output ON to command received	0 ms–500 ms	250	ms	Real-time	"H02_en.09" on page 497
H02.10	0x020A	Delay from brake output OFF to motor de-energized	50 ms–1000 ms	150	ms	Real-time	"H02_en.10" on page 497
H02.11	0x020B	Motor speed threshold at brake output OFF in rotation state	20 rpm to 3000 rpm	30	rpm	Real-time	"H02_en.11" on page 498
H02.12	0x020C	Delay from S-ON OFF to brake output OFF in rotation state	1 ms–65535 ms	500	ms	Real-time	"H02_en.12" on page 498
H02.15	0x020F	LED Alarm Display	0: Output alarm information immediately 1: Not output alarm information	0	-	Real-time	"H02_en.15" on page 498
H02.16	0x0210	Brake enable switch	0: OFF 1: ON	0	-	Real-time	"H02_en.16" on page 498
H02.17	0x0211	Stop mode upon main circuit power failure	0: Keep current action 1: Stop upon fault as defined by H02.06 2: Stop at S-ON OFF as defined by H02.05 3: Stop quickly as defined by H02.18	2	-	Real-time	"H02_en.17" on page 499
H02.18	0x0212	DI emergency stop mode	0: Coast to stop, keeping de-energized state 1: Ramp 1 stop, keeping de-energized state 2: Ramp 2 stop, keeping de-energized stat 3: Stop at emergency stop torque, keeping de-energized state	2	-	Real-time	"H02_en.18" on page 499
H02.21	0x0215	Permissible minimum resistance of braking resistor	1Ω to 1000Ω	40	Ω	Unchangeable	"H02_en.21" on page 499
H02.22	0x0216	Power of built-in braking resistor	0 W–65535 W	50	W	Unchangeable	"H02_en.22" on page 500

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.23	0x0217	Resistance of built-in braking resistor	0Ω to 65535Ω	50	Ω	Unchangeable	"H02_en.23" on page 500
H02.24	0x0218	Resistor heat dissipation coefficient	10% to 100%	30	%	Real-time	"H02_en.24" on page 500
H02.25	0x0219	Braking resistor type	0: Built-in 1: External, natural cooling 2: External, forced air cooling 3: No resistor needed	3	-	Real-time	"H02_en.25" on page 500
H02.26	0x021A	Power of external braking resistor	1 W–65535 W	40	W	Real-time	"H02_en.26" on page 501
H02.27	0x021B	Resistance of external braking resistor	15Ω to 1000Ω	50	Ω	Real-time	"H02_en.27" on page 501
H02.30	0x021E	User password	0 to 65535	0	-	Unchangeable	"H02_en.30" on page 501
H02.31	0x021F	System parameter initialization	0: No operation 1: Restore default settings 2: Clear fault records	0	-	At stop	"H02_en.31" on page 501
H02.32	0x0220	Selection of parameters in group H0b	0 to 99	50	-	Real-time	"H02_en.32" on page 502
H02.33	0x0221	200P software version	0.0 to 6553.5	0.0	-	Unchangeable	"H02_en.33" on page 502
H02.35	0x0223	Keypad data update frequency	0 Hz–20 Hz	0	Hz	Real-time	"H02_en.35" on page 502
H02.38	0x0226	Overload time of external resistor	0s to 200s	40	s	Real-time	"H02_en.38" on page 502
H02.41	0x0229	Manufacturer password	0 to 65535	0	-	Real-time	"H02_en.41" on page 503
H02.43	0x022B	Dynamic braking resistor power	0.0 W–6553.5 W	20.0	W	Unchangeable	"H02_en.43" on page 503
H02.44	0x022C	Dynamic braking resistor resistance	0.0Ω to 1000.0Ω	3.6	Ω	Unchangeable	"H02_en.44" on page 503
H02.47	0x022F	Delay time from power cable breakage to brake OFF	0 ms–1000 ms	10	ms	Real-time	"H02_en.47" on page 503
H02.48	0x0230	Thermal capacity percentage of the dynamic braking resistor	90.0% to 110.0%	100.0	%	Real-time	"H02_en.48" on page 504

15.4 H03 Terminal Input Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H03.02	0x0302	DI1 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 38: Probe 1 39: Probe 2 56: External switch of the EEPOS program block	14	-	Real-time	"H03_en.02" on page 504
H03.03	0x0303	DI1 logic selection	0: Normally open 1: Closed	0	-	Real-time	"H03_en.03" on page 504
H03.04	0x0304	DI2 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 38: Probe 1 39: Probe 2 56: External switch of the EEPOS program block	15	-	Real-time	"H03_en.04" on page 505
H03.05	0x0305	DI2 logic selection	0: Normally open 1: Closed	0	-	Real-time	"H03_en.05" on page 505
H03.06	0x0306	DI3 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 38: Probe 1 39: Probe 2 56: External switch of the EEPOS program block	31	-	Real-time	"H03_en.06" on page 505

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H03.07	0x0307	DI3 logic selection	0: Normally open 1: Closed	0	-	Real-time	"H03_en.07" on page 506
H03.08	0x0308	DI4 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 38: Probe 1 39: Probe 2 56: External switch of the EEPOS program block	34	-	Real-time	"H03_en.08" on page 506
H03.09	0x0309	DI4 logic selection	0: Normally open 1: Closed	0	-	Real-time	"H03_en.09" on page 507
H03.10	0x030A	DI5 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 38: Probe 1 39: Probe 2 56: External switch of the EEPOS program block	38	-	Real-time	"H03_en.10" on page 507
H03.11	0x030B	DI5 logic selection	0: Normally open 1: Closed	0	-	Real-time	"H03_en.11" on page 507
H03.50	0x0332	Voltage-type AI1 offset	-5000 mV–5000 mV	0	mV	Real-time	"H03_en.50" on page 508
H03.51	0x0333	Voltage-type AI1 input filter time constant	0.00 ms–655.35 ms	2.00	ms	Real-time	"H03_en.51" on page 508
H03.53	0x0335	Voltage-type AI1 dead zone	0.0 mV to 1000.0 mV	10.0	mV	Real-time	"H03_en.53" on page 508
H03.54	0x0336	Voltage-type AI1 zero drift	-500.0 mV to 500.0 mV	0.0	mV	Real-time	"H03_en.54" on page 508
H03.55	0x0337	Voltage-type AI2 offset	-5000 mV to 5000 mV	0	mV	Real-time	"H03_en.55" on page 509

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H03.56	0x0338	Voltage-type AI2 input filter time constant	0.00 ms–655.35 ms	2.00	ms	Real-time	"H03_en.56" on page 509
H03.58	0x033A	Voltage-type AI2 dead zone	0.0 mV to 1000.0 mV	10.0	mV	Real-time	"H03_en.58" on page 509
H03.59	0x033B	Voltage-type AI2 zero drift	-500.0 mV to 500.0 mV	0.0	mV	Real-time	"H03_en.59" on page 509
H03.60	0x033C	DI1 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time	"H03_en.60" on page 510
H03.61	0x033D	DI2 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time	"H03_en.61" on page 510
H03.62	0x033E	DI3 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time	"H03_en.62" on page 510
H03.63	0x033F	DI4 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time	"H03_en.63" on page 510
H03.64	0x0340	DI5 filter time	0.00 ms–500.00 ms	3.00	ms	Real-time	"H03_en.64" on page 510
H03.80	0x0350	Speed corresponding to analog 10 V	0[mm/s]/[rpm] to 10000[mm/s]/[rpm]	3000	[mm/s]/[rpm]	At stop	"H03_en.80" on page 511
H03.81	0x0351	Torque corresponding to analog 10 V	0.00 to 8.00	1.00	Multiplier	At stop	"H03_en.81" on page 511

15.5 H04 Terminal Output Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H04.00	0x0400	DO1 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 25: Comparison output DO 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	1	-	Real-time	"H04_en.00" on page 511
H04.01	0x0401	DO1 logic selection	0: Normally open 1: Closed	0	-	Real-time	"H04_en.01" on page 512

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H04.02	0x0402	DO2 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 25: Comparison output DO 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	11	-	Real-time	"H04_en.02" on page 512
H04.03	0x0403	DO2 logic selection	0: Normally open 1: Closed	0	-	Real-time	"H04_en.03" on page 513
H04.22	0x0416	DO source selection	Bit0: DO1 output source 0: DO1 function output 1: Bit0 of H31.04 Bit1: DO2 output source 0: DO2 function output 1: Bit1 of H31.04	0	-	Real-time	"H04_en.22" on page 513
H04.24	0x0418	DO brake enable	0: Disabled 1: Enabled	0	-	At stop	"H04_en.24" on page 513
H04.50	0x0432	AO1 signal selection	0: Motor speed (1 V/1000 [mm/s]/[rpm]) 1: Speed reference (1 V/1000 [mm/s]/[rpm]) 2: Torque reference (1 V/100 x rated torque) 3: Position deviation (0.5 mV/1 reference unit) 4: Position deviation (0.5 mV/1 encoder unit) 5: Position reference speed (1 V/1000 [mm/s]/[rpm]) 6: Positioning completed 8: AI1 voltage 9: AI2 voltage 10: Defined by H31.05	0	-	Real-time	"H04_en.50" on page 513
H04.51	0x0433	AO1 offset voltage	-10000 mV–10000 mV	0	mV	Real-time	"H04_en.51" on page 514
H04.52	0x0434	AO1 ratio	-99.99 to 99.99	1.00	-	Real-time	"H04_en.52" on page 514

15.6 H05 Position Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.02	0x0502	Pulses per revolution	0 PPR to 4294967295 PPR	0	PPR	At stop	"H05_en.02" on page 514
H05.04	0x0504	First-order low-pass filter time constant	0.0 ms–6553.5 ms	0.0	ms	At stop	"H05_en.04" on page 515
H05.06	0x0506	Moving average filter time constant 1	0.0 ms–128.0 ms	0.0	ms	At stop	"H05_en.06" on page 515
H05.07	0x0507	Electronic gear ratio 1 (numerator)	1 to 1073741824	67108864	-	Real-time	"H05_en.07" on page 515
H05.09	0x0509	Electronic gear ratio 1 (denominator)	1 to 1073741824	10000	-	Real-time	"H05_en.09" on page 515
H05.11	0x050B	Electronic gear ratio 2 (numerator)	1 to 1073741824	67108864	-	Real-time	"H05_en.11" on page 515
H05.13	0x050D	Electronic gear ratio 2 (denominator)	1 to 1073741824	10000	-	Real-time	"H05_en.13" on page 516
H05.16	0x0510	Clear action	0: Clear the position deviation upon S-ON OFF or a fault 2: Clear the position deviation when the drive is in the non-RUN state or function DI35 is active.	0	-	At stop	"H05_en.16" on page 516
H05.17	0x0511	Number of encoder frequency-division pulses	0 PPR to 4194303 PPR	2500	PPR	At stop	"H05_en.17" on page 516
H05.19	0x0513	Speed feedforward control	0: No speed feedforward 1: Internal speed feedforward 2: H05.72 3: Zero phase	1	-	At stop	"H05_en.19" on page 516
H05.21	0x0515	Positioning completed threshold	1 to 65535	46976	encoder unit	Real-time	"H05_en.21" on page 517
H05.30	0x051E	Homing enable selection	0: Disabled 6: Current position as home	0	-	Real-time	"H05_en.30" on page 517
H05.35	0x0523	Home search time limit	0 to 65535	10000	-	Real-time	"H05_en.35" on page 518
H05.36	0x0524	Mechanical home offset	-2147483648 to 2147483647	0	reference unit	Real-time	"H05_en.36" on page 518

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.38	0x0526	Frequency-division output source	0: Encoder frequency-division output 2: Frequency-division output inhibited 3: Second encoder frequency-division output 4: H31-01 reference frequency output	0	-	Real-time	"H05_en.38" on page 518
H05.39	0x0527	Electronic gear ratio switchover condition	0: Switchover after position reference is kept 0 for 2.5 ms 1: Switched in real time	0	-	At stop	"H05_en.39" on page 518
H05.40	0x0528	Mechanical home offset and action upon overtravel	0: Mechanical home offset (H05.36) is the coordinate after homing 1: Mechanical home offset (H05.36) is the relative offset after homing	0	-	Real-time	"H05_en.40" on page 519
H05.41	0x0529	Z pulse output polarity	bit0: Frequency-division Z output polarity 0: Positive (high level upon active Z pulse) 1: Negative (low level upon active Z pulse) bit1: OCZ output polarity 0: Positive (high level upon active Z pulse) 1: Negative (low level upon active Z pulse) bit2: Inner loop probe Z signal source 0: Motor Z signal 1: Frequency-division output Z signal	0x1	-	At stop	"H05_en.41" on page 519
H05.44	0x052C	Numerator of frequency-division output reduction ratio	1 to 16383	1	-	At stop	"H05_en.44" on page 520
H05.45	0x052D	Denominator of frequency-division output reduction ratio	1 to 8191	1	-	At stop	"H05_en.45" on page 520
H05.46	0x052E	DI selection of multi-turn frequency-division Z starting point	0: No operation 1: DI1 2: DI2 3: DI3 4: DI4 5: DI5	0	-	Real-time	"H05_en.46" on page 520
H05.47	0x052F	Frequency-division Z pulse width	0μs to 400μs	0	μs	Real-time	"H05_en.47" on page 521
H05.48	0x0530	Frequency-division output dead zone setting threshold	0 to 255	0	encoder unit	Real-time	"H05_en.48" on page 521

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H05.50	0x0532	Mechanical gear ratio in absolute position rotation mode (numerator)	1 to 65535	1	-	At stop	"H05_en.50" on page 521
H05.51	0x0533	Mechanical gear ratio in absolute position rotation mode (denominator)	1 to 65535	1	-	At stop	"H05_en.51" on page 521
H05.52	0x0534	Pulses per revolution of the load in absolute position rotation mode (low 32 bits)	0 to 4294967295	0	encoder unit	At stop	"H05_en.52" on page 522
H05.54	0x0536	Pulses per revolution of the load in absolute position rotation mode (high 32 bits)	0 to 4294967295	0	encoder unit	At stop	"H05_en.54" on page 522
H05.58	0x053A	Torque threshold in homing upon hit-and-stop	0.0% to 400.0%	100.0	%	Real-time	"H05_en.58" on page 522
H05.66	0x0542	Homing time unit	0: 1 ms 1: 10 ms 2: 100 ms	2	-	At stop	"H05_en.66" on page 522
H05.70	0x0546	Moving average filter time constant 2	0.0 ms–1000.0 ms	0.0	ms	At stop	"H05_en.70" on page 523
H05.71	0x0547	Motor Z signal width	1 ms–100 ms	4	ms	Real-time	"H05_en.71" on page 523
H05.72	0x0548	External speed feedforward source selection	0: No definition 1: AI1 2: AI2	0	-	Real-time	"H05_en.72" on page 523
H05.74	0x054A	S-curve mode selection	0: 1 filter on 1: 2 filters on, filter time 5:1 2: 2 filters on, filter time 2:1 3: 2 filters on, filter time 1:1 4: 3 filters on, filter time 4:1:1 5: 3 filters on, filter time 2:1:1 6: 3 filters on, filter time 1:1:1	0	-	At stop	"H05_en.74" on page 523

15.7 H06 Speed Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H06.04	0x0604	DI jog speed reference	0 rpm to 10000 rpm	150	rpm	Real-time	"H06_en.04" on page 524
H06.05	0x0605	Acc. ramp time of speed reference	0 ms–65535 ms	0	ms	Real-time	"H06_en.05" on page 524
H06.06	0x0606	Dec. ramp time of speed reference	0 ms–65535 ms	0	ms	Real-time	"H06_en.06" on page 525
H06.07	0x0607	Maximum speed limit	0 rpm to 10000 rpm	7000	rpm	Real-time	"H06_en.07" on page 525
H06.08	0x0608	Forward speed threshold	0 rpm to 10000 rpm	7000	rpm	Real-time	"H06_en.08" on page 525
H06.09	0x0609	Reverse speed threshold	0 rpm to 10000 rpm	7000	rpm	Real-time	"H06_en.09" on page 525
H06.10	0x060A	Deceleration unit in emergency stop	0: Multiplied by 1 1: Multiplied by 10 2: Multiplied by 100	0	-	At stop	"H06_en.10" on page 525
H06.11	0x060B	Torque feedforward control	0: No torque feedforward 1: Internal torque feedforward	1	-	Real-time	"H06_en.11" on page 526
H06.12	0x060C	Acceleration ramp time of jog speed	0 ms–65535 ms	10	ms	Real-time	"H06_en.12" on page 526
H06.13	0x060D	Speed feedforward smoothing filter	0μs to 65535μs	0	μs	Real-time	"H06_en.13" on page 526
H06.15	0x060F	Zero clamp speed threshold	0 rpm to 10000 rpm	10	rpm	Real-time	"H06_en.15" on page 527
H06.16	0x0610	Threshold of TGON (motor rotation) signal	0[mm/s]/[rpm]–1000[mm/s]/[rpm]	20	[mm/s]/[rpm]	Real-time	"H06_en.16" on page 527
H06.17	0x0611	Threshold of V-Cmp (speed matching) signal	0[mm/s]/[rpm]–100[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	"H06_en.17" on page 527
H06.18	0x0612	Threshold of speed reach signal	20[mm/s]/[rpm]–10000[mm/s]/[rpm]	1000	[mm/s]/[rpm]	Real-time	"H06_en.18" on page 527
H06.19	0x0613	Threshold of zero speed output signal	1[mm/s]/[rpm]–10000[mm/s]/[rpm]	10	[mm/s]/[rpm]	Real-time	"H06_en.19" on page 527
H06.28	0x061C	Cogging torque ripple compensation	0: Disabled 1: Enabled	1	-	At stop	"H06_en.28" on page 528
H06.40	0x0628	Ramp 1 deceleration time	0 ms–65535 ms	0	ms	Real-time	"H06_en.40" on page 528

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H06.41	0x0629	Ramp 2 deceleration time	0 ms–65535 ms	0	ms	Real-time	"H06_en.41" on page 528
H06.42	0x062A	Deceleration time override of ramp 1/ PN ramp stop	0: 1 x 1 time unit 1: 10 x time unit	0	-	At stop	"H06_en.42" on page 528
H06.43	0x062B	Ramp 2/PN quick stop deceleration time ratio	0: 1 x 1 time unit 1: 10 x time unit	0	-	At stop	"H06_en.43" on page 529

15.8 H07 Torque Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H07.05	0x0705	Torque reference filter time constant 1	0.00 ms–30.00 ms	0.50	ms	Real-time	"H07_en.05" on page 529
H07.06	0x0706	Torque reference filter time constant 2	0.00 ms–30.00 ms	0.27	ms	Real-time	"H07_en.06" on page 529
H07.07	0x0707	Torque Limit source	0: Positive/Negative internal torque limit 2: T_LMT limit 5: PN torque limit	0	-	Real-time	"H07_en.07" on page 529
H07.08	0x0708	T-LMT selection	1: AI1 2: AI2	1	-	Real-time	"H07_en.08" on page 530
H07.09	0x0709	Positive internal torque limit	0.0% to 400.0%	350.0	%	Real-time	"H07_en.09" on page 530
H07.10	0x070A	Negative internal torque limit	0.0% to 400.0%	350.0	%	Real-time	"H07_en.10" on page 530
H07.15	0x070F	Emergency-stop torque	0.0% to 400.0%	100.0	%	Real-time	"H07_en.15" on page 530
H07.17	0x0711	Speed limit source	0: Internal speed limit 1: V-LMT	0	-	Real-time	"H07_en.17" on page 531
H07.18	0x0712	V-LMT selection	1: AI1 2: AI2	1	-	Real-time	"H07_en.18" on page 531
H07.19	0x0713	Positive speed limit/Speed limit 1 in torque control	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/ [rpm]	Real-time	"H07_en.19" on page 531
H07.20	0x0714	Negative speed limit/Speed limit 2 in torque control	0[mm/s]/[rpm]–10000[mm/s]/[rpm]	3000	[mm/s]/ [rpm]	Real-time	"H07_en.20" on page 531
H07.24	0x0718	Field weakening depth	60% to 115%	115	%	Real-time	"H07_en.24" on page 532

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H07.25	0x0719	Max. permissible demagnetizing current	0% to 300%	100	%	Real-time	"H07_en.25" on page 532
H07.26	0x071A	Field weakening selection	0: Disabled 1: Enabled	0	-	At stop	"H07_en.26" on page 532
H07.27	0x071B	Flux weakening gain	0.001 kHz–1.000 kHz	0.030	kHz	Real-time	"H07_en.27" on page 532
H07.28	0x071C	Speed of flux weakening point	0 to 65535	0	-	Unchangeable	"H07_en.28" on page 533
H07.35	0x0723	Torque output correction enabled	0 to 3	0	-	At stop	"H07_en.35" on page 533
H07.36	0x0724	Time constant of low-pass filter 2	0.00 ms–10.00 ms	0.00	ms	Real-time	"H07_en.36" on page 533
H07.37	0x0725	Torque reference filter selection	0: First-order filter1: Biquad filter	0	-	Real-time	"H07_en.37" on page 533
H07.38	0x0726	Biquad filter attenuation ratio	0 to 50	16	-	Real-time	"H07_en.38" on page 534
H07.40	0x0728	Speed limit threshold in torque control mode	0 ms–300 ms	10	ms	Real-time	"H07_en.40" on page 534
H07.42	0x072A	Biquad low pass filter damping coefficient	0.001 to 10.000	1.000	-	Real-time	"H07_en.42" on page 534

15.9 H08 Gain Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.00	0x0800	Speed loop gain	0.0 Hz–2000.0 Hz	40.0	Hz	Real-time	"H08_en.00" on page 534
H08.01	0x0801	Speed loop integral time constant	0.15 ms–512.00 ms	19.89	ms	Real-time	"H08_en.01" on page 535
H08.02	0x0802	Position loop gain	0.0 Hz–2000.0 Hz	64.0	Hz	Real-time	"H08_en.02" on page 535
H08.03	0x0803	2nd speed loop gain	0.1 Hz–2000.0 Hz	75.0	Hz	Real-time	"H08_en.03" on page 535
H08.04	0x0804	2nd speed loop integral time constant	0.15 ms–512.00 ms	10.61	ms	Real-time	"H08_en.04" on page 535
H08.05	0x0805	2nd position loop gain	0.1 Hz–2000.0 Hz	120.0	Hz	Real-time	"H08_en.05" on page 536

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.08	0x0808	2nd gain mode setting	0: Fixed to the 1st group of gains, P/PI switched through external DI1:Switched between the 1st and 2nd group of gains as defined by H08.09	1	-	Real-time	"H08_en.08" on page 536
H08.09	0x0809	Gain switchover condition	0: Fixed to the 1st gain set (PS) 1: Switched as defined by Func3 of DI 2: Torque reference too large (PS) 3: Speed reference too large (PS) 4: Speed reference change rate too large (PS) 5: Speed reference low/high speed threshold (PS) 6: Position deviation too large (P) 7: Position reference available (P) 8: Positioning unfinished (P) 9: Actual speed (P) 10: Position reference + Actual speed (P)	0	-	Real-time	"H08_en.09" on page 536
H08.10	0x080A	Gain switchover delay	0.0 ms–1000.0 ms	5.0	ms	Real-time	"H08_en.10" on page 537
H08.11	0x080B	Gain switchover level	0 to 20000	50	-	Real-time	"H08_en.11" on page 537
H08.12	0x080C	Gain switchover hysteresis	0 to 20000	30	-	Real-time	"H08_en.12" on page 537
H08.13	0x080D	Position gain switchover time	0.0 ms–1000.0 ms	3.0	ms	Real-time	"H08_en.13" on page 538
H08.15	0x080F	Load moment of inertia ratio	0.00 to 120.00	1.00	-	Real-time	"H08_en.15" on page 538
H08.17	0x0811	Zero phase delay	0.0 ms–4.0 ms	0.0	ms	Real-time	"H08_en.17" on page 538
H08.18	0x0812	Time constant of speed feedforward filter	0.00 ms–64.00 ms	0.50	ms	Real-time	"H08_en.18" on page 538
H08.19	0x0813	Speed feedforward gain	0.0% to 100.0%	0.0	%	Real-time	"H08_en.19" on page 539
H08.20	0x0814	Torque feedforward filter time constant	0.00 ms–64.00 ms	0.50	ms	Real-time	"H08_en.20" on page 539
H08.21	0x0815	Torque feedforward gain	0.0% to 300.0%	0.0	%	Real-time	"H08_en.21" on page 539

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.22	0x0816	Speed feedback filtering option	0: Inhibited 1: 2 times 2: 4 times 3: 8 times 4: 16 times	0	-	At stop	"H08_en.22" on page 540
H08.23	0x0817	Cutoff frequency of speed feedback low-pass filter	100 Hz–8000 Hz	8000	Hz	Real-time	"H08_en.23" on page 540
H08.24	0x0818	PDFF control coefficient	0.0% to 200.0%	100.0	%	Real-time	"H08_en.24" on page 540
H08.25	0x0819	Speed measurement method	0: M-method 1: MT-method	0	-	At stop	"H08_en.25" on page 541
H08.27	0x081B	Speed observer cutoff frequency	50 Hz–600 Hz	170	Hz	Real-time	"H08_en.27" on page 541
H08.28	0x081C	Speed observer inertia correction coefficient	1% to 1600%	100	%	Real-time	"H08_en.28" on page 541
H08.29	0x081D	Speed observer filter time	0.00 ms–10.00 ms	0.80	ms	Real-time	"H08_en.29" on page 542
H08.31	0x081F	Disturbance cutoff frequency	1 Hz–4000 Hz	600	Hz	Real-time	"H08_en.31" on page 542
H08.32	0x0820	Disturbance compensation gain	0% to 100%	0	%	Real-time	"H08_en.32" on page 542
H08.33	0x0821	Disturbance observer inertia correction coefficient	1% to 1600%	100	%	Real-time	"H08_en.33" on page 542
H08.37	0x0825	Phase modulation for medium-frequency jitter suppression 2	-90° to 90°	0	°	Real-time	"H08_en.37" on page 543
H08.38	0x0826	Medium-frequency suppression 2 frequency	0 Hz–1000 Hz	0	Hz	Real-time	"H08_en.38" on page 543
H08.39	0x0827	Compensation gain of medium-frequency jitter suppression 2	0% to 300%	0	%	Real-time	"H08_en.39" on page 543
H08.40	0x0828	Speed observer selection	0: Disabled 1: Enabled	0	-	Real-time	"H08_en.40" on page 543
H08.42	0x082A	Model control selection	0: Disabled 1: Enabled 2: Reserved	0	-	Real-time	"H08_en.42" on page 544

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.43	0x082B	Model gain	0.1 to 2000.0	40.0	-	Real-time	"H08_en.43" on page 544
H08.46	0x082E	Feedforward value	0.0 to 102.4	95.0	-	Real-time	"H08_en.46" on page 544
H08.53	0x0835	Medium- and low-frequency jitter suppression frequency 3	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	"H08_en.53" on page 544
H08.54	0x0836	Medium- and low-frequency jitter suppression compensation 3	0% to 200%	0	%	Real-time	"H08_en.54" on page 545
H08.56	0x0838	Medium- and low-frequency jitter suppression phase modulation 3	0% to 600%	100	%	Real-time	"H08_en.56" on page 545
H08.59	0x083B	Medium- and low-frequency jitter suppression frequency 4	0.0 Hz–300.0 Hz	0.0	Hz	Real-time	"H08_en.59" on page 545
H08.60	0x083C	Medium- and low-frequency jitter suppression compensation 4	0% to 200%	0	%	Real-time	"H08_en.60" on page 545
H08.61	0x083D	Medium- and low-frequency jitter suppression phase modulation 4	0% to 600%	100	%	Real-time	"H08_en.61" on page 545
H08.62	0x083E	Position loop integral time constant	0.15 to 512.00	512.00	-	Real-time	"H08_en.62" on page 546
H08.63	0x083F	2nd position loop integral time constant	0.15 to 512.00	512.00	-	Real-time	"H08_en.63" on page 546
H08.64	0x0840	Speed observer feedback source	0: Observer output speed 1: Observer observed speed	0	-	Real-time	"H08_en.64" on page 546
H08.65	0x0841	Zero deviation control selection	0: Disabled 1: Enabled	0	-	Real-time	"H08_en.65" on page 546
H08.66	0x0842	Zero deviation control position average filter	0.0 ms–320.0 ms	5.0	ms	At stop	"H08_en.66" on page 547

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H08.68	0x0844	Speed feedforward of zero deviation control	0.0% to 100.0%	100.0	%	Real-time	"H08_en.68" on page 547
H08.69	0x0845	Torque feedforward of zero deviation control	0.0% to 100.0%	100.0	%	Real-time	"H08_en.69" on page 547

15.10 H09 Auto-tuning Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.00	0x0900	Auto-adjustment mode	0: Disabled, manual gain tuning required 1: Enabled, gain parameters generated automatically based on the stiffness level 2: Positioning mode, gain parameters generated automatically based on the stiffness level 3: Interpolation mode+Inertia auto-tuning 4: Normal mode+Inertia auto-tuning 6: Quick positioning mode+Inertia auto-tuning	4	-	Real-time	"H09_en.00" on page 547
H09.01	0x0901	Stiffness level selection	0 to 41	15	-	Real-time	"H09_en.01" on page 548
H09.02	0x0902	Mode selection of adaptive notch	0: Adaptive notch no longer updated 1: One adaptive notch activated (3rd notch) 2: Two adaptive notches activated (3rd and 4th notches) 3: Resonance point tested only (displayed in H09.24) 4: Adaptive notch cleared, values of 3rd and 4th notches restored to default	0	-	Real-time	"H09_en.02" on page 548
H09.03	0x0903	Online inertia auto-tuning mode	0: Disabled 1: Enabled, changing slowly 2: Enabled, changing normally 3: Enabled, changing quickly	0	-	Real-time	"H09_en.03" on page 549
H09.05	0x0905	Offline inertia auto-tuning mode	0: Bi-directional 1: Unidirectional	0	-	At stop	"H09_en.05" on page 549
H09.06	0x0906	Max. speed of inertia auto-tuning	100[mm/s]/[rpm]–1000[mm/s]/[rpm]	500	[mm/s]/[rpm]	At stop	"H09_en.06" on page 549

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.07	0x0907	Time constant for accelerating to max. speed during inertia auto-tuning	10 ms–5000 ms	125	ms	At stop	"H09_en.07" on page 549
H09.08	0x0908	Interval time after an individual inertia auto-tuning	50 ms–10000 ms	800	ms	At stop	"H09_en.08" on page 550
H09.09	0x0909	Motor rotating distance per inertia auto-tuning	0.00[mm]/[Rev]–100.00[mm]/[Rev]	1.00	[mm]/[Rev]	Real-time	"H09_en.09" on page 550
H09.11	0x090B	Vibration threshold	0.0% to 100.0%	5.0	%	Real-time	"H09_en.11" on page 550
H09.12	0x090C	Frequency of the 1st notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.12" on page 551
H09.13	0x090D	Width level of the 1st notch	0 to 20	2	-	Real-time	"H09_en.13" on page 551
H09.14	0x090E	Depth level of the 1st notch	0 to 99	0	-	Real-time	"H09_en.14" on page 551
H09.15	0x090F	Frequency of the 2nd notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.15" on page 551
H09.16	0x0910	Width level of the 2nd notch	0 to 20	2	-	Real-time	"H09_en.16" on page 552
H09.17	0x0911	Depth level of the 2nd notch	0 to 99	0	-	Real-time	"H09_en.17" on page 552
H09.18	0x0912	Frequency of the 3rd notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.18" on page 552
H09.19	0x0913	Width level of the 3rd notch	0 to 20	2	-	Real-time	"H09_en.19" on page 552
H09.20	0x0914	Depth level of the 3rd notch	0 to 99	0	-	Real-time	"H09_en.20" on page 552
H09.21	0x0915	Frequency of the 4th notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.21" on page 553
H09.22	0x0916	Width level of the 4th notch	0 to 20	2	-	Real-time	"H09_en.22" on page 553
H09.23	0x0917	Depth level of the 4th notch	0 to 99	0	-	Real-time	"H09_en.23" on page 553
H09.24	0x0918	Auto-tuned resonance frequency	0 Hz–5000 Hz	0	Hz	Unchangeable	"H09_en.24" on page 553
H09.32	0x0920	Gravity compensation value	-100.0% to 100.0%	0.0	%	Real-time	"H09_en.32" on page 553

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.33	0x0921	Positive friction compensation value	0.0% to 100.0%	0.0	%	Real-time	"H09_en.33" on page 554
H09.34	0x0922	Negative friction compensation value	-100.0% to 0.0%	0.0	%	Real-time	"H09_en.34" on page 554
H09.35	0x0923	Friction compensation speed	0.0 to 20.0	2.0	-	Real-time	"H09_en.35" on page 554
H09.36	0x0924	Friction compensation speed	0: Slow mode+Speed reference 1: Slow mode+Model speed 2: Slow mode+Speed feedback 3: Slow mode+Observe speed 16: Quick mode +Speed reference 17: Quick mode +Model speed 18: Quick mode +Speed feedback 19: Quick mode+Observe speed	0x0	-	Real-time	"H09_en.36" on page 554
H09.37	0x0925	Vibration monitoring time	0s to 65535s	300	s	Real-time	"H09_en.37" on page 555
H09.38	0x0926	Frequency of low-frequency resonance suppression 1 at the mechanical end	1.0 Hz–100.0 Hz	100.0	Hz	At stop	"H09_en.38" on page 555
H09.39	0x0927	Low-frequency resonance suppression 1 at the mechanical end	0 to 3	2	-	At stop	"H09_en.39" on page 555
H09.41	0x0929	Frequency of the 5th notch	50 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.41" on page 556
H09.42	0x092A	Width level of the 5th notch	0 to 20	2	-	Real-time	"H09_en.42" on page 556
H09.43	0x092B	Depth level of the 5th notch	0 to 99	0	-	Real-time	"H09_en.43" on page 556
H09.44	0x092C	Frequency of low-frequency resonance suppression 2 at the mechanical end	0.0 Hz–200.0 Hz	0.0	Hz	At stop	"H09_en.44" on page 556

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.45	0x092D	Responsiveness of low-frequency resonance suppression 2 at mechanical load end	0.01 to 10.00	1.00	-	At stop	"H09_en.45" on page 557
H09.47	0x092F	Width of low-frequency resonance suppression 2 at mechanical load end	0.00 to 2.00	1.00	-	At stop	"H09_en.47" on page 557
H09.49	0x0931	Frequency of low-frequency resonance suppression 3 at the mechanical end	0.0 Hz–200.0 Hz	0.0	Hz	At stop	"H09_en.49" on page 557
H09.50	0x0932	Responsiveness of low-frequency resonance suppression 3 at mechanical load end	0.01 to 10.00	1.00	-	At stop	"H09_en.50" on page 557
H09.52	0x0934	Width of low-frequency resonance suppression 3 at mechanical load end	0.00 to 2.00	1.00	-	At stop	"H09_en.52" on page 557
H09.54	0x0936	Resonance detection torque threshold	0.0% to 300.0%	50.0	%	Real-time	"H09_en.54" on page 558
H09.56	0x0938	Max. overshoot allowed by ETune	0 to 65535	2936	-	Real-time	"H09_en.56" on page 558
H09.57	0x0939	STune resonance suppression switchover frequency	0 Hz–4000 Hz	650	Hz	Real-time	"H09_en.57" on page 558
H09.58	0x093A	STune resonance suppression reset selection	0: Disabled 1: Enabled	0	-	Real-time	"H09_en.58" on page 558
H09.62	0x093E	Stune stop delay judgment	0.00 ms–50.00 ms	1.00	ms	Real-time	"H09_en.62" on page 559
H09.63	0x093F	STune quick convergence speed	0.00 to 50.00	1.00	-	Real-time	"H09_en.63" on page 559

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H09.71	0x0947	Starting frequency	0 Hz–8000 Hz	15	Hz	Real-time	"H09_en.71" on page 559
H09.72	0x0948	End frequency	0 Hz–8000 Hz	8000	Hz	Real-time	"H09_en.72" on page 559
H09.73	0x0949	Frequency subdivision	0 to 500	50	-	Real-time	"H09_en.73" on page 559
H09.74	0x094A	Excitation amplitude	0.0% to 400.0%	15.0	%	Real-time	"H09_en.74" on page 560
H09.75	0x094B	Starting frequency 2	0 Hz–8000 Hz	500	Hz	Real-time	"H09_en.75" on page 560
H09.76	0x094C	Frequency subdivision 2	0 to 1000	500	-	Real-time	"H09_en.76" on page 560
H09.77	0x094D	Biquad filter mode	0: Disabled 1: First-order low-pass 2: Second-order low-pass 3: Notch 4: Lead-lag 5: User-defined	0	-	Real-time	"H09_en.77" on page 560
H09.78	0x094E	Biquad filter numerator frequency	0 Hz–16000 Hz	8000	Hz	Real-time	"H09_en.78" on page 561
H09.79	0x094F	Biquad filter numerator damping coefficient	0.001 to 10.000	1.000	-	Real-time	"H09_en.79" on page 561
H09.80	0x0950	Biquad filter denominator frequency	0 Hz–16000 Hz	8000	Hz	Real-time	"H09_en.80" on page 561
H09.81	0x0951	Biquad filter denominator damping coefficient	0.001 to 10.000	1.000	-	Real-time	"H09_en.81" on page 561

15.11 H0A Fault and Protection Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.00	0x0A00	Power input phase loss and failure protection	0: Enable 1: Disable	0	-	Real-time	"H0A_en.00" on page 562
H0A.01	0x0A01	Absolute position limit	0: Disabled 1: Enabled 2: Enabled after homing	0	-	Real-time	"H0A_en.01" on page 562

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.04	0x0A04	Motor overload protection gain	50 to 300	100	-	Real-time	"H0A_en.04" on page 562
H0A.08	0x0A08	Overspeed threshold	0[mm/s]/[rpm] to 20000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	"H0A_en.08" on page 563
H0A.10	0x0A0A	Threshold of excessive local position deviation	0 to 4294967295	219895614	encoder unit	Real-time	"H0A_en.10" on page 563
H0A.12	0x0A0C	Runaway protection enable	0: Disable 1: Enable	1	-	Real-time	"H0A_en.12" on page 563
H0A.13	0x0A0D	Angle auto-tuning mode	0: pre-positioning 1: Inching 2: Voltage injection 8: Closed-loop pre-positioning 9: Position locking	0	-	At stop	"H0A_en.13" on page 563
H0A.18	0x0A12	IGBT over-temperature threshold	120°C to 175°C	140	°C	Real-time	"H0A_en.18" on page 564
H0A.19	0x0A13	Filter time constant of touch probe 1	0.00µs to 6.30µs	2.00	µs	Real-time	"H0A_en.19" on page 564
H0A.20	0x0A14	Filter time constant of touch probe 2	0.00µs to 6.30µs	2.00	µs	Real-time	"H0A_en.20" on page 564
H0A.21	0x0A15	STO function display selection	0 to 5	0	-	Real-time	"H0A_en.21" on page 565
H0A.23	0x0A17	TZ signal filter time	0 ns–31 ns	15	25 ns	At stop	"H0A_en.23" on page 565
H0A.25	0x0A19	Speed display DO low-pass filter time	0 ms–5000 ms	0	ms	At stop	"H0A_en.25" on page 565
H0A.26	0x0A1A	Motor overload detection	0: Show motor overload alarm (A909.0) and fault (E620.0) 1: Hide motor overload alarm (E909.0) and fault (E620.0)	0	-	Real-time	"H0A_en.26" on page 566
H0A.27	0x0A1B	Average filter time for speed display DO	0 ms–100 ms	50	ms	At stop	"H0A_en.27" on page 566
H0A.28	0x0A1C	Quadrature encoder filter time	0 ns–255 ns	2	25 ns	At stop	"H0A_en.28" on page 566
H0A.29	0x0A1D	Fully closed-loop encoder (ABZ) filter time	bit0–bit7: Fully closed loop encoder (ABZ) pulse signal filtering time bit8–bit15: Fully closed loop encoder (ABZ) wire breakage filter time	4111	25 ns	At stop	"H0A_en.29" on page 566

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.32	0x0A20	Time threshold for locked motor overheat protection	10 ms–65535 ms	200	ms	Real-time	"H0A_en.32" on page 567
H0A.33	0x0A21	Locked motor overheat protection	0: Disabled 1: Enabled	1	-	Real-time	"H0A_en.33" on page 567
H0A.36	0x0A24	Encoder multi-turn overflow fault selection	0: Not hide 1: Hide	0	-	Real-time	"H0A_en.36" on page 567
H0A.40	0x0A28	Compensation function selection	bit0: Overtravel compensation 0: Enabled 1: Disabled bit1: Touch probe rising edge compensation 0: Disabled 1: Enabled bit2: Touch probe falling edge compensation 0: Disabled 1: Enabled bit3: Touch probe scheme 0: New scheme 1: Old scheme (same as SV660N) bit4: Probe 2 separate compensation time enable 0: Disabled 1: Enabled	0x6	-	At stop	"H0A_en.40" on page 567
H0A.41	0x0A29	Forward position of software position limit	-2147483648 to 2147483647	2147483647	reference unit	At stop	"H0A_en.41" on page 568
H0A.43	0x0A2B	Reverse position of software position limit	-2147483648 to 2147483647	-2147483648	reference unit	At stop	"H0A_en.43" on page 568
H0A.50	0x0A32	Encoder communication fault tolerance threshold	0 to 31	31	-	Real-time	"H0A_en.50" on page 569
H0A.51	0x0A33	Phase loss detection filter times	3 ms–36 ms	20	55 ms	Real-time	"H0A_en.51" on page 569
H0A.52	0x0A34	Encoder temperature protection threshold	0°C to 175°C	120	°C	Real-time	"H0A_en.52" on page 569
H0A.53	0x0A35	Probe DI ON compensation time	-3000 ns–3000 ns	200	25 ns	Real-time	"H0A_en.53" on page 569

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.54	0x0A36	Probe DI OFF compensation time	-3000 ns–3000 ns	1512	25 ns	Real-time	"H0A_en.54" on page 570
H0A.55	0x0A37	Runaway current threshold	100.0% to 400.0%	200.0	%	Real-time	"H0A_en.55" on page 570
H0A.56	0x0A38	Fault reset delay	0 ms–60000 ms	10000	ms	Real-time	"H0A_en.56" on page 570
H0A.57	0x0A39	Runaway speed threshold	1[mm/s]/[rpm] to 1000[mm/s]/[rpm]	50	[mm/s]/[rpm]	Real-time	"H0A_en.57" on page 570
H0A.58	0x0A3A	Runaway speed filter time	0.1 ms–100.0 ms	2.0	ms	Real-time	"H0A_en.58" on page 570
H0A.59	0x0A3B	Runaway protection detection time	10 ms–1000 ms	30	ms	Real-time	"H0A_en.59" on page 571
H0A.60	0x0A3C	Black box function mode	0: Disable 1: Any fault 2: Designated fault 3: Triggered based on designated condition	1	-	Real-time	"H0A_en.60" on page 571
H0A.61	0x0A3D	Designated fault code	0.0 to 6553.5	0.0	-	Real-time	"H0A_en.61" on page 571
H0A.62	0x0A3E	Trigger source	0 to 31	0	-	Real-time	"H0A_en.62" on page 571
H0A.63	0x0A3F	Trigger level	-2147483648 to 2147483647	0	-	Real-time	"H0A_en.63" on page 572
H0A.65	0x0A41	Trigger level	0: Rising edge 1: Equal 2: Falling edge 3: Edge-triggered	0	-	Real-time	"H0A_en.65" on page 572
H0A.66	0x0A42	Trigger position	0% to 100%	75	%	Real-time	"H0A_en.66" on page 572
H0A.67	0x0A43	Sampling frequency	0: Current loop 1: Position loop 2: Main cycle	0	-	Real-time	"H0A_en.67" on page 572
H0A.70	0x0A46	Overspeed threshold 2	0[mm/s]/[rpm] to 20000[mm/s]/[rpm]	0	[mm/s]/[rpm]	Real-time	"H0A_en.70" on page 573
H0A.71	0x0A47	Internal function switch	0 to 65535	4098	-	Real-time	"H0A_en.71" on page 573
H0A.72	0x0A48	Maximum stop time in ramp-to-stop	0 ms–65535 ms	10000	ms	At stop	"H0A_en.72" on page 574
H0A.73	0x0A49	STO 24 V disconnection filter time	1 ms–5 ms	1	ms	Real-time	"H0A_en.73" on page 574

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0A.74	0x0A4A	Filter time for two inconsistent STO channels	1 ms–1000 ms	100	ms	Real-time	"H0A_en.74" on page 575
H0A.75	0x0A4B	Servo OFF delay after STO triggered	0 ms–25 ms	20	ms	Real-time	"H0A_en.75" on page 575
H0A.81	0x0A51	Voltage drop protection enable	0: No operation 1: Host controller executes torque limit 2: Servo executes torque limit	0	-	At stop	"H0A_en.81" on page 575
H0A.82	0x0A52	Voltage drop torque limit	0.0% to 100.0%	50.0	%	Real-time	"H0A_en.82" on page 575
H0A.83	0x0A53	Torque limit cancel time	0 ms–1000 ms	100	ms	Real-time	"H0A_en.83" on page 576
H0A.84	0x0A54	Instantaneous power failure holding time	20 ms–50000 ms	1000	ms	Real-time	"H0A_en.84" on page 576
H0A.88	0x0A58	BiSS-C data alarm enabled	0 to 1	0	-	At stop	"H0A_en.88" on page 576
H0A.89	0x0A59	Correct state of BiSS-C data	0 to 31	1	-	At stop	"H0A_en.89" on page 576
H0A.90	0x0A5A	Speed display low-pass filter time	0 ms–100 ms	0	ms	At stop	"H0A_en.90" on page 576
H0A.91	0x0A5B	Moving average filter time for torque display values	0 ms–100 ms	0	ms	At stop	"H0A_en.91" on page 577
H0A.92	0x0A5C	Moving average filter time for position display values	0 ms–100 ms	0	ms	At stop	"H0A_en.92" on page 577
H0A.93	0x0A5D	Low-pass filter time for voltage display values	0 ms–250 ms	0	ms	At stop	"H0A_en.93" on page 577
H0A.94	0x0A5E	Low-pass filter time for thermal display values	0 ms–250 ms	0	ms	At stop	"H0A_en.94" on page 577

15.12 H0b Monitoring Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.00	0x0B00	Motor speed actual value	-32767[mm/s]/[rpm] to 32767[mm/s]/[rpm]	0	[mm/s]/[rpm]	Unchangeable	"H0b_en.00" on page 578
H0b.01	0x0B01	Speed reference	-32767[mm/s]/[rpm] to 32767[mm/s]/[rpm]	0	[mm/s]/[rpm]	Unchangeable	"H0b_en.01" on page 578
H0b.02	0x0B02	Internal torque reference	-3276.7% to 3276.7%	0.0	%	Unchangeable	"H0b_en.02" on page 578
H0b.03	0x0B03	Input (DI) signal monitoring	0 to 65535	0	-	Unchangeable	"H0b_en.03" on page 578
H0b.05	0x0B05	Output (DO) signal monitoring	0 to 65535	0	-	Unchangeable	"H0b_en.05" on page 579
H0b.07	0x0B07	Absolute position counter	-2147483648 to 2147483647	0	reference unit	Unchangeable	"H0b_en.07" on page 579
H0b.09	0x0B09	Mechanical angle	0.0° to 360.0°	0.0	°	Unchangeable	"H0b_en.09" on page 579
H0b.10	0x0B0A	Electrical angle	0.0° to 360.0°	0.0	°	Unchangeable	"H0b_en.10" on page 579
H0b.12	0x0B0C	Average load ratio	0.0% to 800.0%	0.0	%	Unchangeable	"H0b_en.12" on page 580
H0b.15	0x0B0F	Position following error (encoder unit)	-2147483648 to 2147483647	0	encoder unit	Unchangeable	"H0b_en.15" on page 580
H0b.17	0x0B11	Feedback pulse counter	-2147483648 to 2147483647	0	encoder unit	Unchangeable	"H0b_en.17" on page 580
H0b.19	0x0B13	Total power-on time	0.0s–429496729.5s	0.0	s	Unchangeable	"H0b_en.19" on page 580
H0b.21	0x0B15	Displayed AI1 voltage	-327.67 V–327.67 V	0.00	V	Unchangeable	"H0b_en.21" on page 581
H0b.22	0x0B16	Displayed AI2 voltage	-327.67 V–327.67 V	0.00	V	Unchangeable	"H0b_en.22" on page 581
H0b.24	0x0B18	Phase current RMS value	0.0 A to 6553.5 A	0.0	A	Unchangeable	"H0b_en.24" on page 581
H0b.25	0x0B19	Angle obtained upon voltage injection auto-tuning	0.0° to 360.0°	0.0	°	Unchangeable	"H0b_en.25" on page 581
H0b.26	0x0B1A	Bus voltage	0.0 V to 6553.5 V	0.0	V	Unchangeable	"H0b_en.26" on page 582
H0b.27	0x0B1B	Module temperature	-20°C to 200°C	0	°C	Unchangeable	"H0b_en.27" on page 582

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.28	0x0B1C	Absolute encoder fault information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.28" on page 582
H0b.29	0x0B1D	Axis status information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.29" on page 582
H0b.30	0x0B1E	Axis fault information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.30" on page 582
H0b.31	0x0B1F	Encoder fault information	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.31" on page 583
H0b.33	0x0B21	Fault log	0: Present fault 1: Last fault 2: 2nd to last fault 3: 3rd to last fault 4: 4th to last fault 5: 5th to last fault 6: 6th to last fault 7: 7th to last fault 8: 8th to last fault 9: 9th to last fault 10: 10th to last fault 11: 11th to last fault 12: 12th to last fault 13: 13th to last fault 14: 14th to last fault 15: 15th to last fault 16: 16th to last fault 17: 17th to last fault 18: 18th to last fault 19: 19th to last fault	0	-	Real-time	"H0b_en.33" on page 583
H0b.34	0x0B22	Fault code of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.34" on page 584
H0b.35	0x0B23	Timestamp of the selected fault	0.0s–429496729.5s	0.0	s	Unchangeable	"H0b_en.35" on page 584
H0b.37	0x0B25	Motor speed upon occurrence of the selected fault	-32767[mm/s]/[rpm] to 32767[mm/s]/[rpm]	0	[mm/s]/[rpm]	Unchangeable	"H0b_en.37" on page 584
H0b.38	0x0B26	Motor phase U current upon occurrence of the selected fault	-3276.7 A to 3276.7 A	0.0	A	Unchangeable	"H0b_en.38" on page 585
H0b.39	0x0B27	Motor phase V current upon occurrence of the selected fault	-3276.7 A to 3276.7 A	0.0	A	Unchangeable	"H0b_en.39" on page 585

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.40	0x0B28	Bus voltage upon occurrence of the selected fault	0.0 V to 6553.5 V	0.0	V	Unchangeable	"H0b_en.40" on page 585
H0b.41	0x0B29	Input terminal state on selected fault	0 to 65535	0	-	Unchangeable	"H0b_en.41" on page 585
H0b.43	0x0B2B	Output terminal status upon occurrence of the selected fault	0 to 65535	0	-	Unchangeable	"H0b_en.43" on page 585
H0b.45	0x0B2D	Internal fault code	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.45" on page 586
H0b.46	0x0B2E	Absolute encoder fault information given by FPGA upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.46" on page 586
H0b.47	0x0B2F	System status information given by FPGA upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.47" on page 586
H0b.48	0x0B30	System fault information given by FPGA upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.48" on page 586
H0b.49	0x0B31	Encoder fault information upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.49" on page 587
H0b.51	0x0B33	Internal fault code upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.51" on page 587
H0b.52	0x0B34	FPGA timeout fault standard bit upon occurrence of the selected fault	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.52" on page 587
H0b.53	0x0B35	Position following error (reference unit)	-2147483648 to 2147483647	0	reference unit	Unchangeable	"H0b_en.53" on page 587
H0b.55	0x0B37	Actual motor speed 2	-214748364.8[mm/s]/[rpm] to 214748364.7[mm/s]/[rpm]	0.0	[mm/s]/[rpm]	Unchangeable	"H0b_en.55" on page 588

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.57	0x0B39	Control circuit bus voltage	0.0 V to 6553.5 V	0.0	V	Unchangeable	"H0b_en.57" on page 588
H0b.58	0x0B3A	Mechanical absolute position (low 32 bits)	0 to 4294967295	0	encoder unit	Unchangeable	"H0b_en.58" on page 588
H0b.60	0x0B3C	Mechanical absolute position (high 32 bits)	-2147483648 to 2147483647	0	encoder unit	Unchangeable	"H0b_en.60" on page 588
H0b.63	0x0B3F	NotRdy state	0: Normal 1: Control circuit error 2: Main circuit power input error 3: Bus undervoltage 4: Soft start failed 5: Encoder initialization undone 6: Short circuit to ground failed 7: Others 9: Fully closed-loop encoder initialization not completed	0	-	Unchangeable	"H0b_en.63" on page 588
H0b.66	0x0B42	Encoder temperature	-32768°C to 32767°C	0	°C	Unchangeable	"H0b_en.66" on page 589
H0b.67	0x0B43	Load rate of braking resistor	0.0% to 200.0%	0.0	%	Unchangeable	"H0b_en.67" on page 589
H0b.70	0x0B46	Number of absolute encoder revolutions	-32768Rev to 32767Rev	0	Rev	Unchangeable	"H0b_en.70" on page 590
H0b.71	0x0B47	Single-turn position fed back by the absolute encoder	0 to 2147483647	0	encoder unit	Unchangeable	"H0b_en.71" on page 590
H0b.74	0x0B4A	System fault information given by FPGA	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.74" on page 590
H0b.77	0x0B4D	Encoder position (low 32 bits)	0 to 4294967295	0	encoder unit	Unchangeable	"H0b_en.77" on page 590
H0b.79	0x0B4F	Encoder position (high 32 bits)	-2147483648 to 2147483647	0	encoder unit	Unchangeable	"H0b_en.79" on page 590
H0b.81	0x0B51	Single-turn position of the rotary load (low 32 bits)	0 to 4294967295	0	encoder unit	Unchangeable	"H0b_en.81" on page 591
H0b.83	0x0B53	Single-turn position of the rotary load (high 32 bits)	-2147483648 to 2147483647	0	encoder unit	Unchangeable	"H0b_en.83" on page 591

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0b.85	0x0B55	Single-turn position of the rotary load (reference unit)	0 to 4294967295	0	reference unit	Unchangeable	"H0b_en.85" on page 591
H0b.87	0x0B57	IGBT junction temperature	0°C to 200°C	0	°C	Unchangeable	"H0b_en.87" on page 591
H0b.90	0x0B5A	Group No. of the abnormal parameter	0x0 to 0xFFFF	0x0	-	Unchangeable	"H0b_en.90" on page 592
H0b.91	0x0B5B	Offset within the group of the abnormal parameter	0 to 65535	0	-	Unchangeable	"H0b_en.91" on page 592
H0b.93	0x0B5D	Closed loop state	0: Half closed loop 1: Fully closed loop	0	-	Unchangeable	"H0b_en.93" on page 592
H0b.94	0x0B5E	Individual power-on time	0.0s–429496729.5s	0.0	s	Unchangeable	"H0b_en.94" on page 592
H0b.96	0x0B60	Individual power-on time upon occurrence of the selected fault	0.0s–429496729.5s	0.0	s	Unchangeable	"H0b_en.96" on page 592
H0b.98	0x0B62	Dynamic braking resistor load rate	0.0% to 200.0%	0.0	%	Unchangeable	"H0b_en.98" on page 593

15.13 H0C Fault and Protection Parameters 2

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H0C.53	0x0C35	Probe DI ON compensation time 2	-3000 ns–3000 ns	200	25 ns	Real-time	"H0C_en.53" on page 593
H0C.54	0x0C36	Probe DI OFF compensation time 2	-3000 ns–3000 ns	1512	25 ns	Real-time	"H0C_en.54" on page 593

Parameter	Comm. Add.	Name	Value	Default	Unit	Change Mode	Page
H0C.71	0x0C47	Internal function switch	0 to 65535	520	-	Real-time	"H0C_en.71" on page 593
H0C.73	0x0C49	Servo function switchover switch 3	Bit1: Switch encoder communication baud rate to 2M upon power-on bit1 = 0: On bit1 = 1: Off Bit6: Prohibit soft/hard limit under AC4 bit6 = 0: forbidden bit6 = 1: Not forbidden Bit9: Prohibit ramp generation time under AC4 0: Prohibited 1: Not prohibited	0	-	Real-time	"H0C_en.73" on page 594

15.14 H0d Auxiliary Function Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0d.00	0x0D00	Software Reset	0: No operation 1: Enable	0	-	At stop	"H0d_en.00" on page 594
H0d.01	0x0D01	Fault reset	0: No operation 1: Enable	0	-	At stop	"H0d_en.01" on page 595
H0d.02	0x0D02	Inertia auto-tuning enable	0 to 65	0	-	Real-time	"H0d_en.02" on page 595
H0d.04	0x0D04	Read/write in encoder ROM	0: No operation 1: Write ROM 2: Read ROM 3: ROM failure	0	-	At stop	"H0d_en.04" on page 595
H0d.05	0x0D05	Emergency stop	0: No operation 1: Emergency stop	0	-	Real-time	"H0d_en.05" on page 596
H0d.06	0x0D06	Current loop auto-tuning test	0: No operation 1: Enable current loop auto-tuning 2: Enable current loop step test (static) 3: Enable current loop step test	0	-	At stop	"H0d_en.06" on page 596
H0d.10	0x0D0A	Analog channel auto adjusting	0: No operation 1: Adjusted through AI1 2: Adjusted through AI2	0	-	At stop	"H0d_en.10" on page 596
H0d.12	0x0D0C	Phase U/V current balance correction	0: Disabled 1: Enabled	0	-	At stop	"H0d_en.12" on page 596

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0d.17	0x0D11	Forced DI/DO enable switch	bit0: Forced DI enable switch 0: Disabled 1: Enabled bit1: Forced DO enable switch 0: Disabled 1: Enabled	0	-	Real-time	"H0d_en.17" on page 597
H0d.18	0x0D12	Forced DI value	0x0 to 0x1F	0x1F	-	Real-time	"H0d_en.18" on page 597
H0d.19	0x0D13	Forced DO value	0x0 to 0x3	0x0	-	Real-time	"H0d_en.19" on page 597
H0d.20	0x0D14	Absolute encoder reset	0: No operation 1: Reset fault 2: Reset fault and multi-turn data 3: Reset Inovance 2nd encoder fault 4: Reset Inovance 2nd encoder fault and multi-turn data	0	-	At stop	"H0d_en.20" on page 598
H0d.21	0x0D15	Read error status bit of EnDat2.2 encoders	0: No operation 1: Reading error status bit	0	-	At stop	"H0d_en.21" on page 598
H0d.29	0x0D1D	Motor parameter auto-tuning	0: No operation 1: Enabled	0	-	At stop	"H0d_en.29" on page 598

15.15 H0E Communication Function Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0E.01	0x0E01	Save objects written through communication to EEPROM	0: Do not save 1: Save upon parameter writing	1	-	Real-time	"H0E_en.01" on page 599
H0E.80	0x0E50	Modbus baud rate	0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps	9	-	Real-time	"H0E_en.80" on page 599
H0E.81	0x0E51	Modbus data format	0: No parity, 2 stop bits (N-2) 1: Even parity, 1 stop bit (E-1) 2: Odd parity, 1 stop bit (O-1) 3: No parity, 1 stop bit (N-1)	3	-	Real-time	"H0E_en.81" on page 600

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0E.82	0x0E52	Modbus response delay	0 ms–20 ms	0	ms	Real-time	"H0E_en.82" on page 600
H0E.83	0x0E53	Modbus communication timeout	0 ms–600 ms	0	ms	Real-time	"H0E_en.83" on page 600
H0E.84	0x0E54	Sequence of Modbus communication data bits	0: High bits before low bits 1: Low bits before high bits	1	-	Real-time	"H0E_en.84" on page 601
H0E.90	0x0E5A	Communication version	0.00 to 655.35	0.00	-	Unchangeable	"H0E_en.90" on page 601

15.16 H0F Fully Closed-loop Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.00	0x0F00	Encoder feedback mode	0: Internal encoder feedback 1: External encoder feedback 2: Inner/Outer loop switchover	0	-	Real-time	"H0F_en.00" on page 601
H0F.01	0x0F01	Fully closed-loop encoder application mode	0: Standard operating direction 1: Reverse operating direction	0	-	Real-time	"H0F_en.01" on page 602
H0F.02	0x0F02	Fully closed-loop encoder absolute value	0: Incremental mode 1: Absolute linear mode	0	-	At stop	"H0F_en.02" on page 602
H0F.03	0x0F03	Fully closed-loop encoder feedback type	0: Quadrature pulse 1: Inovance 2: BiSS-C 3: EnDat2.2 4: SSI	0	-	At stop	"H0F_en.03" on page 602
H0F.04	0x0F04	Number of fully closed-loop encoder pulses per revolution	1 to 2147483647	10000	-	At stop	"H0F_en.04" on page 603
H0F.06	0x0F06	Fully closed-loop encoder interface	0: CN2 1: CN7	1	-	At stop	"H0F_en.06" on page 603
H0F.08	0x0F08	Excessive deviation threshold in compound control mode	0 to 2147483647	1000	encoder unit	Real-time	"H0F_en.08" on page 604
H0F.10	0x0F0A	Clear deviation in compound control mode	0 Rev–100 Rev	1	Rev	Real-time	"H0F_en.10" on page 604

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.13	0x0F0D	Compound vibration suppression filter time	0.0 ms–6553.5 ms	0.0	ms	At stop	"H0F_en.13" on page 604
H0F.16	0x0F10	Pulse deviation display in compound control mode	-2147483648 to 2147483647	0	encoder unit	Unchangeable	"H0F_en.16" on page 605
H0F.18	0x0F12	Internal position pulse feedback display	-2147483648 to 2147483647	0	encoder unit	Unchangeable	"H0F_en.18" on page 605
H0F.20	0x0F14	Fully closed-loop encoder position pulse feedback display	-2147483648 to 2147483647	0	encoder unit	Unchangeable	"H0F_en.20" on page 605
H0F.22	0x0F16	Quadrature pulse phase Z detection invalid in fully closed-loop mode	0: Detected 1: Not detected	0	-	Real-time	"H0F_en.22" on page 605
H0F.23	0x0F17	BiSS-C/SSI/ EDNAT2.2 fully closed-loop encoder absolute homing offset	-2147483648 to 2147483647	0	encoder unit	Real-time	"H0F_en.23" on page 606
H0F.25	0x0F19	Set the source of touch probe Z signal in fully closed-loop mode.	0: Motor Z signal 1: External feedback Z signal	0	-	Real-time	"H0F_en.25" on page 606
H0F.26	0x0F1A	BiSS-C/SSI/ EDNAT2.2 fully closed-loop encoder absolute feedback offset	-2147483648 to 2147483647	0	encoder unit	Real-time	"H0F_en.26" on page 606
H0F.28	0x0F1C	Index value of BiSS-C/SSI communication alarm	0 to 65535	0	-	Unchangeable	"H0F_en.28" on page 606
H0F.29	0x0F1D	CRC of BiSS-C/SSI fully closed-loop encoder feedback	0: Positive 1: Negative	1	-	Real-time	"H0F_en.29" on page 607
H0F.30	0x0F1E	BiSS-C/SSI/ EDNAT2.2 valid bits of encoder communication position feedback in full closed-loop mode	0 to 127	29	-	At stop	"H0F_en.30" on page 607

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.31	0x0F1F	Valid bit of BiSS-C/SSI encoder communication alarm index in full closed-loop mode	0 to 31	2	-	At stop	"H0F_en.31" on page 607
H0F.32	0x0F20	BiSS-C/SSI/ENDAT encoder communication frequency in fully closed-loop mode	0 kHz–10000 kHz	2000	kHz	Real-time	"H0F_en.32" on page 608
H0F.33	0x0F21	SSI/ENDAT encoder recovery time in fully closed-loop mode	0.000 μs to 40.000 μs	0.500	μs	Real-time	"H0F_en.33" on page 608
H0F.35	0x0F23	BiSS-C error detection enable in fully closed-loop mode	0: Disabled 1: Enabled	0	-	At stop	"H0F_en.35" on page 608
H0F.36	0x0F24	BiSS-C error bit polarity in fully closed-loop mode	0: Positive 1: Negative	0	-	At stop	"H0F_en.36" on page 609
H0F.40	0x0F28	Fully closed-loop communication encoder fault info	0 to 65535	0	-	Unchangeable	"H0F_en.40" on page 609
H0F.41	0x0F29	Inovance fully closed-loop encoder version	0.0 to 6553.5	0.0	-	Unchangeable	"H0F_en.41" on page 610
H0F.42	0x0F2A	Inovance fully closed-loop encoder resolution	0 to 4294967295	0	-	Unchangeable	"H0F_en.42" on page 611
H0F.45	0x0F2D	Positioning completed/ Position deviation threshold in fully closed-loop mode	0: Threshold scaled to outer loop unit 1: Same threshold used for inner and outer loops	0	-	At stop	"H0F_en.45" on page 611
H0F.51	0x0F33	SSI encoder check bit selection in fully closed-loop mode	0: No check 1: Check applied	1	-	At stop	"H0F_en.51" on page 611
H0F.52	0x0F34	SSI encoder code system in full closed-loop mode	0: Binary 1: Gray code	1	-	At stop	"H0F_en.52" on page 611
H0F.53	0x0F35	SSI encoder state word code system in fully closed-loop mode	0: Binary 1: Gray code	1	-	At stop	"H0F_en.53" on page 612

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H0F.54	0x0F36	SSI encoder parity check in fully closed-loop mode	0: Disabled 1: Enabled	0	-	At stop	"H0F_en.54" on page 612
H0F.55	0x0F37	Fully closed-loop encoder communication timeout error count	0 to 65535	0	-	Unchangeable	"H0F_en.55" on page 612
H0F.56	0x0F38	Encoder CRC error count in fully closed-loop mode	0 to 65535	0	-	Unchangeable	"H0F_en.56" on page 612
H0F.57	0x0F39	Fully closed-loop encoder communication frame stop bit error count.	0 to 65535	0	-	Unchangeable	"H0F_en.57" on page 613

15.17 H17 Virtual DI/DO Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.00	0x1700	VDI1 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.00" on page 613
H17.01	0x1701	VDI1 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.01" on page 613

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.02	0x1702	VDI2 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.02" on page 614
H17.03	0x1703	VDI2 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.03" on page 614
H17.04	0x1704	VDI3 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.04" on page 614
H17.05	0x1705	VDI3 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.05" on page 615
H17.06	0x1706	VDI4 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.06" on page 615
H17.07	0x1707	VDI4 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.07" on page 616

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.08	0x1708	VDI5 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.08" on page 616
H17.09	0x1709	VDI5 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.09" on page 616
H17.10	0x170A	VDI6 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.10" on page 616
H17.11	0x170B	VDI6 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.11" on page 617
H17.12	0x170C	VDI7 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.12" on page 617
H17.13	0x170D	VDI7 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.13" on page 618

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.14	0x170E	VDI8 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.14" on page 618
H17.15	0x170F	VDI8 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.15" on page 618
H17.16	0x1710	VDI9 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.16" on page 618
H17.17	0x1711	VDI9 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.17" on page 619
H17.18	0x1712	VDI10 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.18" on page 619
H17.19	0x1713	VDI10 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.19" on page 620

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.20	0x1714	VDI11 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.20" on page 620
H17.21	0x1715	VDI11 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.21" on page 620
H17.22	0x1716	VDI12 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.22" on page 620
H17.23	0x1717	VDI12 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.23" on page 621
H17.24	0x1718	VDI13 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.24" on page 621
H17.25	0x1719	VDI13 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.25" on page 622

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.26	0x171A	VDI14 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.26" on page 622
H17.27	0x171B	VDI14 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.27" on page 622
H17.28	0x171C	VDI15 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.28" on page 622
H17.29	0x171D	VDI15 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.29" on page 623
H17.30	0x171E	VDI16 function	0: No definition 3: Gain switchover 14: Positive limit switch 15: Negative limit switch 18: Forward jog 19: Reverse jog 24: Electronic gear Gear selection 31: Home switch 34: Emergency stop 35: Clear position deviation 56: External switch of the EEPOS program block	0	-	Real-time	"H17_en.30" on page 623
H17.31	0x171F	VDI16 logic level selection	0: Active when the written value is 1 1: Active when the written value changes from 0 to 1	0	-	Real-time	"H17_en.31" on page 624
H17.32	0x1720	VDO virtual level	0x0 to 0xFFFF	0x0	-	Unchangeable	"H17_en.32" on page 624

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.33	0x1721	VDO1 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.33" on page 624
H17.34	0x1722	VDO1 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.34" on page 624
H17.35	0x1723	VDO2 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.35" on page 625
H17.36	0x1724	VDO2 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.36" on page 625
H17.37	0x1725	VDO3 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.37" on page 625
H17.38	0x1726	VDO3 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.38" on page 626
H17.39	0x1727	VDO4 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.39" on page 626

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.40	0x1728	VDO4 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.40" on page 626
H17.41	0x1729	VDO5 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.41" on page 627
H17.42	0x172A	VDO5 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.42" on page 627
H17.43	0x172B	VDO6 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.43" on page 627
H17.44	0x172C	VDO6 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.44" on page 628
H17.45	0x172D	VDO7 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.45" on page 628
H17.46	0x172E	VDO7 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.46" on page 628

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.47	0x172F	VDO8 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.47" on page 629
H17.48	0x1730	VDO8 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.48" on page 629
H17.49	0x1731	VDO9 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.49" on page 629
H17.50	0x1732	VDO9 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.50" on page 630
H17.51	0x1733	VDO10 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.51" on page 630
H17.52	0x1734	VDO10 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.52" on page 630
H17.53	0x1735	VDO11 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.53" on page 631

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.54	0x1736	VDO11 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.54" on page 631
H17.55	0x1737	VDO12 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.55" on page 631
H17.56	0x1738	VDO12 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.56" on page 632
H17.57	0x1739	VDO13 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.57" on page 632
H17.58	0x173A	VDO13 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.58" on page 632
H17.59	0x173B	VDO14 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.59" on page 633
H17.60	0x173C	VDO14 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.60" on page 633

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.61	0x173D	VDO15 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.61" on page 633
H17.62	0x173E	VDO15 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.62" on page 634
H17.63	0x173F	VDO16 function	0: No definition 1: Servo ready 9: Brake output signal 10: Warning 11: Fault 16: Homing completed 21: Enabled 26: Fully closed-lo op state 30: Alarm or fault output 32: EDM output	0	-	Real-time	"H17_en.63" on page 634
H17.64	0x1740	VDO16 logic level selection	0: Output 1 upon active logic 1: Output 0 upon active logic	0	-	Real-time	"H17_en.64" on page 634
H17.90	0x175A	Communication VDI enable	0: Disabled 1: Enabled	0	-	At stop	"H17_en.90" on page 635
H17.91	0x175B	VDI default value after power-on	bit0: VDI1 bit1: VDI2 bit2: VDI3 bit3: VDI4 bit4: VDI5 bit5: VDI6 bit6: VDI7 bit7: VDI8 bit8: VDI9 bit9: VDI10 bit10: VDI11 bit11: VDI12 bit12: VDI13 bit13: VDI14 bit14: VDI15 bit15: VDI16	0	-	Real-time	"H17_en.91" on page 635

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H17.92	0x175C	Communication VDO enable	0: Disabled 1: Enabled	0	-	At stop	"H17_en.92" on page 636
H17.93	0x175D	VDO default value after power-on	bit0: VDO1 bit1: VDO2 bit2: VDO3 bit3: VDO4 bit4: VDO5bit5: VDO6 bit6: VDO7 bit7: VDO8 bit8: VDO9 bit9: VDO10 bit10: VDO11 bit11: VDO12 bit12: VDO13 bit13: VDO14 bit14: VDO15 bit15: VDO16	0x0	-	At stop	"H17_en.93" on page 636

15.18 H18 Position Comparison Output Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H18.00	0x1800	Position comparison output selection	0: Disable 1: Enable (rising edge-triggered)	0	-	Real-time	"H18_en.00" on page 637
H18.01	0x1801	Position comparison output feedback source	0: Motor encoder feedback 1: Fully closed-loop position feedback	0	-	Real-time	"H18_en.01" on page 637
H18.02	0x1802	Position comparison resolution	0: 24-bit 1: 23-bit 2: 22-bit 3: 21-bit 4: 20-bit 5: 19-bit 6: 18-bit 7: 17-bit	1	-	Real-time	"H18_en.02" on page 637
H18.03	0x1803	Position comparison mode	0: Individual comparison mode 1: Cyclic comparison mode 2: Fixed cyclic comparison mode	0	-	Real-time	"H18_en.03" on page 638
H18.04	0x1804	Current position as zero	0: Disable 1: Enable (rising edge-triggered)	0	-	Real-time	"H18_en.04" on page 638
H18.05	0x1805	Position comparison output width	0.1 ms–204.7 ms	0.1	ms	Real-time	"H18_en.05" on page 638

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H18.06	0x1806	Position comparison output ABZ port polarity	Bit 0: OCZ output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic Bit 1: Z port output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic bit2: A/B output logic 0: Positive, output high level upon active logic 1: Negative, output low level upon active logic	0	-	Real-time	"H18_en.06" on page 639
H18.07	0x1807	Position comparison start point	1 to 40	1	-	Real-time	"H18_en.07" on page 639
H18.08	0x1808	Position comparison end point	1 to 40	1	-	Real-time	"H18_en.08" on page 639
H18.09	0x1809	Current state of position comparison	0 to 1024	0	-	Unchangeable	"H18_en.09" on page 639
H18.10	0x180A	Real-time position of position comparison	-2147483648 to 2147483647	0	-	Unchangeable	"H18_en.10" on page 640
H18.12	0x180C	Zero offset of position comparison	-2147483648 to 2147483647	0	-	Real-time	"H18_en.12" on page 640
H18.14	0x180E	Position comparison output delay compensation	-12.00μs to 12.00μs	0.00	μs	Real-time	"H18_en.14" on page 640
H18.15	0x180F	Fixed cyclic comparison	1 to 65535	1	-	Real-time	"H18_en.15" on page 640
H18.16	0x1810	ABZ output function setting	bit0: OCZ output function 0: Frequency-division output 1: Position comparison bit1: Z port output function 0: Frequency-division output 1: Position comparison bit2: A/B port output function 0: Frequency-division output 1: Position comparison	0	-	Real-time	"H18_en.16" on page 640
H18.17	0x1811	Number of fixed mode cycles	0 to 65535	0	-	Unchangeable	"H18_en.17" on page 641

15.19 H19 Target Position Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.00	0x1900	Target value of position comparison 1	-2147483648 to 2147483647	0	-	Real-time	"H19_en.00" on page 641
H19.02	0x1902	Attribute value of position comparison 1	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.02" on page 641
H19.03	0x1903	Target value of position comparison 2	-2147483648 to 2147483647	0	-	Real-time	"H19_en.03" on page 642

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.05	0x1905	Attribute value of position comparison 2	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.05" on page 642
H19.06	0x1906	Target value of position comparison 3	-2147483648 to 2147483647	0	-	Real-time	"H19_en.06" on page 643
H19.08	0x1908	Attribute value of position comparison 3	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.08" on page 643

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.09	0x1909	Target value of position comparison 4	-2147483648 to 2147483647	0	-	Real-time	"H19_en.09" on page 644
H19.11	0x190B	Attribute value of position comparison 4	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.11" on page 644
H19.12	0x190C	Target value of position comparison 5	-2147483648 to 2147483647	0	-	Real-time	"H19_en.12" on page 645

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.14	0x190E	Attribute value of position comparison 5	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.14" on page 645
H19.15	0x190F	Target value of position comparison 6	-2147483648 to 2147483647	0	-	Real-time	"H19_en.15" on page 646
H19.17	0x1911	Attribute value of position comparison 6	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.17" on page 646

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.18	0x1912	Target value of position comparison 7	-2147483648 to 2147483647	0	-	Real-time	"H19_en.18" on page 647
H19.20	0x1914	Attribute value of position comparison 7	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.20" on page 647
H19.21	0x1915	Target value of position comparison 8	-2147483648 to 2147483647	0	-	Real-time	"H19_en.21" on page 648

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.23	0x1917	Attribute value of position comparison 8	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.23" on page 648
H19.24	0x1918	Target value of position comparison 9	-2147483648 to 2147483647	0	-	Real-time	"H19_en.24" on page 649
H19.26	0x191A	Attribute value of position comparison 9	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.26" on page 649

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.27	0x191B	Target value of position comparison 10	-2147483648 to 2147483647	0	-	Real-time	"H19_en.27" on page 650
H19.29	0x191D	Attribute value of position comparison 10	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.29" on page 650
H19.30	0x191E	Target value of position comparison 11	-2147483648 to 2147483647	0	-	Real-time	"H19_en.30" on page 651

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.32	0x1920	Attribute value of position comparison 11	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.32" on page 651
H19.33	0x1921	Target value of position comparison 12	-2147483648 to 2147483647	0	-	Real-time	"H19_en.33" on page 652
H19.35	0x1923	Attribute value of position comparison 12	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.35" on page 652

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.36	0x1924	Target value of position comparison 13	-2147483648 to 2147483647	0	-	Real-time	"H19_en.36" on page 653
H19.38	0x1926	Attribute value of position comparison 13	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.38" on page 653
H19.39	0x1927	Target value of position comparison 14	-2147483648 to 2147483647	0	-	Real-time	"H19_en.39" on page 654

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.41	0x1929	Attribute value of position comparison 14	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.41" on page 654
H19.42	0x192A	Target value of position comparison 15	-2147483648 to 2147483647	0	-	Real-time	"H19_en.42" on page 655
H19.44	0x192C	Attribute value of position comparison 15	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.44" on page 655

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.45	0x192D	Target value of position comparison 16	-2147483648 to 2147483647	0	-	Real-time	"H19_en.45" on page 656
H19.47	0x192F	Attribute value of position comparison 16	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.47" on page 656
H19.48	0x1930	Target value of position comparison 17	-2147483648 to 2147483647	0	-	Real-time	"H19_en.48" on page 657

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.50	0x1932	Attribute value of position comparison 17	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.50" on page 657
H19.51	0x1933	Target value of position comparison 18	-2147483648 to 2147483647	0	-	Real-time	"H19_en.51" on page 658
H19.53	0x1935	Attribute value of position comparison 18	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.53" on page 658

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.54	0x1936	Target value of position comparison 19	-2147483648 to 2147483647	0	-	Real-time	"H19_en.54" on page 659
H19.56	0x1938	Attribute value of position comparison 19	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.56" on page 659
H19.57	0x1939	Target value of position comparison 20	-2147483648 to 2147483647	0	-	Real-time	"H19_en.57" on page 660

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.59	0x193B	Attribute value of position comparison 20	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.59" on page 660
H19.60	0x193C	Target value of position comparison 21	-2147483648 to 2147483647	0	-	Real-time	"H19_en.60" on page 661
H19.62	0x193E	Attribute value of position comparison 21	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.62" on page 661

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.63	0x193F	Target value of position comparison 22	-2147483648 to 2147483647	0	-	Real-time	"H19_en.63" on page 662
H19.65	0x1941	Attribute value of position comparison 22	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.65" on page 662
H19.66	0x1942	Target value of position comparison 23	-2147483648 to 2147483647	0	-	Real-time	"H19_en.66" on page 663

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.68	0x1944	Attribute value of position comparison 23	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.68" on page 663
H19.69	0x1945	Target value of position comparison 24	-2147483648 to 2147483647	0	-	Real-time	"H19_en.69" on page 664
H19.71	0x1947	Attribute value of position comparison 24	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.71" on page 664

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.72	0x1948	Target value of position comparison 25	-2147483648 to 2147483647	0	-	Real-time	"H19_en.72" on page 665
H19.74	0x194A	Attribute value of position comparison 25	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.74" on page 665
H19.75	0x194B	Target value of position comparison 26	-2147483648 to 2147483647	0	-	Real-time	"H19_en.75" on page 666

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.77	0x194D	Attribute value of position comparison 26	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.77" on page 666
H19.78	0x194E	Target value of position comparison 27	-2147483648 to 2147483647	0	-	Real-time	"H19_en.78" on page 667
H19.80	0x1950	Attribute value of position comparison 27	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.80" on page 667

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.81	0x1951	Target value of position comparison 28	-2147483648 to 2147483647	0	-	Real-time	"H19_en.81" on page 668
H19.83	0x1953	Attribute value of position comparison 28	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.83" on page 668
H19.84	0x1954	Target value of position comparison 29	-2147483648 to 2147483647	0	-	Real-time	"H19_en.84" on page 669

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.86	0x1956	Attribute value of position comparison 29	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.86" on page 669
H19.87	0x1957	Target value of position comparison 30	-2147483648 to 2147483647	0	-	Real-time	"H19_en.87" on page 670
H19.89	0x1959	Attribute value of position comparison 30	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.89" on page 670

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.90	0x195A	Target value of position comparison 31	-2147483648 to 2147483647	0	-	Real-time	"H19_en.90" on page 671
H19.92	0x195C	Attribute value of position comparison 31	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.92" on page 671
H19.93	0x195D	Target value of position comparison 32	-2147483648 to 2147483647	0	-	Real-time	"H19_en.93" on page 672

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.95	0x195F	Attribute value of position comparison 32	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.95" on page 672
H19.96	0x1960	Target value of position comparison 33	-2147483648 to 2147483647	0	-	Real-time	"H19_en.96" on page 673
H19.98	0x1962	Attribute value of position comparison 33	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.98" on page 673

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.99	0x1963	Target value of position comparison 34	-2147483648 to 2147483647	0	-	Real-time	"H19_en.99" on page 674
H19.101	0x1965	Attribute value of position comparison 34	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.101" on page 674
H19.102	0x1966	Target value of position comparison 35	-2147483648 to 2147483647	0	-	Real-time	"H19_en.102" on page 675

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.104	0x1968	Attribute value of position comparison 35	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.104" on page 675
H19.105	0x1969	Target value of position comparison 36	-2147483648 to 2147483647	0	-	Real-time	"H19_en.105" on page 676
H19.107	0x196B	Attribute value of position comparison 36	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.107" on page 676

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.108	0x196C	Target value of position comparison 37	-2147483648 to 2147483647	0	-	Real-time	"H19_en.108" on page 677
H19.110	0x196E	Attribute value of position comparison 37	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.110" on page 677
H19.111	0x196F	Target value of position comparison 38	-2147483648 to 2147483647	0	-	Real-time	"H19_en.111" on page 678

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.113	0x1971	Attribute value of position comparison 38	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.113" on page 678
H19.114	0x1972	Target value of position comparison 39	-2147483648 to 2147483647	0	-	Real-time	"H19_en.114" on page 679
H19.116	0x1974	Attribute value of position comparison 39	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 output bit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.116" on page 679

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H19.117	0x1975	Target value of position comparison 40	-2147483648 to 2147483647	0	-	Real-time	"H19_en.117" on page 680
H19.119	0x1977	Attribute value of position comparison 40	Bit0: Current position changes from "less than" to "more than" the comparison point bit1: Current position changes from "more than" to "less than" the comparison point bit2: N/A bit3: N/A bit4: N/A bit5: N/A bit6: N/A bit7: DO1 outputbit8: DO2 output bit9: N/A bit10: bit10: N/A bit11: N/A bit12: Frequency-division A output bit13: Frequency-division B output bit14: Frequency-division Z output bit15: Frequency-division OCZ output	0	-	Real-time	"H19_en.119" on page 680

15.20 H21 Current Loop Gain Switchover Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H21.00	0x2100	Current loop gain switchover	0: No operation 1: Enabled	0	-	Real-time	"H21_en.00" on page 681

15.21 H24 PN Bus Communication Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H24.00	0x2400	Telegram number selection [PN922]	0 to 65535	3	-	Unchangeable	"H24_en.00" on page 681
H24.01	0x2401	Heartbeat warning threshold [PN925]	0 to 65535	5	-	At stop	"H24_en.01" on page 682
H24.02	0x2402	Fault message counter [PN944]	0 to 65535	0	-	Unchangeable	"H24_en.02" on page 682

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H24.03	0x2403	Fault code [PN947]	0x0 to 0xFFFF	0x0	-	Unchangeable	"H24_en.03" on page 682
H24.04	0x2404	Fault No.	0 to 63	0	-	At stop	"H24_en.04" on page 682
H24.05	0x2405	Fault condition counter [PN952]	0 to 65535	0	-	Unchangeable	"H24_en.05" on page 682
H24.06	0x2406	Sensor header [PN979[0]]	0x0 to 0xFFFFFFFF	0x5112	-	Unchangeable	"H24_en.06" on page 683
H24.08	0x2408	Sensor type [PN979[1]]	0x0 to 0xFFFFFFFF	0x80000002	-	Unchangeable	"H24_en.08" on page 683
H24.10	0x240A	Sensor resolution [PN979[2]]	0 to 4294967295	256	-	Unchangeable	"H24_en.10" on page 683
H24.12	0x240C	Sensor G1_X1ST1 displacement factor [PN979[3]]	0 to 4294967295	15	-	Unchangeable	"H24_en.12" on page 683
H24.14	0x240E	Sensor G1_X1ST2 displacement factor [PN979[4]]	0 to 4294967295	15	-	Unchangeable	"H24_en.14" on page 684
H24.16	0x2410	Sensor multi-turn number [PN979[5]]	0 to 4294967295	512	-	Unchangeable	"H24_en.16" on page 684
H24.19	0x2413	Synchronization cycle	0.000 ms–65.535 ms	0.000	ms	Unchangeable	"H24_en.19" on page 684
H24.22	0x2416	IP address	0x0 to 0xFFFFFFFF	0xC0A80002	-	Unchangeable	"H24_en.22" on page 684
H24.24	0x2418	Subnet mask	0x0 to 0xFFFFFFFF	0xFFFFFF00	-	Unchangeable	"H24_en.24" on page 684
H24.26	0x241A	Default gateway	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	"H24_en.26" on page 685
H24.32	0x2420	Telegram 105 configuration	Bit0: Enable PLC position loop gain when DSC is on Bit0 = 0: Local gain enabled Bit0 = 1: PLC gain enabled Bit1: NSOLL_B enabled Bit1 = 0: Disabled Bit1 = 1: Enabled	0x3	-	At stop	"H24_en.32" on page 685

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H24.33	0x2421	Number of Sync with advanced DSC position feedback	0 to 16	2	-	Real-time	"H24_en.33" on page 685
H24.34	0x2422	DSC control word (DSC_STW)	Bit0: DSC with spline enabled Bit0 = 0: Disabled Bit0 = 1: Enabled Bit4: Speed feedforward enabled in DSC with spline Bit0 = 0: Disabled Bit4 = 1: Enabled Bit5: Torque feedforward enabled in DSC with spline Bit5 = 0: Disabled Bit5 = 1: Enabled	0x0	-	Real-time	"H24_en.34" on page 685
H24.35	0x2423	Customized telegram 850 transmission	0: No assignment 1: VDO 2: External DI state	0	-	Real-time	"H24_en.35" on page 686
H24.36	0x2424	Customized receive of telegram 850	0: No assignment 1: VDI 2: External DO state	0	-	Real-time	"H24_en.36" on page 686
H24.37	0x2425	Extra telegram	0 to 999	999	-	At stop	"H24_en.37" on page 687
H24.38	0x2426	Customized receive word	0: No function 1: Additive torque 2: Forced DO	0	-	Real-time	"H24_en.38" on page 687
H24.39	0x2427	Customized transmit word	0: No function 1: Actual torque 2: Actual current 3: DI state	0	-	Real-time	"H24_en.39" on page 687
H24.41	0x2429	Device name loss warning selection	0 to 1	0	-	Real-time	"H24_en.41" on page 687
H24.42	0x242A	Number of consecutive loss detections	0 to 65535	8	-	At stop	"H24_en.42" on page 688
H24.44	0x242C	FPGA synchronous detection deviation threshold	0 ns–65535 ns	3000	ns	At stop	"H24_en.44" on page 688

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H24.45	0x242D	MAC address	0x0 to 0xFFFF	0x0	-	Unchangeable	"H24_en.45" on page 688
H24.46	0x242E	MAC address	0x0 to 0xFFFF	0x0	-	Unchangeable	"H24_en.46" on page 688
H24.47	0x242F	MAC address	0x0 to 0xFFFF	0x0	-	Unchangeable	"H24_en.47" on page 689
H24.49	0x2431	PN disconnection fault code	0 to 65535	0	-	Unchangeable	"H24_en.49" on page 689
H24.50	0x2432	Acceleration time of AC1AC4 ramp generator	0 ms–655350 ms	0	ms	Real-time	"H24_en.50" on page 689
H24.52	0x2434	Deceleration time of AC1AC4 ramp generator	0 ms–655350 ms	0	ms	Real-time	"H24_en.52" on page 689
H24.54	0x2436	Speed reference filter time	0.0 ms–100.0 ms	0.0	ms	At stop	"H24_en.54" on page 689
H24.55	0x2437	DSC maximum Kv coefficient estimation	0.0/s to 6553.5/s	0.0	1/s	Unchangeable	"H24_en.55" on page 690
H24.56	0x2438	DSC symmetrical time constant estimation	0.00 ms–655.35 ms	0.00	ms	Unchangeable	"H24_en.56" on page 690
H24.57	0x2439	Ti	0.000 ms–65.535 ms	0.000	ms	Unchangeable	"H24_en.57" on page 690
H24.58	0x243A	To	0.000 ms–65.535 ms	0.000	ms	Unchangeable	"H24_en.58" on page 690
H24.59	0x243B	Safety telegram No. selection	0 to 65535	0	-	Unchangeable	"H24_en.59" on page 691

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H24.60	0x243C	PN Function Selection	Bit0-1: PN fault channel upload scheme 0: Upload drive local fault code to host controller 1: Upload by 20 fault types according to PN rules 2: Do not upload Bit2: Internal switch 0: Internal switch 1: Internal switch Bit 3: Customized PN reference speed switch 0: H24.64 and H00.14 are forcibly bound 1: H24.64 can be customized Bit4: Hide AE19.7 unsupported overtravel stop 0: Not hide 1: Hide	0	-	At stop	"H24_en.60" on page 691
H24.64	0x2440	Reference speed	1.000rpm to 10000.000rpm	3000.000	rpm	At stop	"H24_en.64" on page 692

15.22 H25 AC3 Control Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H25.00	0x2500	EPOS max. speed	0 LU/min.–40000000 LU/min.	30000	1000 LU/min	Real-time	"H25_en.00" on page 692
H25.02	0x2502	EPOS max. acceleration	1 LU/s/s–2000000 LU/s/s	100	1000 LU/s/s	Real-time	"H25_en.02" on page 693
H25.04	0x2504	EPOS max. deceleration	1 LU/s/s–2000000 LU/s/s	100	1000 LU/s/s	Real-time	"H25_en.04" on page 693
H25.06	0x2506	EPOS ramp deceleration	1 LU/s/s–2000000 LU/s/s	100	1000 LU/s/s	Real-time	"H25_en.06" on page 694
H25.10	0x250A	EPOS positioning reach threshold	0LU–2147483647LU	7	LU	Real-time	"H25_en.10" on page 694

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H25.12	0x250C	EPOS positioning reached window time	0 ms–2147483647 ms	0	ms	Real-time	"H25_en.12" on page 694
H25.14	0x250E	EPOS-Jog1 speed	-40000000 Lu/min to 40000000 LU/min	-300	1000 LU/min	Real-time	"H25_en.14" on page 694
H25.16	0x2510	EPOS-Jog2 speed	-40000000 Lu/min to 40000000 LU/min	300	1000 LU/min	Real-time	"H25_en.16" on page 694
H25.18	0x2512	EPOS-JOG1 position increment	0LU–2147483647LU	1000	LU	Real-time	"H25_en.18" on page 695
H25.20	0x2514	EPOS-JOG2 position increment	0LU–2147483647LU	1000	LU	Real-time	"H25_en.20" on page 695
H25.22	0x2516	Homing type	-2 to 35	0	-	Real-time	"H25_en.22" on page 695
H25.23	0x2517	Homing high speed	0 LU/min.–40000000 LU/min.	5000	1000 LU/min	Real-time	"H25_en.23" on page 695
H25.25	0x2519	Homing low speed	0 LU/min.–40000000 LU/min.	300	1000 LU/min	Real-time	"H25_en.25" on page 695
H25.27	0x251B	Homing acceleration/ deceleration override	0.01% to 100.00%	100.00	%	Real-time	"H25_en.27" on page 696
H25.28	0x251C	EPOS acceleration/ deceleration determination sampling interval	0 ms–1500 ms	0	ms	Real-time	"H25_en.28" on page 696

15.23 H27 Block Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H27.00	0x2700	Current block	0 to 15	0	-	Unchangeable	"H27_en.00" on page 696
H27.01	0x2701	Block 0 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.01" on page 696

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H27.02	0x2702	Block 1 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.02" on page 697
H27.03	0x2703	Block 2 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.03" on page 697
H27.04	0x2704	Block 3 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.04" on page 698
H27.05	0x2705	Block 4 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.05" on page 698
H27.06	0x2706	Block 5 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.06" on page 698

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H27.07	0x2707	Block 6 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.07" on page 699
H27.08	0x2708	Block 7 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.08" on page 699
H27.09	0x2709	Block 8 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.09" on page 700
H27.10	0x270A	Block 9 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.10" on page 700
H27.11	0x270B	Block 10 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.11" on page 700

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H27.12	0x270C	Block 11 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.12" on page 701
H27.13	0x270D	Block 12 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.13" on page 701
H27.14	0x270E	Block 13 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.14" on page 702
H27.15	0x270F	Block 14 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.15" on page 702
H27.16	0x2710	Block 15 task	1: Positioning 2: Fixed stopper 3: Forward cycle 4: Reverse cycle 5: Waiting 6: Switching 7: Setting O 8: Resetting O	1	-	Real-time	"H27_en.16" on page 702
H27.17	0x2711	Position of block 0	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.17" on page 703
H27.19	0x2713	Position of block 1	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.19" on page 703
H27.21	0x2715	Position of block 2	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.21" on page 703

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H27.23	0x2717	Position of block 3	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.23" on page 703
H27.25	0x2719	Position of block 4	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.25" on page 704
H27.27	0x271B	Position of block 5	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.27" on page 704
H27.29	0x271D	Position of block 6	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.29" on page 704
H27.31	0x271F	Position of block 7	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.31" on page 704
H27.33	0x2721	Position of block 8	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.33" on page 704
H27.35	0x2723	Position of block 9	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.35" on page 705
H27.37	0x2725	Position of block 10	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.37" on page 705
H27.39	0x2727	Position of block 11	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.39" on page 705
H27.41	0x2729	Position of block 12	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.41" on page 705
H27.43	0x272B	Position of block 13	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.43" on page 706
H27.45	0x272D	Position of block 14	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.45" on page 706
H27.47	0x272F	Position of block 15	-2147483648LU to 2147483647LU	0	LU	Real-time	"H27_en.47" on page 706
H27.49	0x2731	Block 0 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.49" on page 706
H27.51	0x2733	Block 1 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.51" on page 706
H27.53	0x2735	Block 2 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.53" on page 707
H27.55	0x2737	Block 3 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.55" on page 707
H27.57	0x2739	Block 4 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.57" on page 707
H27.59	0x273B	Block 5 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.59" on page 707
H27.61	0x273D	Block 6 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.61" on page 707

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H27.63	0x273F	Block 7 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.63" on page 708
H27.65	0x2741	Block 8 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.65" on page 708
H27.67	0x2743	Block 9 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.67" on page 708
H27.69	0x2745	Block 10 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.69" on page 708
H27.71	0x2747	Block 11 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.71" on page 709
H27.73	0x2749	Block 12 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.73" on page 709
H27.75	0x274B	Block 13 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.75" on page 709
H27.77	0x274D	Block 14 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.77" on page 709
H27.79	0x274F	Block 15 speed	0 Lu/min–4294967295 LU/min	600	1000 LU/min	Real-time	"H27_en.79" on page 709
H27.81	0x2751	Block 0 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.81" on page 710
H27.82	0x2752	Block 1 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.82" on page 710
H27.83	0x2753	Block 2 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.83" on page 710
H27.84	0x2754	Block 3 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.84" on page 710
H27.85	0x2755	Block 4 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.85" on page 710
H27.86	0x2756	Block 5 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.86" on page 711
H27.87	0x2757	Block 6 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.87" on page 711
H27.88	0x2758	Block 7 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.88" on page 711
H27.89	0x2759	Block 8 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.89" on page 711
H27.90	0x275A	Block 9 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.90" on page 712
H27.91	0x275B	Block 10 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.91" on page 712

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H27.92	0x275C	Block 11 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.92" on page 712
H27.93	0x275D	Block 12 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.93" on page 712
H27.94	0x275E	Block 13 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.94" on page 712
H27.95	0x275F	Block 14 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.95" on page 713
H27.96	0x2760	Block 15 acc. override	1.00% to 100.00%	100.00	%	Real-time	"H27_en.96" on page 713

15.24 H28 Block Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H28.00	0x2800	Block 0 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.00" on page 713
H28.01	0x2801	Block 1 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.01" on page 713
H28.02	0x2802	Block 2 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.02" on page 714
H28.03	0x2803	Block 3 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.03" on page 714
H28.04	0x2804	Block 4 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.04" on page 714
H28.05	0x2805	Block 5 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.05" on page 714
H28.06	0x2806	Block 6 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.06" on page 714
H28.07	0x2807	Block 7 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.07" on page 715
H28.08	0x2808	Block 8 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.08" on page 715
H28.09	0x2809	Block 9 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.09" on page 715
H28.10	0x280A	Block 10 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.10" on page 715
H28.11	0x280B	Block 11 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.11" on page 715

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H28.12	0x280C	Block 12 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.12" on page 716
H28.13	0x280D	Block 13 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.13" on page 716
H28.14	0x280E	Block 14 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.14" on page 716
H28.15	0x280F	Block 15 dec. override	1.00% to 100.00%	100.00	%	Real-time	"H28_en.15" on page 716
H28.16	0x2810	Task mode of block 0	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.16" on page 717
H28.17	0x2811	Task mode of block 1	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.17" on page 717
H28.18	0x2812	Task mode of block 2	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.18" on page 718

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H28.19	0x2813	Task mode of block 3	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.19" on page 719
H28.20	0x2814	Task mode of block 4	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.20" on page 720
H28.21	0x2815	Task mode of block 5	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.21" on page 721

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H28.22	0x2816	Task mode of block 6	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.22" on page 722
H28.23	0x2817	Task mode of block 7	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.23" on page 723
H28.24	0x2818	Task mode of block 8	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.24" on page 724

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H28.25	0x2819	Task mode of block 9	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.25" on page 725
H28.26	0x281A	Task mode of block 10	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.26" on page 725
H28.27	0x281B	Task mode of block 11	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.27" on page 726

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H28.28	0x281C	Task mode of block 12	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.28" on page 727
H28.29	0x281D	Task mode of block 13	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.29" on page 728
H28.30	0x281E	Task mode of block 14	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	"H28_en.30" on page 729

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H28.31	0x281F	Task mode of block 15	Bit0: Task identifier 0: Task execution 1: Task hiding bit4-7: Subsequent condition 0: END 1: CONTINUE_WITH_STOP 2: CONTINUE_ON_THE_FLY 3: CONTINUE_EXTERNAL 4: CONTINUE_EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_WARN bit8-11: Positioning mode 0: Absolute positioning 1: Relative positioning	0	-	Real-time	" H28_en.31" on page 730
H28.32	0x2820	Block 0 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.32" on page 731
H28.34	0x2822	Block 1 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.34" on page 731
H28.36	0x2824	Block 2 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.36" on page 732
H28.38	0x2826	Block 3 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.38" on page 732
H28.40	0x2828	Block 4 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.40" on page 732
H28.42	0x282A	Block 5 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.42" on page 733
H28.44	0x282C	Block 6 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.44" on page 733
H28.46	0x282E	Block 7 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.46" on page 733
H28.48	0x2830	Block 8 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.48" on page 734
H28.50	0x2832	Block 9 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.50" on page 734
H28.52	0x2834	Block 10 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.52" on page 735
H28.54	0x2836	Block 11 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.54" on page 735
H28.56	0x2838	Block 12 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.56" on page 735
H28.58	0x283A	Block 13 task parameter	0 to 2147483647	0	-	Real-time	" H28_en.58" on page 736

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H28.60	0x283C	Block 14 task parameter	0 to 2147483647	0	-	Real-time	"H28_en.60" on page 736
H28.62	0x283E	Block 15 task parameter	0 to 2147483647	0	-	Real-time	"H28_en.62" on page 736
H28.64	0x2840	Fixed stopper monitoring window	0LU to 4294967295LU	100	LU	Real-time	"H28_en.64" on page 737
H28.66	0x2842	Max. following error of fixed stopper	0LU to 4294967295LU	1000	LU	Real-time	"H28_en.66" on page 737
H28.68	0x2844	External trigger source	0: Triggered by STW1.bit13 1: Triggered by DI	0	-	At stop	"H28_en.68" on page 737

15.25 H29 PN Telegram Value Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.00	0x2900	Control word 1 (STW1)	Bit0: 1 = Pulse enable allowed; 0 = OFF1, ramp to stop, pulse cleared, ready to switch on bit1: 1 = No OFF2 (pulse enable allowed); 0 = OFF2, coast to stop, pulse cleared immediately, switch-on inhibited bit2: 1 = No OFF3 (pulse enable allowed); 0 = OFF3 quick stop, P1135 brake, pulse cleared, switch-on inhibited bit3: 1 = Enable allowed; 0 = Operation inhibited (pulse cleared) bit4: 1 = Ramp function generator available; 0 = Ramp function generator inhibited bit5:1 = Ramp function generator continued; 0 = Ramp function generator output frozen bit6:1 = Setpoint enabled; 0 = Setpoint inhibited (ramp function generator input being zero) bit7: Rising edge-triggered, response fault bit8: JOG1 bit9: JOG2 bit10: 1 = PLC controlled bit11: Reserved bit12: Reserved bit13: Reserved bit14: Reserved bit15: Reserved	0x0	-	Unchangeable	"H29_en.00" on page 738
H29.01	0x2901	Control word 2 (STW2)	0x0 to 0xFFFF	0x0	-	Unchangeable	"H29_en.01" on page 738
H29.02	0x2902	Speed setpoint A (VEL_NSOLL_A)	-32768 to 32767	0	-	Unchangeable	"H29_en.02" on page 738
H29.04	0x2904	Speed setpoint B (VEL_NSOLL_B)	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	"H29_en.04" on page 739

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.06	0x2906	Encoder control word (G1_STW)	bit0: bit7 = 0, searching for reference point 1; bit7 = 1, measure the pointer 1 bit1: bit7 = 0, searching for reference point 2; bit7 = 1, measure the pointer 2 bit2: bit7 = 0, searching for reference point 3; bit7 = 1, measure the pointer 3 bit3: bit7 = 0, searching for reference point 4; bit7 = 1, measuring pointer 4 bit4: bit4–bit6 000b = Not activated; 001b = Selected functions activated; 010b = Read value; 011b = Cancel bit5: bit4–bit6 000b = Not activated; 001b = Selected functions activated; 010b = Read value; 011b = Cancel bit6: bit4–bit6 000b = Not activated; 001b = Selected functions activated; 010b = Read value; 011b = Cancel bit7: Mode selection; 1 = Real-time measurement; 0 = Searching for the reference point bit8: Reserved bit9: Reserved bit10: Reserved bit11: Zero setting mode; 0 = Absolute position; 1 = Relative position bit12: Rising edge-triggered; request for setting the zero bit bit13: Rising edge-triggered; request for cyclic transmission of absolute position in G1_XIST2 bit14: Parking encoder bit15: Rising-edge triggered Response encoder fault	0x0	-	Unchangeable	"H29_en.06" on page 739
H29.07	0x2907	Position deviation (XERR)	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	"H29_en.07" on page 739
H29.09	0x2909	Position loop gain (KPC)	0x0 to 0xFFFFFFFF	0x0	-	Unchangeable	"H29_en.09" on page 740

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.11	0x290B	Position control word 1 (POS_ STW1)	Bit0: bit0–bit5 block selection supports up to 16 blocks bit1: bit0–bit5 block selection supports up to 16 blocks bit2: bit0–bit5 block selection supports up to 16 blocks bit3: bit0–bit5 block selection supports up to 16 blocks bit4: bit0–bit5 block selection supports up to 16 blocks bit5: bit0–bit5 block selection supports up to 16 blocks bit6: Reserved bit7: Reserved bit8: 1 = Absolute positioning 0 = Relative positioning bit9: 1 = Forward bit10: 1 = Reverse bit11: Reserved bit12: 1 = Continuous transmission 0 = MDI block modification activated by running the rising edge of the program segment (STW1.6) bit13: Reserved bit14: 1 = Setting signal selected 0 = Positioning signal selected bit15: 1= MDI sub-mode 0 = Program segment sub-mode	0x0	-	Unchangeable	"H29_en.11" on page 740
H29.12	0x290C	MDI position setting (EPOS)	0LU to 4294967295LU	0	LU	Unchangeable	"H29_en.12" on page 740
H29.14	0x290E	MDI speed setting (EPOS)	0 Lu/min–4294967295 LU/min	0	1000 LU/min	Unchangeable	"H29_en.14" on page 741
H29.16	0x2910	MDI acceleration override (EPOS)	0 to 65535	0	-	Unchangeable	"H29_en.16" on page 741
H29.17	0x2911	MDI deceleration override (EPOS)	0 to 65535	0	-	Unchangeable	"H29_en.17" on page 741

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.18	0x2912	MDI mode (EPOS)	bit0: 1 = Absolute positioning 0 = Relative positioning bit1: 1 = Forward bit2: 1 = Reverse bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: Reserved bit8: Reserved bit9: Reserved bit10: Reserved bit11: Reserved bit12: Reserved bit13: Reserved bit14: Reserved bit15: Reserved	0	-	Unchangeable	"H29_en.18" on page 741
H29.19	0x2913	Position control word 2 (POS_STW2)	bit0: 1 = Tracking mode activated bit1: 1 = Set reference point bit2: 1 = Reference point stopper activated bit3: Reserved bit4: Reserved bit5: 1 = JOG incremental positioning activated 0 = Speed activated bit6: Reserved bit7: Reserved bit8: Reserved bit9: 1 = Searching for the reference point in the reverse direction 0 = Start searching for the reference point in the forward direction bit10: Reserved bit11: Reserved bit12: Reserved bit13: Reserved bit14: 1 = Software limit switch activated bit15: 1 = Stopper activated	0x0	-	Unchangeable	"H29_en.19" on page 742
H29.20	0x2914	Position speed override (EPOS)	0x0 to 0xFFFF	0x0	-	Unchangeable	"H29_en.20" on page 743
H29.21	0x2915	Customized receive word for telegram 111	0x0 to 0xFFFF	0x0	-	Unchangeable	"H29_en.21" on page 743
H29.22	0x2916	Torque reduction (MOMRED)	0 to 65535	0	-	Unchangeable	"H29_en.22" on page 743

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.23	0x2917	Torque reference (AdditiveTorque)	0 to 65535	0	-	Unchangeable	"H29_en.23" on page 743
H29.24	0x2918	Torque upper limit	0 to 65535	0	-	Unchangeable	"H29_en.24" on page 743
H29.25	0x2919	Torque lower limit	0 to 65535	0	-	Unchangeable	"H29_en.25" on page 744
H29.26	0x291A	Customized receive word for 850 additive telegram	0 to 65535	0	-	Unchangeable	"H29_en.26" on page 744
H29.27	0x291B	Message word (MELDW)	0 to 65535	0	-	Unchangeable	"H29_en.27" on page 744
H29.28	0x291C	Safety control word 1 (S_STW1)	Bit0: 1 = Cancel STO, 0 = Select STO bit1 1: Cancel SS1, 0 = Select SS1 bit2: 1 = Cancel SS2, 0 = Select SS2 bit3 1: Cancel SOS, 0 = Select SOS bit4 1: Cancel SLS, 0 = Select SLS bit5: Reserved bit6: Reserved bit7: 1 -> 0: Respond to safety failure bit8: Reserved bit9: SLS limit value 0 bit10: SLS limit value 1 bit11: Reserved bit12: 1 = Cancel SDI+, 0 = Select SDI+ bit13 1 = Cancel SDI-, 0 = Select SDI- bit14: Reserved bit15: 1= Cancel SSM, 0 = Select SSM	0x0	-	Unchangeable	"H29_en.28" on page 744

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.29	0x291D	Safety control word 2 (S_STW2)	bit0: 1 = Cancel STO, 0 = Select STO bit1: 1 = Cancel SS1, 0 = Select SS1 bit2: 1 = Cancel SS2, 0 = Select SS2 bit3: 1 = Cancel SOS, 0 = Select SOS bit4: 1 = Cancel SLS, 0 = Select SLS bit5: Reserved bit6: Reserved bit7: 1-> 0 respond to safety failure bit8: Reserved bit9: SLS limit value 0 bit10: SLS limit value 1 bit11: Reserved bit12: 1 = Cancel SDI+, 0 = Select SDI+ bit13: 1 = Cancel SDI-, 0 = Select SDI- bit14: Reserved bit15: 1 = Cancel SSM, 0 = Select SSM bit16: Reserved bit17: Reserved bit18: 1 = Cancel SS1E, 0 = Select SS1E bit19: Reserved bit20: Reserved bit21: Reserved bit22: Reserved bit23: Reserved bit24: Reserved bit25: Reserved bit26: Reserved bit27: Reserved bit28: 1 = Cancel SS2E, 0 = Select SS2E bit29: Reserved bit30: Reserved bit31: Reserved	0x0	-	Unchangeable	"H29_en.29" on page 745
H29.31	0x291F	Variable SLS limit	-32768 to 32767	0	-	Unchangeable	"H29_en.31" on page 746

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.50	0x2932	Status word 1 (ZSW1)	bit0: 1 = Ready to switch on, control circuit switched on, initialization done bit1: 1 = Ready to run, main circuit switched on bit2: 1 = Run enable bit3: 1 = Fault bit4: 1 = Coast to stop deactivated (OFF2 deactivated) 0 = Cost to stop activated (OFF2 activated) bit5: 1 = Quick stop deactivated (OFF2 deactivated) 0 = Quick stop activated (OFF2 activated) bit6: 1 = Switch-on inhibited bit7: 1 = Warning existed bit8: Reserved bit9: 1 = PLC control request bit10: Reserved bit11: Reserved bit12: Reserved bit13: Reserved bit14: Reserved bit15: Reserved	0	-	Unchangeable	"H29_en.50" on page 747
H29.51	0x2933	Status word 2 (ZSW2)	bit0: Reserved bit1: Reserved bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: Reserved bit8: Reserved bit9: Reserved bit10: Reserved bit11: Reserved bit12: bit12–bit15 drive heartbeat count value, uploaded to PLC bit13: bit12–bit15 drive heartbeat count value, uploaded to PLC bit14: bit12–bit15 drive heartbeat count value, uploaded to PLC bit15: bit12–bit15 drive heartbeat count value, uploaded to PLC	0	-	Unchangeable	"H29_en.51" on page 747
H29.52	0x2934	Speed actual value A (VEL_NIST_A)	0 to 65535	0	-	Unchangeable	"H29_en.52" on page 748
H29.53	0x2935	Speed actual value B (VEL_NIST_B)	0 to 4294967295	0	-	Unchangeable	"H29_en.53" on page 748

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.55	0x2937	Encoder status word (G1_ZSW)	Bit0: 1 = Function 1 activated bit1: 1 = Function 2 activated bit2: 1 = Function 3 activated bit3: 1 = Function 4 activated bit4: 1 = Actual value 1 readable bit5: 1 = Actual value 2 readable bit6: 1 = Actual value 3 readable bit7: 1 = Actual value 4 readable bit8: Touch probe 1 bit9:Touch probe 2 bit10: Reserved bit11: Response encoder fault bit12: Set zero response bit13: Cyclic transmission of the absolute position in G1_XIST2 bit14: Parking encoder activated bit15: The encoder is faulty.	0	-	Unchangeable	"H29_en.55" on page 748
H29.56	0x2938	Encoder 1 position actual value 1 (G1_XIST1)	0 to 4294967295	0	-	Unchangeable	"H29_en.56" on page 749
H29.58	0x293A	Encoder 1 position actual value 2 (G1_XIST2)	0 to 4294967295	0	-	Unchangeable	"H29_en.58" on page 749
H29.60	0x293C	Position status word 1 (POS_ZSW1)	Bit0: bit0–bit5 effective traversing block supports up to 16 blocks bit1: bit0–bit5 effective traversing block supports up to 16 blocks bit2 :bit0–bit5 effective traversing block supports up to 16 blocks bit3 :bit0–bit5 effective traversing block supports up to 16 blocks bit4: bit0–bit5 effective traversing block supports up to 16 blocks bit5: bit0–bit5 effective traversing block supports up to 16 blocks bit6: Reserved bit7: Reserved bit8: 1 = Reverse stopper activated bit9: 1 = Forward stopper activated bit10: 1 = JOG activated bit11: 1 = Proactive reference point approach activated bit12: Reserved bit13: 1 = Running block activated bit14: 1 = Setting activated bit15: 1 = MDI activated 0 = MDI deactivated	0	-	Unchangeable	"H29_en.60" on page 749

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.61	0x293D	Position status word 2 (POS_ ZSW2)	Bit0:1 = Tracking mode activated bit1:1 = Speed limit activated bit2:1 = Setpoint available bit3: Reserved bit4:1= Axis moving forwardly bit5:1 = Axis moving reversely bit6:1 = Negative software limit switch reached bit7:1 = Positive software limit switch reached bit8: 1 = Position actual value < = Limit switch position 1 bit9:1 = Position actual value < = Limit switch position 2 bit10:1 = Direct output 1 through running block setting bit11:1 = Direct output 2 through running block setting bit12:1 = Fixed stop point reached bit13: 1 = Fixed stop point fastening torque reached bit14: 1 = Running to the fixed stop point activated bit15: 1 = RUN command activated	0	-	Unchangeable	"H29_en.61" on page 750
H29.63	0x293F	Customized send word for telegram 111	0 to 65535	0	-	Unchangeable	"H29_en.63" on page 751
H29.65	0x2941	Fault code (FaultCode)	0 to 65535	0	-	Unchangeable	"H29_en.65" on page 751
H29.66	0x2942	Warning code	0 to 65535	0	-	Unchangeable	"H29_en.66" on page 751
H29.67	0x2943	Actual torque	-32768 to 32767	0	-	Unchangeable	"H29_en.67" on page 751
H29.68	0x2944	User-defined send word for 850 additive telegram	0 to 65535	0	-	Unchangeable	"H29_en.68" on page 751
H29.69	0x2945	XIST_A position feedback	-2147483648 to 2147483647	0	-	Unchangeable	"H29_en.69" on page 752

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.71	0x2947	Safety status word 1 (S_ZSW1)	bit0: 1 = STO activated, 0 = STO not activated bit1: 1 = SS1 not activated, 0 = SS1 not activated bit2: 1 = SS2 not activated, 0 = SS2 not activated bit3: 1 = SOS activated, 0 = SOS not activated bit4: 1 = SLS activated, 0 = SLS not activated bit5: Reserved bit6: Reserved bit7: 1 = Safety failure, 0 = Normal operation bit8: Reserved bit9: SLS limit value 0 bit10: SLS limit value 1 bit11: SOS selected bit12: 1 = SDI+ activated, 0 = SDI+ not activated bit13: 1 = SDI- activated, 0 = SDI- not activated bit14: Reserved bit15: 1 = speed smaller than or equal to SSM threshold, 0 = current speed exceeds the SSM threshold	0x0	-	Unchangeable	"H29_en.71" on page 752

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.72	0x2948	Safety status word 2 (S_ZSW2)	Bit0: 1 = STO active, 0 = STO not active bit1: 1 = SS1 active, 0 = SS1 not active bit2: 1 = SS2 active, 0 = SS2 not active bit3: 1 = SOS active, 0 = SOS not active bit4: 1 = SLS active, 0 = SLS not active bit5: Reserved bit6: Reserved bit7: 1 = safety failure, 0 = normal operation bit8: Reserved bit9: SLS limit value 0 bit10: SLS limit value 1 bit11: Reserved bit12: 1 = SDI + active, 0 = SDI + not active bit13: 1 = SDI- active, 0 = SDI- not active bit14: Reserved bit15: 1 = speed is less than or equal to SSM threshold, 0 = current speed is greater than SSM threshold bit16: Reserved bit17: reserved bit18: 1 = SS1E active, 0 = SS1E not active bit19: reserved bit20: Reserved bit21: Reserved bit22: Reserved bit23: Reserved bit24: 1 = F-DI1 is 1 signal, 0 = F-DI1 is 0 signal bit25: 1 = F-DI2 is 1 signal, 0 = F-DI2 is 0 signal bit26: 1 = F-DI3 is 1 signal, 0 = F-DI3 is 0 signal bit27: 1 = F-DI4 is 1 signal, 0 = F-DI4 is 0 signal bit28: 1 = SS2E active, 0 = SS2E not active bit29: 1 = SOS selected, 0 = SOS revoked bit30: 1 = F-DI5 is 1 signal, 0 = F-DI5 is 0 signal bit31: Reserved	0x0	-	Unchangeable	"H29_en.72" on page 752

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H29.74	0x294A	Variable SLS limit state	-32768 to 32767	0	-	Unchangeable	"H29_en.74" on page 753
H29.90	0x295A	Modulo axis modulus	0 to 2147483647	0	-	Unchangeable	"H29_en.90" on page 754

15.26 H30 Related Variables Read through Communication

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H30.00	0x3000	Servo state read via communication	0 to 65535	0	-	Unchangeable	"H30_en.00" on page 754
H30.01	0x3001	DO function status 1 read through communication	0 to 65535	0	-	Unchangeable	"H30_en.01" on page 754
H30.02	0x3002	DO function status 2 read through communication	0 to 65535	0	-	Unchangeable	"H30_en.02" on page 754
H30.16	0x3010	1st encoder communication timeout count	0 to 65535	0	-	Unchangeable	"H30_en.16" on page 755
H30.17	0x3011	1st encoder communication CRC error count	0 to 65535	0	-	Unchangeable	"H30_en.17" on page 755
H30.18	0x3012	1st encoder communication frame stop bit error count	0 to 65535	0	-	Unchangeable	"H30_en.18" on page 755
H30.20	0x3014	Servo SN code digits 0 & 1	0x0 to 0xFFFF	0x0	-	Unchangeable	"H30_en.20" on page 755
H30.21	0x3015	Servo SN code digits 2 & 3	0x0 to 0xFFFF	0x0	-	Unchangeable	"H30_en.21" on page 756
H30.22	0x3016	Servo SN code digits 4 & 5	0x0 to 0xFFFF	0x0	-	Unchangeable	"H30_en.22" on page 756
H30.23	0x3017	Servo SN code digits 6 & 7	0x0 to 0xFFFF	0x0	-	Unchangeable	"H30_en.23" on page 756
H30.24	0x3018	Servo SN code digits 8 & 9	0x0 to 0xFFFF	0x0	-	Unchangeable	"H30_en.24" on page 756
H30.25	0x3019	Servo SN code digits 10 & 11	0x0 to 0xFFFF	0x0	-	Unchangeable	"H30_en.25" on page 756

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H30.26	0x301A	Servo SN code digits 12 & 13	0x0 to 0xFFFF	0x0	-	Unchangeable	"H30_en.26" on page 757
H30.27	0x301B	Servo SN code digits 14 & 15	0x0 to 0xFFFF	0x0	-	Unchangeable	"H30_en.27" on page 757

15.27 H31 References Set through Communication

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H31.00	0x3100	VDI virtual level set through communication	0 to 65535	0	-	Real-time	"H31_en.00" on page 757
H31.01	0x3101	Frequency-division output frequency set through communication	0 Hz–16000000 Hz	0	Hz	Real-time	"H31_en.01" on page 757
H31.04	0x3104	DO status set through communication	0 to 65535	0	-	Real-time	"H31_en.04" on page 758
H31.05	0x3105	AO status set through communication	-10000 mV–10000 mV	0	mV	Real-time	"H31_en.05" on page 758
H31.09	0x3109	Speed reference set through communication	-10000.000[mm/s]/[rpm] to 10000.000[mm/s]/[rpm]	0.000	[mm/s]/[rpm]	Real-time	"H31_en.09" on page 758
H31.11	0x310B	Torque reference set through communication	-100.000% to 100.000%	0.000	%	Real-time	"H31_en.11" on page 758

15.28 H32 Direct Drive Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H32.01	0x3201	Encoder interface switchover switch	0: Default encoder interface 1: Switching encoder interface	0	-	At stop	"H32_en.01" on page 759
H32.02	0x3202	Angle auto-tuning upon power-on	0: Disabled 1: Enabled	0	-	At stop	"H32_en.02" on page 759
H32.04	0x3204	Angle auto-tuning state	Bit1: E602.9	0	-	At stop	"H32_en.04" on page 759
H32.05	0x3205	Pre-positioning retract selection	0: Disabled 1: Enabled	0	-	At stop	"H32_en.05" on page 759

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H32.06	0x3206	Position feedback	0: Disabled 1: Enabled	0	-	At stop	"H32_en.06" on page 760
H32.07	0x3207	Incremental homing method	0: Z Signal short circuit 1: Only first short circuit	1	-	At stop	"H32_en.07" on page 760
H32.08	0x3208	Homing signal width	100 to 65535	800	encoder unit	At stop	"H32_en.08" on page 760
H32.10	0x320A	Max. reference current in angle auto-tuning through inching	10.0% to 300.0%	100.0	%	At stop	"H32_en.10" on page 761
H32.13	0x320D	Motor operation threshold (ROT/DDR) in angle auto-tuning through inching	0.001deg to 20.000deg	0.200	deg	At stop	"H32_en.13" on page 761
H32.14	0x320E	Motor standstill threshold (ROT/DDR) in angle auto-tuning through inching	0.1[mm/s]/[rpm] to 100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	"H32_en.14" on page 761
H32.20	0x3214	Max. reference current in angle auto-tuning through pre-positioning (closed-loop)	10.0% to 300.0%	100.0	%	At stop	"H32_en.20" on page 761
H32.22	0x3216	Electrical angle reference in angle auto-tuning through pre-positioning (closed-loop)	0.0deg to 360.0deg	0.0	deg	At stop	"H32_en.22" on page 761
H32.23	0x3217	Electrical angle reference change range in angle auto-tuning through pre-positioning (closed-loop)	10.0deg to 170.0deg	90.0	deg	At stop	"H32_en.23" on page 762
H32.24	0x3218	Motor stop threshold (ROT/DDR) in angle auto-tuning through pre-positioning (closed-loop)	0.1[mm/s]/[rpm] to 100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	"H32_en.24" on page 762

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H32.26	0x321A	Damping in angle auto-tuning through pre-positioning (closed-loop)	0.00[N/(m/s)]/[N·m/rpm]–655.35[N/(m/s)]/[N·m/rpm]	0.00	[N/(m/s)]/[N·m/rpm]	At stop	"H32_en.26" on page 762
H32.30	0x321E	Max. reference current in angle auto-tuning through position lock	10.0% to 300.0%	100.0	%	At stop	"H32_en.30" on page 762
H32.33	0x3221	Motor operation threshold (ROT/DDR) in angle auto-tuning through position lock	0.001deg to 20.000deg	0.200	deg	At stop	"H32_en.33" on page 763
H32.34	0x3222	Motor standstill threshold (ROT/DDR) in angle auto-tuning through position lock	0.1[mm/s]/[rpm] to 100.0[mm/s]/[rpm]	1.0	[mm/s]/[rpm]	At stop	"H32_en.34" on page 763
H32.37	0x3225	Angle gain in angle auto-tuning through position lock	0deg/(p/s)–10000deg/(p/s)	1000	deg/(p/s)	At stop	"H32_en.37" on page 763
H32.38	0x3226	Inertia ratio in angle auto-tuning through position lock	0.00 to 120.00	0.00	-	At stop	"H32_en.38" on page 763
H32.39	0x3227	Gain class in angle auto-tuning through position lock	4level to 31level	16	level	At stop	"H32_en.39" on page 764
H32.41	0x3229	Angle auto-tuning delay after power-on	0s to 65535s	3	s	Real-time	"H32_en.41" on page 764
H32.45	0x322D	Black box channel 28 function	0: Real-time target position (607Ah) 1: Electric angle	0	-	At stop	"H32_en.45" on page 764
H32.50	0x3232	32-bit range compatibility	0 to 99	1	-	At stop	"H32_en.50" on page 764
H32.70	0x3246	Motor overload protection mode	0: Internal motor overload curve 1: External motor overload curve 2: Current limit overload protection 3: Hide motor overload protection	0	-	At stop	"H32_en.70" on page 765
H32.73	0x3249	Thermal threshold current of overload current limit	10.0% to 750.0%	115.0	%	At stop	"H32_en.73" on page 765

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H32.74	0x324A	Peak current of overload current limit	100.0% to 750.0%	300.0	%	At stop	"H32_en.74" on page 765
H32.75	0x324B	Max. current duration of overload protection	0.01s to 655.35s	1.00	s	At stop	"H32_en.75" on page 766
H32.76	0x324C	Current limit time constant of overload protection	0.01 to 655.35	1.00	-	At stop	"H32_en.76" on page 766
H32.77	0x324D	Current limit alarm threshold of overload protection	0.0% to 750.0%	0.0	%	At stop	"H32_en.77" on page 766
H32.78	0x324E	Current limit fault threshold of overload protection	0.0% to 750.0%	0.0	%	At stop	"H32_en.78" on page 766
H32.79	0x324F	Thermal threshold current of overload	10.0% to 750.0%	115.0	%	At stop	"H32_en.79" on page 766
H32.80	0x3250	Thermal current interval of overload	0.1% to 204.8%	6.4	%	At stop	"H32_en.80" on page 767
H32.81	0x3251	Overload heat dissipation current interval	0.1% to 204.8%	6.4	%	At stop	"H32_en.81" on page 767
H32.82	0x3252	Length of overload heat dissipation curve	1 to 200	1	-	At stop	"H32_en.82" on page 767
H32.83	0x3253	Length of overload heat dissipation curve	1 to 200	1	-	At stop	"H32_en.83" on page 767

15.29 H33 Compensation Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.00	0x3300	Compensation data BUFFER0	0 to 65535	0	-	At stop	"H33_en.00" on page 768
H33.01	0x3301	Compensation data BUFFER1	0 to 65535	0	-	At stop	"H33_en.01" on page 768
H33.02	0x3302	Compensation data BUFFER2	0 to 65535	0	-	At stop	"H33_en.02" on page 768

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.03	0x3303	Compensation data BUFFER3	0 to 65535	0	-	At stop	"H33_en.03" on page 768
H33.04	0x3304	Compensation data BUFFER4	0 to 65535	0	-	At stop	"H33_en.04" on page 768
H33.05	0x3305	Compensation data BUFFER5	0 to 65535	0	-	At stop	"H33_en.05" on page 769
H33.06	0x3306	Compensation data BUFFER6	0 to 65535	0	-	At stop	"H33_en.06" on page 769
H33.07	0x3307	Compensation data BUFFER7	0 to 65535	0	-	At stop	"H33_en.07" on page 769
H33.08	0x3308	Compensation data BUFFER8	0 to 65535	0	-	At stop	"H33_en.08" on page 769
H33.09	0x3309	Compensation data BUFFER9	0 to 65535	0	-	At stop	"H33_en.09" on page 770
H33.10	0x330A	Compensation data BUFFER10	0 to 65535	0	-	At stop	"H33_en.10" on page 770
H33.11	0x330B	Compensation data BUFFER11	0 to 65535	0	-	At stop	"H33_en.11" on page 770
H33.12	0x330C	Compensation data BUFFER12	0 to 65535	0	-	At stop	"H33_en.12" on page 770
H33.13	0x330D	Compensation data BUFFER13	0 to 65535	0	-	At stop	"H33_en.13" on page 770
H33.14	0x330E	Compensation data BUFFER14	0 to 65535	0	-	At stop	"H33_en.14" on page 771
H33.15	0x330F	Compensation data BUFFER15	0 to 65535	0	-	At stop	"H33_en.15" on page 771
H33.16	0x3310	Compensation data BUFFER16	0 to 65535	0	-	At stop	"H33_en.16" on page 771
H33.17	0x3311	Compensation data BUFFER17	0 to 65535	0	-	At stop	"H33_en.17" on page 771
H33.18	0x3312	Compensation data BUFFER18	0 to 65535	0	-	At stop	"H33_en.18" on page 771
H33.19	0x3313	Compensation data BUFFER19	0 to 65535	0	-	At stop	"H33_en.19" on page 772
H33.20	0x3314	Compensation data BUFFER20	0 to 65535	0	-	At stop	"H33_en.20" on page 772
H33.21	0x3315	Compensation data BUFFER21	0 to 65535	0	-	At stop	"H33_en.21" on page 772
H33.22	0x3316	Compensation data BUFFER22	0 to 65535	0	-	At stop	"H33_en.22" on page 772

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.23	0x3317	Compensation data BUFFER23	0 to 65535	0	-	At stop	"H33_en.23" on page 773
H33.24	0x3318	Compensation data BUFFER24	0 to 65535	0	-	At stop	"H33_en.24" on page 773
H33.25	0x3319	Compensation data BUFFER25	0 to 65535	0	-	At stop	"H33_en.25" on page 773
H33.26	0x331A	Compensation data BUFFER26	0 to 65535	0	-	At stop	"H33_en.26" on page 773
H33.27	0x331B	Compensation data BUFFER27	0 to 65535	0	-	At stop	"H33_en.27" on page 773
H33.28	0x331C	Compensation data BUFFER28	0 to 65535	0	-	At stop	"H33_en.28" on page 774
H33.29	0x331D	Compensation data BUFFER29	0 to 65535	0	-	At stop	"H33_en.29" on page 774
H33.30	0x331E	Compensation data BUFFER30	0 to 65535	0	-	At stop	"H33_en.30" on page 774
H33.31	0x331F	Compensation data BUFFER31	0 to 65535	0	-	At stop	"H33_en.31" on page 774
H33.32	0x3320	Compensation data BUFFER32	0 to 65535	0	-	At stop	"H33_en.32" on page 774
H33.33	0x3321	Compensation data BUFFER33	0 to 65535	0	-	At stop	"H33_en.33" on page 775
H33.34	0x3322	Compensation data BUFFER34	0 to 65535	0	-	At stop	"H33_en.34" on page 775
H33.35	0x3323	Compensation data BUFFER35	0 to 65535	0	-	At stop	"H33_en.35" on page 775
H33.36	0x3324	Compensation data BUFFER36	0 to 65535	0	-	At stop	"H33_en.36" on page 775
H33.37	0x3325	Compensation data BUFFER37	0 to 65535	0	-	At stop	"H33_en.37" on page 776
H33.38	0x3326	Compensation data BUFFER38	0 to 65535	0	-	At stop	"H33_en.38" on page 776
H33.39	0x3327	Compensation data BUFFER39	0 to 65535	0	-	At stop	"H33_en.39" on page 776
H33.40	0x3328	Current Compensation BUFFER group number	0 to 65535	0	-	At stop	"H33_en.40" on page 776
H33.41	0x3329	Compensation data sum	0 to 32767	0	-	At stop	"H33_en.41" on page 776

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H33.44	0x332C	Data command	0 to 1	1	-	At stop	"H33_en.44" on page 777
H33.45	0x332D	Data storage position	0: Servo RAM 1: Servo FLASH 2: Encoder FLASH	1	-	At stop	"H33_en.45" on page 777
H33.46	0x332E	Data clear	0 to 3	0	-	At stop	"H33_en.46" on page 777
H33.47	0x332F	Software tool write status	0 to 2	0	-	At stop	"H33_en.47" on page 777
H33.48	0x3330	Servo read status	0 to 65535	0	-	Unchangeable	"H33_en.48" on page 778
H33.49	0x3331	Software tool read status	0 to 2	0	-	At stop	"H33_en.49" on page 778
H33.50	0x3332	Servo write status	0 to 65535	0	-	Unchangeable	"H33_en.50" on page 778
H33.51	0x3333	Data transmission completed flag	0 to 1	0	-	At stop	"H33_en.51" on page 778
H33.52	0x3334	Servo data transfer completed flag	0 to 65535	0	-	Unchangeable	"H33_en.52" on page 778
H33.81	0x3351	Motor cogging torque ripple compensation sum	0count to 65535count	2000	count	At stop	"H33_en.81" on page 779

15.30 H34 Servo Motor Parameters 2

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H34.12	0x340C	Error type supported by EnDat2.2 encoder	0x0 to 0xFFFF	0x0	-	Unchangeable	"H34_en.12" on page 779
H34.13	0x340D	Alarm types supported by EnDat2.2 encoders	0x0 to 0xFFFF	0x0	-	Unchangeable	"H34_en.13" on page 779
H34.14	0x340E	Error value output by EnDat2.2 encoder	0x0 to 0xFFFF	0x0	-	Unchangeable	"H34_en.14" on page 779
H34.15	0x340F	Alarm value output by EnDat2.2 encoder	0x0 to 0xFFFF	0x0	-	Unchangeable	"H34_en.15" on page 780

15.31 H3A Servo Version Number Parameters

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H3A.00	0x3A00	MCU software version - VR version	0.00 to 655.35	0.00	-	Unchangeable	"H3A_en.00" on page 780
H3A.01	0x3A01	MCU software version - C SPC version	0.000 to 65.535	0.000	-	Unchangeable	"H3A_en.01" on page 780
H3A.02	0x3A02	MCU software version - non-standard version	0 to 65535	0	-	Unchangeable	"H3A_en.02" on page 780
H3A.03	0x3A03	MCU software version - test, trial version	0.000 to 65.535	0.000	-	Unchangeable	"H3A_en.03" on page 781
H3A.04	0x3A04	MCU software version - software version	0 to 65535	0	-	Unchangeable	"H3A_en.04" on page 781
H3A.05	0x3A05	FPGA software version - VR version	0.00 to 655.35	0.00	-	Unchangeable	"H3A_en.05" on page 781
H3A.06	0x3A06	FPGA software version - C SPC version	0.000 to 65.535	0.000	-	Unchangeable	"H3A_en.06" on page 781
H3A.07	0x3A07	FPGA software version - non-standard version	0 to 65535	0	-	Unchangeable	"H3A_en.07" on page 782
H3A.08	0x3A08	FPGA software version - test, trial version	0.000 to 65.535	0.000	-	Unchangeable	"H3A_en.08" on page 782
H3A.09	0x3A09	FPGA software version - software version	0 to 65535	0	-	Unchangeable	"H3A_en.09" on page 782
H3A.10	0x3A0A	SAFE software version - VR version	0.00 to 655.35	0.00	-	Unchangeable	"H3A_en.10" on page 782
H3A.11	0x3A0B	SAFE software version - C SPC version	0.000 to 65.535	0.000	-	Unchangeable	"H3A_en.11" on page 782
H3A.12	0x3A0C	SAFE software version - non-standard version	0 to 65535	0	-	Unchangeable	"H3A_en.12" on page 783
H3A.13	0x3A0D	SAFE software version - test, trial version	0.000 to 65.535	0.000	-	Unchangeable	"H3A_en.13" on page 783

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H3A.14	0x3A0E	SAFE software version - software version	0 to 65535	0	-	Unchangeable	"H3A_en.14" on page 783
H3A.15	0x3A0F	Communication version - 200P	0.0 to 6553.5	0.0	-	Unchangeable	"H3A_en.15" on page 783

16 Parameter Description

16.1 H00 Servo Motor Parameters

H00.00 **Motor SN**

Address:	0x0000	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	14102	Change:	At stop

Value Range:

20002: Rotary motor-pulse encoder

14000: Rotary motor-Inovance 20-bit encoder

14101: Rotary motor-Inovance 23-bit encoder

14102: Rotary motor-Inovance 26-bit encoder

14140: Rotary motor-Endat2.2 encoder

14150: Rotary motor-SSI encoder

14160: Rotary motor-BiSS-C encoder

Description

20002: Rotary motor-pulse encoder

14000: Rotary motor-Inovance 20-bit encoder

14101: Rotary motor-Inovance 23-bit encoder

14102: Rotary motor-Inovance 26-bit encoder

14140: Rotary motor-Endat2.2 encoder. Before using it, set H0A.35 to 1

14150: Rotary motor-SSI encoder

14160: Rotary motor-BiSS-C encoder

H00.02 **Customized No.**

Address:	0x0002	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	42949672.95	Data Type:	UInt32
Default:	0.00	Change:	Unchangeable

Value Range:

0.00 to 42949672.95

Description

Differentiates the customized MCU software version, which is not applicable to standard models.

H00.04 **Encoder version**

Address:	0x0004	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 to 6553.5

Description

Saved in the encoder and used to differentiate the encoder software version.

H00.05 **Serial-type motor code**

Address:	0x0005	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the code of the serial-type motor, which is determined by the motor model and unchangeable.

H00.06 **FPGA customized SN**

Address:	0x0006	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:
0.00 to 655.35
Description
Differentiates the customized FPGA software version, which is not applicable to standard models.

H00.07 **STO version**

Address:	0x0007	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0 to 6553.5
Description
Display the software version number of STO function.

H00.08 **Bus encoder type**

Address:	0x0008	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
14100: Multi-turn absolute encoder
Others: Single-turn absolute encoder

H00.14 **Rated speed**

Address:	0x000E	Effective mode:	Upon the next power-on
Min.:	50	Unit:	rpm
Max.:	10000	Data Type:	UInt16

Default:	3000	Change:	At stop

Value Range:
50rpm to 10000rpm
Description
Set the motor rated speed.

H00.15 **Maximum speed**

Address:	0x000F	Effective mode:	Upon the next power-on
Min.:	50	Unit:	rpm
Max.:	10000	Data Type:	UInt16
Default:	6000	Change:	At stop

Value Range:
50rpm to 10000rpm
Description
Set the maximum motor speed.

H00.40 **Motor control type**

Address:	0x0028	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:
0: General-purpose rotary motor ROT
Description
The motor type supported by the drive.
0: General-purpose rotary motor ROT

H00.41 **Master encoder configuration**

Address:	0x0029	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Unchangeable

Value Range:
0: CN2
1: CN7
Description
Set the terminal for the master encoder.

H00.43 **Number of BiSS-C/SSI/EnDat2.2 data bits**

Address:	0x002B	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	32	Change:	At stop

Value Range:
0 to 40
Description
Defines the length of the data configured based on BiSS-C/SSI/EnDat2.2 protocol.

H00.44 **Number of BiSS-C/SSI fault bits**

Address:	0x002C	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:
0 to 31
Description
Defines the length of the fault configured based on BiSS-C/SSI protocol.

H00.54 **BiSS-C/SSI CRC**

Address:	0x0036	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0 to 1
Description
Defines the CRC polarity of the BiSS-C/SSI protocol.
0: Positive
1: Negative

H00.59 **Encoder counting direction**

Address:	0x003B	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Forward
1: Reverse
Description
Motor phase sequence:
0: Forward
1: Reverse

H00.65 **Motor rated current**

Address:	0x0041	Effective mode:	Upon the next power-on
Min.:	0.00	Unit:	A
Max.:	42949672.95	Data Type:	UInt32
Default:	1.00	Change:	At stop

Value Range:
0.00 A to 42949672.95 A
Description
Set the rated current.

H00.69 **Linear back EMF coefficient**

Address:	0x0045	Effective mode:	Upon the next power-on

Min.:	0.00	Unit:	[V/(m/s)]/[100mV/rpm]
Max.:	42949672.95	Data Type:	UInt32
Default:	33.00	Change:	At stop

Value Range:
0.00[V/(m/s)]/[100mV/rpm]–42949672.95[V/(m/s)]/[100mV/rpm]
Description
Set the Linear back EMF coefficient.

16.2 H01 Drive Parameters

H01.00 **MCU software version**

Address:	0x0100	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0 to 6553.5
Description
Displays MCU software version (with one decimal place).

H01.01 **FPGA software version**

Address:	0x0101	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0 to 6553.5
Description
Displays the FPGA software version, with 1 decimal place.

H01.02 **Servo drive series No.**

Address:	0x0102	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Display servo drive serial number, with 0 decimal place.

H01.06 **Board software version**

Address:	0x0106	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 to 6553.5

Description

Display board software version number, with 1 decimal place.

H01.10 Drive series No.

Address:	0x010A	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	3	Change:	At stop

Value Range:

2: S1R6

3: S2R8

5: S5R5

6: S7R6

7: S012

8: S018

9: S022

10: S027

10001: T3R5

10002: T5R4

10003: T8R4

10004: T012

10005: T017

10006: T021

10007: T026

Description

Displays the drive series number, with no decimal place.

H01.11 DC-AC voltage class

Address:	0x010B	Effective mode:	-
Min.:	0	Unit:	V
Max.:	65535	Data Type:	UInt16
Default:	220	Change:	Unchangeable

Value Range:

0 V to 65535 V

Description

Display inverter voltage level, with 0 decimal place.

H01.12 Drive rated power

Address:	0x010C	Effective mode:	-
Min.:	0.00	Unit:	kW
Max.:	42949672.95	Data Type:	UInt32
Default:	0.40	Change:	Unchangeable

Value Range:

0.00 kW–42949672.95 kW

Description

Display the rated power of the drive, with 2 decimal places.

H01.14 **Max. output power of the drive**

Address:	0x010E	Effective mode:	-
Min.:	0.00	Unit:	kW
Max.:	42949672.95	Data Type:	UInt32
Default:	0.40	Change:	Unchangeable

Value Range:
0.00 kW–42949672.95 kW
Description
Displays the maximum output power of the drive, with 2 decimal places.

H01.16 **Rated output current of the drive**

Address:	0x0110	Effective mode:	-
Min.:	0.00	Unit:	A
Max.:	42949672.95	Data Type:	UInt32
Default:	2.80	Change:	Unchangeable

Value Range:
0.00 A to 42949672.95 A
Description
Displays the rated output current of the drive, with 2 decimal places.

H01.18 **Max. output current of the drive**

Address:	0x0112	Effective mode:	-
Min.:	0.00	Unit:	A
Max.:	42949672.95	Data Type:	UInt32
Default:	10.10	Change:	Unchangeable

Value Range:
0.00 A to 42949672.95 A
Description
Displays the maximum output current of the drive, with 2 decimal places.

H01.40 **DC bus overvoltage protection threshold**

Address:	0x0128	Effective mode:	Real-time
Min.:	0	Unit:	V
Max.:	2000	Data Type:	UInt16
Default:	420	Change:	Real-time

Value Range:
0 V to 2000 V
Description
Displays DC bus overvoltage protection threshold, with 0 decimal place.

H01.88 **Junction temperature parameter version 1**

Address:	0x0158	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 to 6553.5

Description

Displays version 1 of the junction temperature parameter.

H01.89 **Junction temperature parameter version 2**

Address:	0x0159	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Displays version 2 of the junction temperature parameter.

16.3 H02 Basic Control Parameters

H02.00 **Control mode**

Address:	0x0200	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	11	Data Type:	UInt16
Default:	11	Change:	At stop

Value Range:

11: PN communication mode

Description

11: PN communication mode

H02.01 **Absolute system selection**

Address:	0x0201	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	5	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Incremental mode

1: Absolute position linear mode

2: Absolute position rotation mode

3: Absolute position linear mode (without encoder overflow warning)

4: Absolute position single-turn mode

5: Absolute position rotational mode, modal axis single modal revolution absolute command

Description

Absolute system mode selection

0: Incremental mode

1: Absolute position linear mode

2: Absolute position rotation mode

3: Absolute position linear mode (without encoder overflow warning)

4: Absolute position single-turn mode

5: Absolute position rotational mode, modal axis single modal revolution absolute command

H02.02 **Rotation direction selection**

Address:	0x0202	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Counterclockwise (CCW) as forward direction

1: Clockwise (CW) as forward direction

Description

Defines the forward direction of the motor when viewed from the motor shaft side.

0: Counterclockwise (CCW) as forward direction

1: Clockwise (CW) as forward direction

H02.03 **Output pulse phase**

Address:	0x0203	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Phase A leads phase B

1: Phase A lags behind phase B

Description

Defines the relationship between phase A and phase B on the condition that the motor direction of rotation remains unchanged when pulse output is enabled.

0: Phase A leads phase B

1: Phase A lags behind phase B

H02.05 **Stop mode at S-ON OFF**

Address:	0x0205	Effective mode:	At stop
Min.:	-5	Unit:	-
Max.:	3	Data Type:	Int16
Default:	3	Change:	Real-time

Value Range:

–5: Stop in PN communication state (ramp/quick/coast to stop), keeping DB state: ramp stop when OFF1 is active, coast to stop when OFF2 is active, quick stop when OFF3 is active, and coast to stop when all are inactive

-4: Stop based on ramp 2, keeping dynamic braking state

-3: Stop at zero speed, keeping dynamic braking state

-2: Stop based on ramp 1, keeping dynamic braking state

-1: Dynamic braking stop, keeping dynamic braking state

0: Coast to stop, keeping de-energized state

1: Stop based on ramp 1, keeping de-energized state

2: Dynamic braking stop, keeping de-energized state, keeping dynamic braking state

3: Stop in PN communication state (ramp/quick/coast to stop), keeping de-energized state: ramp stop when OFF1 is active, coast to stop when OFF2 is active, quick stop when OFF3 is active, and coast to stop when all are inactive

Description

Defines the deceleration mode of the motor for stopping rotating upon S-ON OFF and the motor status after stop.

Set a proper stop mode according to the mechanical status and operation requirements.

-5: Stop in PN communication state (ramp/quick/coast to stop), keeping DB state: ramp stop when OFF1 is active, coast to stop when OFF2 is active, quick stop when OFF3 is active, and coast to stop when all are inactive

–4: Stop based on ramp 2, keeping dynamic braking state

–3: Stop at zero speed, keeping dynamic braking state

–2: Stop based on ramp 1, keeping dynamic braking state

–1: Dynamic braking stop, keeping dynamic braking state

0: Coast to stop, keeping de-energized state

1: Stop by ramp 1, keeping de-energized state

2: Dynamic braking stop, keeping de-energized state

3: Stop in PN communication state (ramp/quick/coast to stop), keeping de-energized state: ramp stop when OFF1 is active, coast to stop when OFF2 is active, quick stop when OFF3 is active, and coast to stop when all are inactive

Note: After the brake is enabled, H02.05 will be forcibly set to "-4: Ramp to stop, keeping DB state".

H02.06 **Stop mode at No. 2 fault**

Address:	0x0206	Effective mode:	At stop
Min.:	-5	Unit:	-
Max.:	4	Data Type:	Int16
Default:	2	Change:	Real-time

Value Range:

-5: Stop at zero speed, keeping dynamic braking state

-4: Stop at emergency stop torque, keeping dynamic braking state

-3: Stop based on ramp 2, keeping dynamic braking state

-2: Stop based on ramp 1, keeping dynamic braking state

-1: Dynamic braking stop, keeping dynamic braking state

0: Coast to stop, keeping de-energized state

1: Stop based on ramp 1, keeping de-energized state

2: Stop based on ramp 2, keeping de-energized state

3: Stop at emergency stop torque, keeping de-energized state

4: Dynamic braking stop, keeping de-energized state

Description

Defines the deceleration mode of the servo motor for stopping rotating and the servo motor status when a No. 2 fault occurs.

Note: If the brake is enabled, H02.06 is forced to –3: Stop by ramp 2, keeping dynamic braking state.

H02.07 **Stop mode at overtravel**

Address:	0x0207	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

1: Stop at zero speed, keeping position lock state

4: Stop at ramp 2, keeping position lock state

7: Not respond to overtravel

Description

Defines the deceleration mode of the motor for stopping rotating upon overtravel and the motor status after stop.

When the servo motor drives vertical axis, your setting must make the motor axis in position locking state after the limit switch signal is active to ensure safety.

1: Stop at zero speed, keeping position lock state

4: Stop at ramp 2, keeping position lock state

7: Not respond to overtravel

Note: After the brake function is enabled, H02.07 will be forcibly set to "4: Ramp to stop, keeping position lock state".

H02.08 **Stop mode at No.1 fault**

Address:	0x0208	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0: Coast to stop, keeping de-energized state

1: Dynamic braking stop, keeping de-energized state

2: Dynamic braking stop, keeping dynamic braking state

Description

Defines the deceleration mode of the servo motor for stopping rotating and the servo motor status when a No. 1 fault occurs.

0: Coast to stop, keeping de-energized state

1: Dynamic braking stop, keeping de-energized status

2: Dynamic braking stop, keeping de-energized state

Note: After the brake is enabled, H02.08 is forced to "2: Dynamic braking stop, keeping dynamic braking state".

H02.09 **Delay from brake output ON to command received**

Address:	0x0209	Effective mode:	At stop
Min.:	0	Unit:	ms
Max.:	500	Data Type:	UInt16
Default:	250	Change:	Real-time

Value Range:

0 ms–500 ms

Description

Defines the delay from the moment the brake output signal is ON to the moment the servo drive starts to receive commands after power-on.

H02.10 **Delay from brake output OFF to motor de-energized**

Address:	0x020A	Effective mode:	Real-time
Min.:	50	Unit:	ms

Max.:	1000	Data Type:	UInt16
Default:	150	Change:	Real-time

Value Range:
50 ms–1000 ms
Description
Defines the delay from the moment brake output is OFF to the moment when the motor at standstill enters the de-energized status.

H02.11 Motor speed threshold at brake output OFF in rotation state

Address:	0x020B	Effective mode:	Real-time
Min.:	20	Unit:	rpm
Max.:	3000	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:
20 rpm to 3000 rpm
Description
Defines the motor speed threshold when brake (BK) output is OFF in the rotating state.

H02.12 Delay from S-ON OFF to brake output OFF in rotation state

Address:	0x020C	Effective mode:	Real-time
Min.:	1	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
1 ms–65535 ms
Description
Sets the delay time from BK OFF to S-ON OFF when the motor is in rotating state.

H02.15 LED Alarm Display

Address:	0x020F	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Output alarm information immediately
1: Not output alarm information
Description
Defines whether to switch the keypad to the fault display mode when a No. 3 fault occurs.
0: Output alarm information immediately
1: Not output alarm information

H02.16 Brake enable switch

Address:	0x0210	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: OFF

1: ON

Description

Turn on or off the brake function.

0: OFF

1: ON

H02.17 **Stop mode upon main circuit power failure**

Address:	0x0211	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0: Keep current action

1: Stop upon fault as defined by H02.06

2: Stop at S-ON OFF as defined by H02.05

3: Stop quickly as defined by H02.18

Description

Defines the stop mode of the motor for stopping rotating upon main circuit power failure.

0: Keep current action

1: Stop upon fault as defined by H02.06

2: Stop at S-ON OFF as defined by H02.053: Stop quickly as defined by H02.18

H02.18 **DI emergency stop mode**

Address:	0x0212	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0: Coast to stop, keeping de-energized state

1: Ramp 1 stop, keeping de-energized state

2: Ramp 2 stop, keeping de-energized stat

3: Stop at emergency stop torque, keeping de-energized state

Description

Defines the deceleration mode of the motor for stopping rotating upon quick stop and the motor status after stop.

0: Coast to stop, keeping de-energized state

1: Stop based on ramp 1, keeping de-energized state

2: Stop based on ramp 2, keeping de-energized stat

3: Stop at emergency stop torque, keeping de-energized state

Note: If the brake is enabled, H02.18 is forced to "3: Stop based on ramp 2, keeping de-energized state".

H02.21 **Permissible minimum resistance of braking resistor**

Address:	0x0215	Effective mode:	-
Min.:	1	Unit:	Ω
Max.:	1000	Data Type:	UInt16

Default:	40	Change:	Unchangeable

Value Range:
1Ω to 1000Ω
Description
The permissible minimum resistance of the braking resistor is only related to the servo drive model.

H02.22 **Power of built-in braking resistor**

Address:	0x0216	Effective mode:	-
Min.:	0	Unit:	W
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Unchangeable

Value Range:
0W–65535W
Description
The power of the built-in braking resistor is only related to the servo drive model, which is unmodifiable.

H02.23 **Resistance of built-in braking resistor**

Address:	0x0217	Effective mode:	-
Min.:	0	Unit:	Ω
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Unchangeable

Value Range:
0Ω to 65535Ω
Description
The resistance of the built-in braking resistor is only related to the servo drive model, which is unmodifiable.

H02.24 **Resistor heat dissipation coefficient**

Address:	0x0218	Effective mode:	Real-time
Min.:	10	Unit:	%
Max.:	100	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:
10% to 100%
Description
Defines the heat dissipation coefficient of the braking resistor, which is applicable to both external and built-in braking resistors.
Defines the heat dissipation coefficient of the braking resistor, which is applicable to both external and built-in braking resistors.
Set this parameter properly according to actual heat dissipation conditions of the resistor.
Recommendations:
Generally, the value of H02.24 cannot exceed 30% for natural cooling.
The value of H02.24 cannot exceed 50% for forced air cooling.

H02.25 **Braking resistor type**

Address:	0x0219	Effective mode:	Real-time

Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:

0: Built-in

1: External, natural cooling

2: External, forced air cooling

3: No resistor needed

Description

Defines the resistor type and the mode of absorbing and releasing the braking energy.

0: Built-in

1: External, natural cooling

2: External, forced air cooling

3: No resistor needed

H02.26 Power of external braking resistor

Address:	0x021A	Effective mode:	Real-time
Min.:	1	Unit:	W
Max.:	65535	Data Type:	UInt16
Default:	40	Change:	Real-time

Value Range:

1 W–65535 W

Description

Defines the power of external braking resistor.

H02.27 Resistance of external braking resistor

Address:	0x021B	Effective mode:	Real-time
Min.:	15	Unit:	Ω
Max.:	1000	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

15Ω to 1000Ω

Description

Defines the resistance of the external braking resistor.

H02.30 User password

Address:	0x021E	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

You can only set the user password through the keypad.

H02.31 System parameter initialization

Address:	0x021F	Effective mode:	Real-time

Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Restore default settings

2: Clear fault records

Description

Used to restore default values or clear fault records.

0: No operation

1: Restore default settings

2: Clear fault records

H02.32 Selection of parameters in group H0b

Address:	0x0220	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0 to 99

Description

Sets the offset of H0b parameters to be displayed on the operating panel.

For example, the setpoint 0 indicates the value of H0b.00 (Motor speed actual value) is displayed on the keypad.

The setpoint 1 indicates the value of H0b.01 is displayed on the operating panel.

H02.33 200P software version

Address:	0x0221	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 to 6553.5

Description

Displays 200P version number.

H02.35 Keypad data update frequency

Address:	0x0223	Effective mode:	Real-time
Min.:	0	Unit:	Hz
Max.:	20	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 Hz–20 Hz

Description

Set the keypad data update frequency.

H02.38 Overload time of external resistor

Address:	0x0226	Effective mode:	Upon the next power-on

Min.:	0	Unit:	s
Max.:	200	Data Type:	UInt16
Default:	40	Change:	Real-time

Value Range:
0s to 200s
Description
Set the overload time threshold of the external braking resistor.

H02.41 Manufacturer password

Address:	0x0229	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 65535
Description
You need to input this manufacturer password to enable the access to protected manufacturer parameters.

H02.43 Dynamic braking resistor power

Address:	0x022B	Effective mode:	-
Min.:	0.0	Unit:	W
Max.:	6553.5	Data Type:	UInt16
Default:	20.0	Change:	Unchangeable

Value Range:
0.0 W–6553.5 W
Description
Read the power of the dynamic braking resistor.

H02.44 Dynamic braking resistor resistance

Address:	0x022C	Effective mode:	-
Min.:	0.0	Unit:	Ω
Max.:	1000.0	Data Type:	UInt16
Default:	3.6	Change:	Unchangeable

Value Range:
0.0Ω to 1000.0Ω
Description
Read the resistance of the dynamic braking resistor.

H02.47 Delay time from power cable breakage to brake OFF

Address:	0x022F	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms–1000 ms

Description

It is the same as H02.12. In case of power line breakage, this parameter is used instead of H02.12 to avoid the vertical axis falling.

H02.48 **Thermal capacity percentage of the dynamic braking resistor**

Address:	0x0230	Effective mode:	Real-time
Min.:	90.0	Unit:	%
Max.:	110.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:

90.0% to 110.0%

Description

Defines the overload protection gain of the dynamic braking resistor.

16.4 H03 Terminal Input Parameters

H03.02 **DI1 function**

Address:	0x0302	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	14	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

38: Probe 1

39: Probe 2

56: External switch of the EEPOS program block

Description

Defines the function of DI1.

H03.03 **DI1 logic selection**

Address:	0x0303	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open

1: Closed

Description

Used to set the level logic of DI1 when the function assigned to DI is active.

H03.04 **DI2 function**

Address:	0x0304	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	15	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

38: Probe 1

39: Probe 2

56: External switch of the EEPOS program block

Description

Defines the function of DI2.

H03.05 **DI2 logic selection**

Address:	0x0305	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open

1: Closed

Description

Set the DI2 logic when the DI function allocated to DI2 is enabled.

H03.06 **DI3 function**

Address:	0x0306	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	31	Change:	Real-time

Value Range:

0: No definition
3: Gain switchover
14: Positive limit switch
15: Negative limit switch
18: Forward jog
19: Reverse jog
24: Electronic gear Gear selection
31: Home switch
34: Emergency stop
35: Clear position deviation
38: Probe 1
39: Probe 2
56: External switch of the EEPOS program block

Description

Defines the function of DI3.

H03.07 **DI3 logic selection**

Address:	0x0307	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Set the DI3 logic when the DI function allocated to DI3 is enabled.

H03.08 **DI4 function**

Address:	0x0308	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	34	Change:	Real-time

Value Range:

0: No definition
3: Gain switchover
14: Positive limit switch
15: Negative limit switch
18: Forward jog
19: Reverse jog
24: Electronic gear Gear selection
31: Home switch
34: Emergency stop
35: Clear position deviation
38: Probe 1
39: Probe 2
56: External switch of the EEPOS program block

Description
Defines the function of DI4.

H03.09 **DI4 logic selection**

Address:	0x0309	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Normally open
1: Closed
Description
Set the DI4 logic when the DI function allocated to DI4 is enabled.

H03.10 **DI5 function**

Address:	0x030A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	38	Change:	Real-time

Value Range:
0: No definition
3: Gain switchover
14: Positive limit switch
15: Negative limit switch
18: Forward jog
19: Reverse jog
24: Electronic gear Gear selection
31: Home switch
34: Emergency stop
35: Clear position deviation
38: Probe 1
39: Probe 2
56: External switch of the EEPOS program block
Description
Defines the function of DI5.

H03.11 **DI5 logic selection**

Address:	0x030B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Normally open
1: Closed
Description
Set the DI5 logic when the DI function allocated to DI5 is enabled.

H03.50 **Voltage-type AI1 offset**

Address:	0x0332	Effective mode:	Real-time
Min.:	-5000	Unit:	mV
Max.:	5000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:
-5000 mV to 5000 mV
Description
Defines the actual AI1 input voltage when the drive sampling voltage is 0 after zero drift correction.

H03.51 **Voltage-type AI1 input filter time constant**

Address:	0x0333	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	655.35	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:
0.00 ms–655.35 ms
Description
It sets the filter time constant of voltage signal input from AI1.
Set this parameter properly to avoid motor reference fluctuation caused by unstable analog voltage input and reduce motor misoperation caused by interference signals.
The filter function cannot eliminate or suppress zero drift or dead zone.

H03.53 **Voltage-type AI1 dead zone**

Address:	0x0335	Effective mode:	Real-time
Min.:	0.0	Unit:	mV
Max.:	1000.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:
0.0 mV to 1000.0 mV
Description
Defines the AI1 input voltage range when the drive sampling voltage is 0.

H03.54 **Voltage-type AI1 zero drift**

Address:	0x0336	Effective mode:	Real-time
Min.:	-500.0	Unit:	mV
Max.:	500.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:
-500.0 mV–500.0 mV
Description
Zero drift refers to the value of the drive o sampling voltage relative to GND upon zero AI voltage.
Set H0d.10 (Automatic adjustment of analog channels) to 1 (AI1 adjustment) to perform automatic adjustment on AI1 zero drift. The AI1 zero drift after adjustment will be saved into H03.54.

H03.55 **Voltage-type AI2 offset**

Address:	0x0337	Effective mode:	Real-time
Min.:	-5000	Unit:	mV
Max.:	5000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:
-5000 mV to 5000 mV
Description
Defines the actual AI2 input voltage when the drive sampling voltage is 0 after zero drift correction.

H03.56 **Voltage-type AI2 input filter time constant**

Address:	0x0338	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	655.35	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:
0.00 ms–655.35 ms
Description
It sets the filter time constant of voltage signal input from AI2.
Set this parameter properly to avoid motor reference fluctuation caused by unstable analog voltage input and reduce motor misoperation caused by interference signals.
The filter function cannot eliminate or suppress zero drift or dead zone.

H03.58 **Voltage-type AI2 dead zone**

Address:	0x033A	Effective mode:	Real-time
Min.:	0.0	Unit:	mV
Max.:	1000.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:
0.0 mV to 1000.0 mV
Description
Defines the AI2 input voltage range when the drive sampling voltage is 0.

H03.59 **Voltage-type AI2 zero drift**

Address:	0x033B	Effective mode:	Real-time
Min.:	-500.0	Unit:	mV
Max.:	500.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:
-500.0 mV–500.0 mV
Description
Zero drift refers to the value of the drive o sampling voltage relative to GND upon zero AI voltage.
Set H0d.10 (Automatic adjustment of analog channels) to 2 (AI2 adjustment) to perform automatic adjustment on AI2 zero drift. The AI1 zero drift after adjustment will be saved into H03.59.

H03.60 **DI1 filter time**

Address:	0x033C	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:
0.00 ms–500.00 ms
Description
Defines the filter time of DI1. The DI function is active only after the effective level is kept within the time defined by H03.60.

H03.61 **DI2 filter time**

Address:	0x033D	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:
0.00 ms–500.00 ms
Description
Defines the filter time of DI2. The DI function is active only after the effective level is kept within the time defined by H03.61.

H03.62 **DI3 filter time**

Address:	0x033E	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:
0.00 ms–500.00 ms
Description
Defines the filter time of DI3. The DI function is active only after the effective level is kept within the time defined by H03.62.

H03.63 **DI4 filter time**

Address:	0x033F	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:
0.00 ms–500.00 ms
Description
Defines the filter time of DI4. The DI function is active only after the effective level is kept within the time defined by H03.63.

H03.64 **DI5 filter time**

Address:	0x0340	Effective mode:	Real-time

Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:
0.00 ms–500.00 ms
Description
Defines the filter time of DI5. The DI function is active only after the effective level is kept within the time defined by H03.64.

H03.80 **Speed corresponding to analog 10 V**

Address:	0x0350	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	3000	Change:	At stop

Value Range:
0[mm/s]/[rpm]–10000[mm/s]/[rpm]
Description
Defines the corresponding motor speed when the sampling voltage is 10 V.
Speed value = Sampling voltage/10 x H03.80

H03.81 **Torque corresponding to analog 10 V**

Address:	0x0351	Effective mode:	Real-time
Min.:	0.00	Unit:	Multiplier
Max.:	8.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:
0.00 to 8.00
Description
Defines the motor torque corresponding to a sampling voltage of 10 V.
Torque value = Sampling voltage/10 × H03.81

16.5 H04 Terminal Output Parameters

H04.00 **DO1 function**

Address:	0x0400	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
25: Comparison output DO
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

Defines the function of DO1.

H04.01 **DO1 logic selection**

Address:	0x0401	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Defines the level logic of DO1 when the function assigned to DO1 is active.

H04.02 **DO2 function**

Address:	0x0402	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	11	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
25: Comparison output DO
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

Defines the function of DO2.

H04.03 **DO2 logic selection**

Address:	0x0403	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open

1: Closed

Description

Defines the level logic of DO2 when the function assigned to DO2 is active.

H04.22 **DO source selection**

Address:	0x0416	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: DO1 output source

0: DO1 function output

1: Bit0 of H31.04

Bit1: DO2 output source

0: DO2 function output

1: Bit1 of H31.04

Description

Defines whether the logic of a physical DO terminal is defined by the actual state of the drive or by communication.

H04.24 **DO brake enable**

Address:	0x0418	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

0: You can only control the motor brake through the built-in brake terminal even if the DO brake function is available.

1: The DO brake function must be available.

Note: This function is not available for functional safety models.

H04.50 **AO1 signal selection**

Address:	0x0432	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Motor speed (1 V/1000 [mm/s]/[rpm])
1: Speed reference (1 V/1000 [mm/s]/[rpm])
2: Torque reference (1 V/100 x rated torque)
3: Position deviation (0.5 mV/1 reference unit)
4: Position deviation (0.5 mV/1 encoder unit)
5: Position reference speed (1 V/1000 [mm/s]/[rpm])
6: Positioning completed
8: AI1 voltage
9: AI2 voltage
10: Defined by H31.05

Description

Defines the physical value source of AO1.

H04.51 **AO1 offset voltage**

Address:	0x0433	Effective mode:	Real-time
Min.:	-10000	Unit:	mV
Max.:	10000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-10000 mV to 10000 mV

Description

Defines the actual AO1 output voltage after offset when the output voltage is 0 V in theory.

H04.52 **AO1 ratio**

Address:	0x0434	Effective mode:	Real-time
Min.:	-99.99	Unit:	-
Max.:	99.99	Data Type:	Int16
Default:	1.00	Change:	Real-time

Value Range:

-99.99 to 99.99

Description

Defines the actual AO1 output voltage after amplification when the output voltage is 1V in theory.

16.6 H05 Position Control Parameters

H05.02 **Pulses per revolution**

Address:	0x0502	Effective mode:	Upon the next power-on
Min.:	0	Unit:	PPR
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	At stop

Value Range:

0 PPR to 4294967295 PPR

Description

Defines the number of pulses required per revolution of the motor.

H05.04 **First-order low-pass filter time constant**

Address:	0x0504	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:
0.0 ms–6553.5 ms
Description
Defines the first-order low pass filter time constant of position references.

H05.06 **Moving average filter time constant 1**

Address:	0x0506	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	128.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:
0.0 ms–128.0 ms
Description
Defines the moving average filter time constant of position references.

H05.07 **Electronic gear ratio 1 (numerator)**

Address:	0x0507	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	1073741824	Data Type:	UInt32
Default:	67108864	Change:	Real-time

Value Range:
1 to 1073741824
Description
Defines the numerator of electronic gear ratio 1. This parameter is recommended to be changed during disabling.

H05.09 **Electronic gear ratio 1 (denominator)**

Address:	0x0509	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	1073741824	Data Type:	UInt32
Default:	10000	Change:	Real-time

Value Range:
1 to 1073741824
Description
Defines the denominator of electronic gear ratio 1. This parameter is recommended to be changed during disabling.

H05.11 **Electronic gear ratio 2 (numerator)**

Address:	0x050B	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	1073741824	Data Type:	UInt32

Default:	67108864	Change:	Real-time

Value Range:
1 to 1073741824
Description
Defines the numerator of electronic gear ratio 2. This parameter is recommended to be changed during disabling.

H05.13 Electronic gear ratio 2 (denominator)

Address:	0x050D	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	1073741824	Data Type:	UInt32
Default:	10000	Change:	Real-time

Value Range:
1 to 1073741824
Description
Defines the denominator of electronic gear ratio 2. This parameter is recommended to be changed during disabling.

H05.16 Clear action

Address:	0x0510	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Clear the position deviation upon S-ON OFF or a fault
2: Clear the position deviation when the drive is in the non-RUN state or function DI35 is active.
Description
Defines the condition for clearing the position deviation.

H05.17 Number of encoder frequency-division pulses

Address:	0x0511	Effective mode:	Upon the next power-on
Min.:	0	Unit:	PPR
Max.:	4194303	Data Type:	UInt32
Default:	2500	Change:	At stop

Value Range:
0 PPR to 4194303 PPR
Description
Defines the number of pulses output by PAO or PBO per revolution.
Pulse output resolution per revolution = (H05.17) x 4

H05.19 Speed feedforward control

Address:	0x0513	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: No speed feedforward

1: Internal speed feedforward

2: H05.72

3: Zero phase

Description

Defines the source of the speed loop feedforward signal.

0: No speed feedforward

1: Internal speed feedforward

2: H05.72

3: Zero phase

Note: If you select external speed feedforward, you must set the feedforward source through H05.72.

H05.21 Positioning completed threshold

Address:	0x0515	Effective mode:	Real-time
Min.:	1	Unit:	encoder unit
Max.:	65535	Data Type:	UInt16
Default:	46976	Change:	Real-time

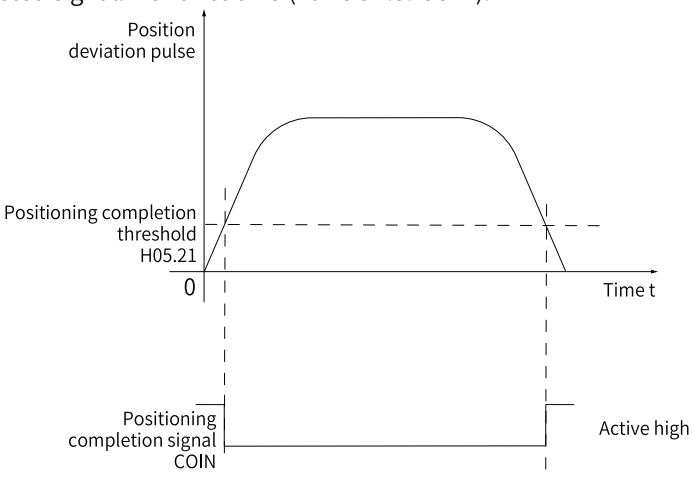
Value Range:

1 to 65535

Description

Defines the threshold of the absolute value of position deviation when the drive outputs the positioning completed signal.

Positioning completed signal: DO function 5 (FunOUT.5: COIN).



Note: The parameter takes effect when H02.00 is not 9.

H05.30 Homing enable selection

Address:	0x051E	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	6	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

6: Current position as home

Description

Defines the homing mode and the trigger signal source.

When H05.30 = 6, position feedback is the setpoint of H05.36 regardless of the value of H05.40.

H05.35 **Home search time limit**

Address:	0x0523	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	10000	Change:	Real-time

Value Range:

0 to 65535

Description

Defines the maximum home searching time. The time unit is defined by H05.66.

H05.36 **Mechanical home offset**

Address:	0x0524	Effective mode:	Real-time
Min.:	-2147483648	Unit:	reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the absolute position of the motor after homing.

H05.38 **Frequency-division output source**

Address:	0x0526	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Encoder frequency-division output

2: Frequency-division output inhibited

3: Second encoder frequency-division output

4: H31-01 reference frequency output

Description

Defines the output source of the pulse output terminal.

0: Encoder frequency-division output

2: Frequency-division output inhibited

3: Second encoder frequency-division output

4: H31.01 reference frequency output

H05.39 **Electronic gear ratio switchover condition**

Address:	0x0527	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Switchover after position reference is kept 0 for 2.5 ms

1: Switched in real time

Description

Defines the condition for switching the electronic gear ratio. After the fully closed-loop function is enabled and H0F.00 is set to 2, the setpoint is forcibly set to 0.

When its value is 0: when H0F.00 = 2, the switching condition is that the position command is 0 and positioning is completed and lasts for 2.5 ms; when H0F.00 is not 2, the switching condition is that the position command keeps at 0 for 2.5 ms.

H05.40 Mechanical home offset and action upon overtravel

Address:	0x0528	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Mechanical home offset (H05.36) is the coordinate after homing

1: Mechanical home offset (H05.36) is the relative offset after homing

Description

Defines the offset relationship between the mechanical home and mechanical zero point, and the action upon overtravel during homing.

0: Mechanical home offset (H05.36) is the coordinate after homing

1: Mechanical home offset (H05.36) is the relative offset after homing

H05.41 Z pulse output polarity

Address:	0x0529	Effective mode:	Upon the next power-on
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x1	Change:	At stop

Value Range:

bit0: Frequency-division Z output polarity

0: Positive (high level upon active Z pulse)

1: Negative (low level upon active Z pulse)

bit1: OCZ output polarity

0: Positive (high level upon active Z pulse)

1: Negative (low level upon active Z pulse)

bit2: Inner loop probe Z signal source

0: Motor Z signal

1: Frequency-division output Z signal

Description

Defines the output level when the Z pulse of pulse output terminal is active.

bit0: Frequency division Z output polarity

0: Positive (high level upon valid Z pulse)

1: Negative (low level upon valid Z pulse)

bit1: OCZ output polarity

0: Positive (high level upon valid Z pulse)

1: Negative (low level upon valid Z pulse)

bit2: Inner loop probe Z signal source

0: Motor Z signal

1: Frequency-division output Z signal

H05.44 Numerator of frequency-division output reduction ratio

Address:	0x052C	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	16383	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

1 to 16383

Description

Defines the numerator of frequency-division output reduction ratio.

H05.45 Denominator of frequency-division output reduction ratio

Address:	0x052D	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	8191	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

1 to 8191

Description

Defines the denominator of frequency-division output reduction ratio.

H05.46 DI selection of multi-turn frequency-division Z starting point

Address:	0x052E	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	5	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No operation

1: DI1

2: DI2

3: DI3

4: DI4

5: DI5

Description

Sets the start point for frequency-division output. It is only effective when the frequency division ratio is greater than 1.

0: No operation

1: DI1

2: DI2

3: DI3

4: DI4

5: DI5

H05.47 **Frequency-division Z pulse width**

Address:	0x052F	Effective mode:	Real-time
Min.:	0	Unit:	μs
Max.:	400	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0μs to 400μs
Description
Defines the minimum output width (μs) of frequency-division output PZ. When the pulse signal is used as master encoder and fully closed-loop encoder, the setpoint 0 indicates the original Z signal will be outputted. Other setpoints indicate the frequency-division Z signal will be output.

H05.48 **Frequency-division output dead zone setting threshold**

Address:	0x0530	Effective mode:	Real-time
Min.:	0	Unit:	encoder unit
Max.:	255	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 255
Description
Defines the dead zone threshold of frequency-division output to prevent frequency-division output caused by encoder jitter.
Note: After this function is enabled, during uniform low-speed operation, intermittent frequency-division pulse output may occur. Set this parameter with caution.

H05.50 **Mechanical gear ratio in absolute position rotation mode (numerator)**

Address:	0x0532	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1 to 65535
Description
Defines the numerator of the transmission ratio between the mechanical rotary load and the motor in the absolute position rotation mode.

H05.51 **Mechanical gear ratio in absolute position rotation mode (denominator)**

Address:	0x0533	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1 to 65535
Description
Defines the denominator of the transmission ratio between the mechanical rotary load and the motor in the absolute position rotation mode.

H05.52 **Pulses per revolution of the load in absolute position rotation mode (low 32 bits)**

Address:	0x0534	Effective mode:	Real-time
Min.:	0	Unit:	encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	At stop

Value Range:
0 to 4294967295
Description
Defines the number of pulses per revolution of the rotary load in the absolute position rotation mode (low 32 bits).

H05.54 **Pulses per revolution of the load in absolute position rotation mode (high 32 bits)**

Address:	0x0536	Effective mode:	Real-time
Min.:	0	Unit:	encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	At stop

Value Range:
0 to 4294967295
Description
Defines the number of pulses per revolution of the rotary load in the absolute position rotation mode (high 32 bits).

H05.58 **Torque threshold in homing upon hit-and-stop**

Address:	0x053A	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
Defines the maximum positive/negative torque limit in homing upon hit-and-stop.

H05.66 **Homing time unit**

Address:	0x0542	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:
0: 1 ms
1: 10 ms
2: 100 ms
Description
Select the unit of homing time.
0: 1ms
1: 10ms
2: 100ms
Note: The actual timeout is H05.35xH05.66ms

H05.70 **Moving average filter time constant 2**

Address:	0x0546	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0 ms–1000.0 ms

Description

-

H05.71 **Motor Z signal width**

Address:	0x0547	Effective mode:	Real-time
Min.:	1	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	4	Change:	Real-time

Value Range:

1 ms–100 ms

Description

Output pulse width when motor Z signal is active.

H05.72 **External speed feedforward source selection**

Address:	0x0548	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

1: AI1

2: AI2

Description

External speed feedforward source selection

0: No definition

1: AI1

2: AI2

H05.74 **S-curve mode selection**

Address:	0x054A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	6	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: 1 filter on

1: 2 filters on, filter time 5:1

2: 2 filters on, filter time 2:1

3: 2 filters on, filter time 1:1

4: 3 filters on, filter time 4:1:1

5: 3 filters on, filter time 2:1:1

6: 3 filters on, filter time 1:1:1

Description

S-curve mode selection

0: 1 filter

1: 2 filters, filter time 5:1

2: 2 filters, filter time 2:1

3: 2 filters, filter time 1:1

4: 3 filters, filter time 4:1:1

5: 3 filters, filter time 2:1:1

6: 3 filters, filter time 1:1:1

16.7 H06 Speed Control Parameters

H06.04 **DI jog speed reference**

Address:	0x0604	Effective mode:	Real-time
Min.:	0	Unit:	rpm
Max.:	10000	Data Type:	UInt16
Default:	150	Change:	Real-time

Value Range:

0 rpm to 10000 rpm

Description

Defines the DI jog speed reference.

H06.05 **Acc. ramp time of speed reference**

Address:	0x0605	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Sets acceleration ramp time of speed reference.

H06.05 defines the time for the speed reference to change from 0 rpm to 1000 rpm.

The formulas for calculating the actual acceleration and deceleration time are as follows:

Actual acceleration time t = Speed reference ÷ 1000 x Acceleration ramp time of speed reference

H06.06 **Dec. ramp time of speed reference**

Address:	0x0606	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Sets deceleration ramp time of speed reference.
H06.06 defines the time for the speed reference to change from 1000 rpm to 0 rpm.
The formulas for calculating the actual acceleration and deceleration time are as follows:
Actual deceleration time t = Speed reference ÷ 1000 x Deceleration ramp time of speed reference

H06.07 **Maximum speed limit**

Address:	0x0607	Effective mode:	Real-time
Min.:	0	Unit:	rpm
Max.:	10000	Data Type:	UInt16
Default:	7000	Change:	Real-time

Value Range:
0 rpm to 10000 rpm
Description
Defines the maximum speed limit.

H06.08 **Forward speed threshold**

Address:	0x0608	Effective mode:	Real-time
Min.:	0	Unit:	rpm
Max.:	10000	Data Type:	UInt16
Default:	7000	Change:	Real-time

Value Range:
0 rpm to 10000 rpm
Description
Defines the forward speed threshold.

H06.09 **Reverse speed threshold**

Address:	0x0609	Effective mode:	Real-time
Min.:	0	Unit:	rpm
Max.:	10000	Data Type:	UInt16
Default:	7000	Change:	Real-time

Value Range:
0 rpm to 10000 rpm
Description
Defines the reverse speed threshold.

H06.10 **Deceleration unit in emergency stop**

Address:	0x060A	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Multiplied by 1

1: Multiplied by 10

2: Multiplied by 100

Description

Sets the deceleration unit in emergency stop.

0: Multiplied by 1

1: Multiplied by 10

2: Multiplied by 100

H06.11 Torque feedforward control

Address:	0x060B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: No torque feedforward

1: Internal torque feedforward

Description

Defines the source for torque feedforward control.

0: No torque feedforward

1: Internal torque feedforward

H06.12 Acceleration ramp time of jog speed

Address:	0x060C	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms–65535 ms

Description

Sets the acceleration ramp time of jog speed.

Indicates the time for the speed reference to accelerate from 0 to 1000 rpm or the time for the speed reference to decelerate from 1000 rpm to 0.

The formulas for calculating the actual acceleration and deceleration time are as follows:

Actual acc./dec. time t = Speed reference ÷ 1000 x Acceleration ramp time of speed reference

H06.13 Speed feedforward smoothing filter

Address:	0x060D	Effective mode:	Real-time
Min.:	0	Unit:	μs
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0μs to 65535μs

Description

Defines the speed feedforward smoothing filter time.

H06.15 Zero clamp speed threshold

Address:	0x060F	Effective mode:	Real-time
Min.:	0	Unit:	rpm
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 rpm to 10000 rpm

Description

Defines the zero clamp speed threshold.

H06.16 Threshold of TGON (motor rotation) signal

Address:	0x0610	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–1000[mm/s]/[rpm]

Description

Sets the threshold of TGON (motor rotation) signal.

H06.17 Threshold of V-Cmp (speed matching) signal

Address:	0x0611	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	100	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–100[mm/s]/[rpm]

Description

Defines the threshold of speed match signal.

H06.18 Threshold of speed reach signal

Address:	0x0612	Effective mode:	Real-time
Min.:	20	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	1000	Change:	Real-time

Value Range:

20[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Defines the threshold of speed reached signal.

H06.19 Threshold of zero speed output signal

Address:	0x0613	Effective mode:	Real-time

Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
1[mm/s]/[rpm]–10000[mm/s]/[rpm]
Description
Defines the threshold of zero speed output signal.

H06.28 Cogging torque ripple compensation

Address:	0x061C	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0: Disabled

1: Enabled
Description
Used to enable the cogging torque fluctuation compensation function.

0: Disabled

1: Enabled

H06.40 Ramp 1 deceleration time

Address:	0x0628	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Defines the deceleration time of ramp 1. The time from the rated speed to 0 rpm can be obtained through H06.40 x H06.42 ramp 1/PN ramp stop deceleration time override.

H06.41 Ramp 2 deceleration time

Address:	0x0629	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–65535 ms
Description
Defines the deceleration time of ramp 2. The time from the rated speed to 0 rpm can be obtained through H06.40 x H06.43 ramp 2/PN quick stop deceleration time override.

H06.42 Deceleration time override of ramp 1/PN ramp stop

Address:	0x062A	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: 1 x 1 time unit
1: 10 x time unit
Description
Defines the override of H06.40 ramp 1 deceleration time.

H06.43 Ramp 2/PN quick stop deceleration time ratio

Address:	0x062B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: 1 x 1 time unit
1: 10 x time unit
Description
Defines the override of H06.41 ramp 2 deceleration time.

16.8 H07 Torque Control Parameters

H07.05 Torque reference filter time constant 1

Address:	0x0705	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	30.00	Data Type:	UInt16
Default:	0.50	Change:	Real-time

Value Range:
0.00 ms–30.00 ms
Description
Defines the torque reference filter time constant 1.

H07.06 Torque reference filter time constant 2

Address:	0x0706	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	30.00	Data Type:	UInt16
Default:	0.27	Change:	Real-time

Value Range:
0.00 ms–30.00 ms
Description
Defines the torque reference filter time constant 2.

H07.07 Torque Limit source

Address:	0x0707	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	5	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Positive/Negative internal torque limit

2: T_LMT limit

5: PN torque limit

Description

Defines the torque reference source of torque limit source.

0: Positive/Negative internal torque limit

2: T_LMT limit

5: PN torque limit

H07.08 T-LMT selection

Address:	0x0708	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: AI1

2: AI2

Description

Sets the AI as the torque limit source.

1: AI1

2: AI2

H07.09 Positive internal torque limit

Address:	0x0709	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:

0.0% to 400.0%

Description

Sets the forward run internal torque limit.

H07.10 Negative internal torque limit

Address:	0x070A	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:

0.0% to 400.0%

Description

Sets the reverse run internal torque limit.

H07.15 Emergency-stop torque

Address:	0x070F	Effective mode:	At stop
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16

Default:	100.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
Set the torque for emergency stop.

H07.17 Speed limit source

Address:	0x0711	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Internal speed limit
1: V-LMT
Description
Defines the speed reference source of speed limit source.
0: Internal speed limit
1: V-LMT

H07.18 V-LMT selection

Address:	0x0712	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
1: AI1
2: AI2
Description
Sets the AI as the speed limit source.
1: AI1
2: AI2

H07.19 Positive speed limit/Speed limit 1 in torque control

Address:	0x0713	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:
0[mm/s]/[rpm]–10000[mm/s]/[rpm]
Description
Set the positive speed limit/Speed limit 1 in torque control.

H07.20 Negative speed limit/Speed limit 2 in torque control

Address:	0x0714	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	10000	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–10000[mm/s]/[rpm]

Description

Set the negative speed limit/Speed limit 2 in torque control.

H07.24 Field weakening depth

Address:	0x0718	Effective mode:	Real-time
Min.:	60	Unit:	%
Max.:	115	Data Type:	UInt16
Default:	115	Change:	Real-time

Value Range:

60% to 115%

Description

Set the flux weakening depth.

H07.25 Max. permissible demagnetizing current

Address:	0x0719	Effective mode:	Real-time
Min.:	0	Unit:	%
Max.:	300	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0% to 300%

Description

Set the maximum allowable demagnetization current value.

H07.26 Field weakening selection

Address:	0x071A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Enable/disable field weakening.

0: Disabled

1: Enabled

H07.27 Flux weakening gain

Address:	0x071B	Effective mode:	Real-time
Min.:	0.001	Unit:	kHz
Max.:	1.000	Data Type:	UInt16
Default:	0.030	Change:	Real-time

Value Range:

0.001 kHz–1.000 kHz

Description

Set the gain of flux weakening.

H07.28 **Speed of flux weakening point**

Address:	0x071C	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Set the speed of flux weakening point.

H07.35 **Torque output correction enabled**

Address:	0x0723	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 3
Description
Set the torque output correction function.

H07.36 **Time constant of low-pass filter 2**

Address:	0x0724	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	10.00	Data Type:	UInt16
Default:	0.00	Change:	Real-time

Value Range:
0.00 ms–10.00 ms
Description
Set the time constant of low-pass filter 2.

H07.37 **Torque reference filter selection**

Address:	0x0725	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: First-order filter
1: Biquad filter
Description
Select the torque reference filter.
0: First-order filter1: Biquad filter
When second-order filter is selected, the filter structure is biquad filter for ROT motors, and the filter parameters are set through H07.38. For DDR/DDL motors, the filter structure is biquad low-pass filter, and the filter parameters are set through H07.42.

H07.38 **Biquad filter attenuation ratio**

Address:	0x0726	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	50	Data Type:	UInt16
Default:	16	Change:	Real-time

Value Range:
0 to 50
Description
Defines the attenuation ratio of biquad filter.

H07.40 **Speed limit threshold in torque control mode**

Address:	0x0728	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	300	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0 ms–300 ms
Description
Sets speed limit time window in the torque control mode.

H07.42 **Biquad low pass filter damping coefficient**

Address:	0x072A	Effective mode:	Real-time
Min.:	0.001	Unit:	-
Max.:	10.000	Data Type:	UInt16
Default:	1.000	Change:	Real-time

Value Range:
0.001 to 10.000
Description
Defines the damping coefficient of biquad low-pass filter.

16.9 H08 Gain Parameters

H08.00 **Speed loop gain**

Address:	0x0800	Effective mode:	Real-time
Min.:	0.0	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	40.0	Change:	Real-time

Value Range:
0.0 Hz–2000.0 Hz
Description
Defines the responsiveness of the speed loop. The higher the setpoint, the faster the speed loop response is. Note that an excessively high setpoint may cause vibration.
In the position control mode, the position loop gain must be increased together with the speed loop gain.

H08.01 **Speed loop integral time constant**

Address:	0x0801	Effective mode:	Real-time
Min.:	0.15	Unit:	ms
Max.:	512.00	Data Type:	UInt16
Default:	19.89	Change:	Real-time

Value Range:

0.15 ms–512.00 ms

Description

Defines the integral time constant of the speed loop.

The lower the setpoint, the better the integral action, and the quicker will the deviation value be close to 0.

Note:

There is no integral action when H08.01 is set to 512.00.

H08.02 **Position loop gain**

Address:	0x0802	Effective mode:	Real-time
Min.:	0.0	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	64.0	Change:	Real-time

Value Range:

0.0 Hz–2000.0 Hz

Description

Defines the proportional gain of the position loop.

Defines the responsiveness of the position loop. A high setpoint shortens the positioning time. Note that an excessively high setpoint may cause vibration.

The 1st group of gain parameters include H08.00 (Speed loop gain), H08.01 (Speed loop integral time constant), H08.02, and H07.05 (Filter time constant 1 of torque reference).

H08.03 **2nd speed loop gain**

Address:	0x0803	Effective mode:	Real-time
Min.:	0.1	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	75.0	Change:	Real-time

Value Range:

0.1 Hz–2000.0 Hz

Description

Set 2nd speed loop gain.

H08.04 **2nd speed loop integral time constant**

Address:	0x0804	Effective mode:	Real-time
Min.:	0.15	Unit:	ms
Max.:	512.00	Data Type:	UInt16
Default:	10.61	Change:	Real-time

Value Range:

0.15 ms–512.00 ms

Description

Set the 2nd speed loop integral time constant.

H08.05 **2nd position loop gain**

Address:	0x0805	Effective mode:	Real-time
Min.:	0.1	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	120.0	Change:	Real-time

Value Range:

0.1 Hz–2000.0 Hz

Description

Defines the second gain set of the position loop and speed loop. The 2nd group of gain parameters include H08.03 (Speed loop gain), H08.04 (Speed loop integral time constant), H08.05, and H07.06 (Torque reference filter time constant 2).

H08.08 **2nd gain mode setting**

Address:	0x0808	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Fixed to the 1st group of gains, P/PI switched through external

DI1:Switched between the 1st and 2nd group of gains as defined by H08.09

Description

Defines the mode for switching to the 2nd gain set.

0: Fixed to the 1st group of gains, P/PI switched through external

DI1:Switched between the 1st and 2nd group of gains as defined by H08.09

H08.09 **Gain switchover condition**

Address:	0x0809	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Fixed to the 1st gain set (PS)

1: Switched as defined by Func3 of DI

2: Torque reference too large (PS)

3: Speed reference too large (PS)

4: Speed reference change rate too large (PS)

5: Speed reference low/high speed threshold (PS)

6: Position deviation too large (P)

7: Position reference available (P)

8: Positioning unfinished (P)

9: Actual speed (P)

10: Position reference + Actual speed (P)

Description

Defines the gain switchover condition.
0: Fixed to the 1st gain set (PS)
1: Switched as defined by Func3 of DI
2: Torque reference too large (PS)
3: Speed reference too large (PS)
4: Speed reference change rate too large (PS)
5: Speed reference low/high speed threshold (PS)
6: Position deviation too large (P)
7: Position reference available (P)
8: Positioning unfinished (P)
9: Actual speed (P)
10: Position reference + Actual speed (P)

H08.10 Gain switchover delay

Address:	0x080A	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:
0.0 ms–1000.0 ms
Description
Defines the delay when the drive switches from the 2nd gain set to the 1st gain set.

H08.11 Gain switchover level

Address:	0x080B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	20000	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:
0 to 20000
Description
Defines the gain switchover level.
Gain switchover is affected by both the level and the dead time, as defined by H08.09. The unit of gain switchover level varies with the switchover condition.

H08.12 Gain switchover hysteresis

Address:	0x080C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	20000	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:
0 to 20000
Description
Defines the dead time for gain switchover.
Gain switchover is affected by both the level and the dead time, as defined by H08.09. The unit of gain switchover hysteresis varies with the switchover condition.

Note:
The set value of H08.11 (Gain switchover level) must be no less than that of H08.12; otherwise, the H08.11 will be set to a value equal to H08.12 automatically.

H08.13 Position gain switchover time

Address:	0x080D	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	3.0	Change:	Real-time

Value Range:
0.0 ms–1000.0 ms
Description
In position control, if H08.05 (2nd position loop gain) is much higher than H08.02 (Position loop gain), set the time for switching from H08.02 to H08.05.
This parameter can be used to reduce the impact caused by an increase in the position loop gain.

H08.15 Load moment of inertia ratio

Address:	0x080F	Effective mode:	Real-time
Min.:	0.00	Unit:	-
Max.:	120.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:
0.00 to 120.00
Description
Defines the mechanical load inertia ratio relative to the motor moment of inertia.

When H08.15 is set to 0, it indicates the motor carries no load; if it is set to 1.00, it indicates the mechanical load inertia is the same as the motor moment of inertia.

H08.17 Zero phase delay

Address:	0x0811	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	4.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0 ms–4.0 ms
Description
Set zero phase delay.

H08.18 Time constant of speed feedforward filter

Address:	0x0812	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	64.00	Data Type:	UInt16
Default:	0.50	Change:	Real-time

Value Range:
0.00 ms–64.00 ms

Description
Defines the filter time constant of speed feedforward.

H08.19 **Speed feedforward gain**

Address:	0x0813	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0% to 100.0%
Description
In position control and full closed-loop control, speed feedforward is the product of speed feedforwad signal multiplied by H08.19 and is part of the speed reference.
Increasing the setpoint improves the responsiveness to position references and reduces the position deviation during operation at a constant speed.
Set H08.18 to a fixed value first, and then increase the value of H08.19 gradually from 0 to a certain value at which speed feedforward achieves the desired effect.
Adjust H08.18 and H08.19 repeatedly until a balanced performance is achieved.
Note:
For how to enable the speed feedforward function and select the speed feedforward signal, see H05.19 (Speed feedforward control).

H08.20 **Torque feedforward filter time constant**

Address:	0x0814	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	64.00	Data Type:	UInt16
Default:	0.50	Change:	Real-time

Value Range:
0.00 ms–64.00 ms
Description
Defines the filter time constant of torque feedforward.

H08.21 **Torque feedforward gain**

Address:	0x0815	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0% to 300.0%
Description
In control modes other than torque control, torque feedforward is the product of torque feedforwad signal multiplied by H08.21 and is part of the torque reference.
Increasing the setpoint improves the responsiveness to variable speed references.
Increasing the setpoint improves the responsiveness to position references and reduces the position deviation during operation at a constant speed.

During parameter adjustment, set H08.20 (Torque feedforward filter time constant) to the default value first, and then increase H08.21 gradually to enhance the effect of torque feedforward. When speed overshoot occurs, keep H08.21 unchanged and increase the value of H08.20. Adjust H08.20 and H08.21 repeatedly until a balanced performance is achieved.
Note:
For how to enable the torque feedforward function and select the torque feedforward signal, see H06.11 (Torque feedforward control).

H08.22 Speed feedback filtering option

Address:	0x0816	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Inhibited
1: 2 times
2: 4 times
3: 8 times
4: 16 times

Description
Defines the moving average filtering times for speed feedback.
0: Inhibited
1: 2 times
2: 4 times
3: 8 times
4: 16 times
Note: The larger the parameter value, the smaller the speed feedback ripple, but the larger the feedback delay.

H08.23 Cutoff frequency of speed feedback low-pass filter

Address:	0x0817	Effective mode:	Real-time
Min.:	100	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
100 Hz–8000 Hz

Description
Defines the cutoff frequency for first-order low-pass filtering on the speed feedback.
Note:
The lower the setpoint, the weaker the speed feedback fluctuation, and the longer the feedback delay will be.
Setting this parameter to 8000 Hz negates the filtering effect.

H08.24 PDFF control coefficient

Address:	0x0818	Effective mode:	Real-time

Min.:	0.0	Unit:	%
Max.:	200.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:
0.0% to 200.0%
Description
Defines the control mode of the speed loop.
When this parameter is set to 100.0, the speed loop adopts PI control (default) with quick dynamic response.
When this parameter is set to 0.0, speed loop integral action is enhanced, which filters out low-frequency interference but also slows down the dynamic response.
H08.24 can be used to keep a good responsiveness of the speed loop, with the anti-interference capacity in low-frequency bands improved and the speed feedback overshoot unaffected.

H08.25 Speed measurement method

Address:	0x0819	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: M-method
1: MT-method
Description
Speed measurement method
Activated only when it is set to 1 and a pulse encoder is used.

H08.27 Speed observer cutoff frequency

Address:	0x081B	Effective mode:	Real-time
Min.:	50	Unit:	Hz
Max.:	600	Data Type:	UInt16
Default:	170	Change:	Real-time

Value Range:
50 Hz–600 Hz
Description
Defines the cutoff frequency of the speed observer. Note that an excessively high setpoint may incur resonance. Decrease the setpoint properly in case of large speed feedback noise.

H08.28 Speed observer inertia correction coefficient

Address:	0x081C	Effective mode:	Real-time
Min.:	1	Unit:	%
Max.:	1600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
1% to 1600%
Description
Defines the speed observer inertia correction coefficient. If H08.15 is set based on the actual inertia, there is no need to adjust this parameter.

H08.29 **Speed observer filter time**

Address:	0x081D	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	10.00	Data Type:	UInt16
Default:	0.80	Change:	Real-time

Value Range:
0.00 ms–10.00 ms
Description
Defines the speed observer filter time. It is recommended to set this parameter to a value equal to the sum of H07.05 plus 0.2 ms.

H08.31 **Disturbance cutoff frequency**

Address:	0x081F	Effective mode:	Real-time
Min.:	1	Unit:	Hz
Max.:	4000	Data Type:	UInt16
Default:	600	Change:	Real-time

Value Range:
1 Hz–4000 Hz
Description
Defines the cutoff frequency of the disturbance observer. Increasing the setpoint improves the responsiveness of the disturbance observer and the compensation effect. Note that an excessively high setpoint may incur resonance.

H08.32 **Disturbance compensation gain**

Address:	0x0820	Effective mode:	Real-time
Min.:	0	Unit:	%
Max.:	100	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0% to 100%
Description
Defines the compensation gain of the disturbance observer. The setpoint 100% indicates full compensation.

H08.33 **Disturbance observer inertia correction coefficient**

Address:	0x0821	Effective mode:	Real-time
Min.:	1	Unit:	%
Max.:	1600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
1% to 1600%
Description
Defines the disturbance observer inertia correction coefficient. If H08.15 is set based on the actual inertia, there is no need to adjust this parameter.

H08.37 **Phase modulation for medium-frequency jitter suppression 2**

Address:	0x0825	Effective mode:	Real-time
Min.:	-90	Unit:	°
Max.:	90	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-90° to 90°

Description

Defines the compensation phase of medium-frequency jitter suppression 2.

H08.38 **Medium-frequency suppression 2 frequency**

Address:	0x0826	Effective mode:	Real-time
Min.:	0	Unit:	Hz
Max.:	1000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 Hz–1000 Hz

Description

Set this parameter based on actual resonance frequency. The valid suppression frequency range for medium-frequency jitter suppression 2 is 100 Hz to 1000 Hz.

H08.39 **Compensation gain of medium-frequency jitter suppression 2**

Address:	0x0827	Effective mode:	Real-time
Min.:	0	Unit:	%
Max.:	300	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0% to 300%

Description

Defines the compensation gain for medium-frequency jitter suppression 2. Set this parameter to 40%...55% in general cases. Setting this parameter to 0 negates the effect of medium-frequency jitter suppression 2.

H08.40 **Speed observer selection**

Address:	0x0828	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

Used to set the enable bit for speed observer.

0: Disabled

1: Enabled

H08.42 **Model control selection**

Address:	0x082A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

2: Reserved

Description

Used to enable model tracking control.

0: Disabled

1: Enabled

2: Reserved

H08.43 **Model gain**

Address:	0x082B	Effective mode:	Real-time
Min.:	0.1	Unit:	-
Max.:	2000.0	Data Type:	UInt16
Default:	40.0	Change:	Real-time

Value Range:

0.1 to 2000.0

Description

Defines the single inertia model gain. The higher the gain, the faster the position response. Note that an excessively high setpoint may incur excessive overshoot.

H08.46 **Feedforward value**

Address:	0x082E	Effective mode:	Real-time
Min.:	0.0	Unit:	-
Max.:	102.4	Data Type:	UInt16
Default:	95.0	Change:	Real-time

Value Range:

0.0 to 102.4

Description

Defines the speed feedforward gain for single inertia model control. If overshoot occurs, reduce the setpoint properly.

H08.53 **Medium- and low-frequency jitter suppression frequency 3**

Address:	0x0835	Effective mode:	Real-time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0 Hz–300.0 Hz

Description

Set this parameter based on actual resonance frequency. The resonance suppression range is 100 Hz to 300 Hz.

H08.54 **Medium- and low-frequency jitter suppression compensation 3**

Address:	0x0836	Effective mode:	Real-time
Min.:	0	Unit:	%
Max.:	200	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0% to 200%
Description
Defines the compensation gain for medium- and low-frequency suppression compensation 3. The setpoint 200% indicates full compensation.

H08.56 **Medium- and low-frequency jitter suppression phase modulation 3**

Address:	0x0838	Effective mode:	Real-time
Min.:	0	Unit:	%
Max.:	600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
0% to 600%
Description
Adjust this parameter based on the actual compensation effect.

H08.59 **Medium- and low-frequency jitter suppression frequency 4**

Address:	0x083B	Effective mode:	Real-time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0 Hz–300.0 Hz
Description
Set this parameter based on actual resonance frequency. The resonance suppression range is 100 Hz to 300 Hz.

H08.60 **Medium- and low-frequency jitter suppression compensation 4**

Address:	0x083C	Effective mode:	Real-time
Min.:	0	Unit:	%
Max.:	200	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0% to 200%
Description
Defines the compensation gain for medium- and low-frequency suppression compensation 4. The setpoint 200% indicates full compensation.

H08.61 **Medium- and low-frequency jitter suppression phase modulation 4**

Address:	0x083D	Effective mode:	Real-time
Min.:	0	Unit:	%

Max.:	600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0% to 600%

Description

Adjust this parameter based on the actual compensation effect.

H08.62 Position loop integral time constant

Address:	0x083E	Effective mode:	Real-time
Min.:	0.15	Unit:	-
Max.:	512.00	Data Type:	UInt16
Default:	512.00	Change:	Real-time

Value Range:

0.15 to 512.00

Description

Defines the position loop integral time constant.

H08.63 2nd position loop integral time constant

Address:	0x083F	Effective mode:	Real-time
Min.:	0.15	Unit:	-
Max.:	512.00	Data Type:	UInt16
Default:	512.00	Change:	Real-time

Value Range:

0.15 to 512.00

Description

Defines the 2nd position loop integral time constant.

H08.64 Speed observer feedback source

Address:	0x0840	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Observer output speed

1: Observer observed speed

Description

Select the speed observer feedback source.

0: Observer output speed

1: Observer observed speed

H08.65 Zero deviation control selection

Address:	0x0841	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description
Used to enable/disable zero deviation control.
0: Disabled
1: Enabled

H08.66 **Zero deviation control position average filter**

Address:	0x0842	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	320.0	Data Type:	UInt16
Default:	5.0	Change:	At stop

Value Range:
0.0 ms–320.0 ms
Description
Defines the average filter time of zero deviation control position. It is recommended to increase the setpoint in case of large noise caused by low command resolution.

H08.68 **Speed feedforward of zero deviation control**

Address:	0x0844	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:
0.0% to 100.0%
Description
Defines the speed feedforward of zero deviation control.

H08.69 **Torque feedforward of zero deviation control**

Address:	0x0845	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:
0.0% to 100.0%
Description
Defines the torque feedforward of zero deviation control.

16.10 H09 Auto-tuning Parameters

H09.00 **Auto-adjustment mode**

Address:	0x0900	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	4	Change:	Real-time

Value Range:

0: Disabled, manual gain tuning required

1: Enabled, gain parameters generated automatically based on the stiffness level

2: Positioning mode, gain parameters generated automatically based on the stiffness level

3: Interpolation mode+Inertia auto-tuning

4: Normal mode+Inertia auto-tuning

6: Quick positioning mode+Inertia auto-tuning

Description

Defines different gain tuning modes. Related gain parameters can be set manually or automatically according to the stiffness level.

0: Disabled, manual gain tuning required

1: Enabled, gain parameters generated automatically based on the stiffness level

2: Positioning mode, gain parameters generated automatically based on the stiffness level

3: Interpolation mode+Inertia auto-tuning

4: Normal mode+Inertia auto-tuning6: Quick positioning mode+Inertia auto-tuning

H09.01 **Stiffness level selection**

Address:	0x0901	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	41	Data Type:	UInt16
Default:	15	Change:	Real-time

Value Range:

0 to 41

Description

Defines the stiffness level of the servo system. The higher the stiffness level, the stronger the gains and the quicker the response will be. But an excessively high stiffness level will cause vibration. The setpoint 0 indicates the weakest stiffness and 41 indicates the strongest stiffness.

H09.02 **Mode selection of adaptive notch**

Address:	0x0902	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Adaptive notch no longer updated

1: One adaptive notch activated (3rd notch)

2: Two adaptive notches activated (3rd and 4th notches)

3: Resonance point tested only (displayed in H09.24)

4: Adaptive notch cleared, values of 3rd and 4th notches restored to default

Description

Defines the operation mode of the adaptive notch.

0: Adaptive notch no longer updated

1: One adaptive notch activated (3rd notch)

2: Two adaptive notches activated (3rd and 4th notches)

3: Resonance point tested only (displayed in H09.24)

4: Adaptive notch cleared, values of 3rd and 4th notches restored to default

H09.03 **Online inertia auto-tuning mode**

Address:	0x0903	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled, changing slowly

2: Enabled, changing normally

3: Enabled, changing quickly

Description

Defines whether to enable online inertia auto-tuning and the inertia ratio update speed during online inertia auto-tuning.

0: Disabled

1: Enabled, changing slowly

2: Enabled, changing normally

3: Enabled, changing quickly

H09.05 **Offline inertia auto-tuning mode**

Address:	0x0905	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Bi-directional

1: Unidirectional

Description

Defines the offline inertia auto-tuning mode. The offline inertia auto-tuning function can be enabled through H0d.02.

0: Bi-directional

1: Unidirectional

H09.06 **Max. speed of inertia auto-tuning**

Address:	0x0906	Effective mode:	Real-time
Min.:	100	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	500	Change:	At stop

Value Range:

100[mm/s]/[rpm]–1000[mm/s]/[rpm]

Description

Defines the maximum permissible speed reference in offline inertia auto-tuning mode.

During inertia auto-tuning, the higher the speed, the more accurate the auto-tuned values. Use the default setpoint in general cases.

H09.07 **Time constant for accelerating to max. speed during inertia auto-tuning**

Address:	0x0907	Effective mode:	Real-time

Min.:	10	Unit:	ms
Max.:	5000	Data Type:	UInt16
Default:	125	Change:	At stop

Value Range:
10 ms–5000 ms
Description
Defines the time for the motor to accelerate from 0 [mm/s]/[rpm] to the maximum speed of inertia auto-tuning (H09.06) during offline inertia auto-tuning.

H09.08 Interval time after an individual inertia auto-tuning

Address:	0x0908	Effective mode:	Real-time
Min.:	50	Unit:	ms
Max.:	10000	Data Type:	UInt16
Default:	800	Change:	At stop

Value Range:
50 ms–10000 ms
Description
Defines the interval time between two consecutive speed references when H09.05 (Offline inertia auto-tuning mode) is set to 1 (Positive/Negative triangular wave mode).

H09.09 Motor rotating distance per inertia auto-tuning

Address:	0x0909	Effective mode:	Real-time
Min.:	0.00	Unit:	[mm]/[Rev]
Max.:	100.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:
0.00[mm]/[Rev]–100.00[mm]/[Rev]
Description
Defines the motor revolutions per inertia auto-tuning when H09.05 (Offline inertia auto-tuning mode) is set to 1 (Positive/Negative triangular wave mode).
Note:
When using the offline inertia auto-tuning function, check that the travel distance of the motor at the stop position is larger than the value of H09.09. If not, decrease the value of H09.06 (Maximum speed for inertia auto-tuning) or H09.07 (Time constant of accelerating to max. speed during inertia auto-tuning) properly until the motor travel distance fulfills the requirement.

H09.11 Vibration threshold

Address:	0x090B	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:
0.0% to 100.0%
Description
Defines the alarm threshold for current feedback vibration.

H09.12 **Frequency of the 1st notch**

Address:	0x090C	Effective mode:	Real-time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
50 Hz–8000 Hz
Description
Defines the center frequency of the notch, which is the mechanical resonance frequency.
In the torque control mode, setting the notch frequency to 8000 Hz deactivates the notch function.

H09.13 **Width level of the 1st notch**

Address:	0x090D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0 to 20
Description
Defines the width level of the notch. Use the default setpoint in general cases.
Width level is the ratio of the notch width to the notch center frequency.

H09.14 **Depth level of the 1st notch**

Address:	0x090E	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 99
Description
Defines the depth level of the notch.
The depth level of the notch is the ratio between the input to the output at the notch center frequency.
The higher the setpoint, the lower the notch depth and the weaker the mechanical resonance suppression will be. Note that an excessively high setpoint may cause system instability.

H09.15 **Frequency of the 2nd notch**

Address:	0x090F	Effective mode:	Real-time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
50 Hz–8000 Hz
Description
Set the frequency of the 2nd notch.

H09.16 **Width level of the 2nd notch**

Address:	0x0910	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0 to 20
Description
Set the width level of the 2nd notch.

H09.17 **Depth level of the 2nd notch**

Address:	0x0911	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 99
Description
Set the depth level of the 2nd notch.

H09.18 **Frequency of the 3rd notch**

Address:	0x0912	Effective mode:	Real-time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
50 Hz–8000 Hz
Description
Set the frequency of the 3rd notch.

H09.19 **Width level of the 3rd notch**

Address:	0x0913	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0 to 20
Description
Set the width level of the 3rd notch.

H09.20 **Depth level of the 3rd notch**

Address:	0x0914	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 99

Description
Set the depth level of the 3rd notch.

H09.21 **Frequency of the 4th notch**

Address:	0x0915	Effective mode:	Real-time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
50 Hz–8000 Hz
Description
Set the frequency of the 4th notch.

H09.22 **Width level of the 4th notch**

Address:	0x0916	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0 to 20
Description
Set the width level of the 4th notch.

H09.23 **Depth level of the 4th notch**

Address:	0x0917	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 99
Description
Set the depth level of the 4th notch.

H09.24 **Auto-tuned resonance frequency**

Address:	0x0918	Effective mode:	-
Min.:	0	Unit:	Hz
Max.:	5000	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 Hz–5000 Hz
Description
When H09.02 (Adaptive notch mode) is set to 3, the current mechanical resonance frequency is displayed.

H09.32 **Gravity compensation value**

Address:	0x0920	Effective mode:	Real-time

Min.:	-100.0	Unit:	%
Max.:	100.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:
-100.0% to 100.0%
Description
Defines the gravity compensation value. Setting this parameter properly in vertical axis applications can reduce the falling amplitude upon start.

H09.33 Positive friction compensation value

Address:	0x0921	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0% to 100.0%
Description
Defines the forward friction compensation value.

H09.34 Negative friction compensation value

Address:	0x0922	Effective mode:	Real-time
Min.:	-100.0	Unit:	%
Max.:	0.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:
-100.0% to 0.0%
Description
Defines the reverse direction friction compensation value.

H09.35 Friction compensation speed

Address:	0x0923	Effective mode:	Real-time
Min.:	0.0	Unit:	-
Max.:	20.0	Data Type:	UInt16
Default:	2.0	Change:	Real-time

Value Range:
0.0 to 20.0
Description
Defines the friction compensation speed.

H09.36 Friction compensation speed

Address:	0x0924	Effective mode:	Real-time
Min.:	0x0	Unit:	-
Max.:	0x13	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

0: Slow mode+Speed reference
1: Slow mode+Model speed
2: Slow mode+Speed feedback
3: Slow mode+Observe speed
16: Quick mode +Speed reference
17: Quick mode +Model speed
18: Quick mode +Speed feedback
19: Quick mode+Observe speed

Description

Friction compensation speed

0: Slow mode+Speed reference
1: Slow mode+Model speed
2: Slow mode+Speed feedback
3: Slow mode+Observe speed
16: Quick mode +Speed reference
17: Quick mode +Model speed
18: Quick mode +Speed feedback
19: Quick mode+Observe speed

H09.37 Vibration monitoring time

Address:	0x0925	Effective mode:	Real-time
Min.:	0	Unit:	s
Max.:	65535	Data Type:	UInt16
Default:	300	Change:	Real-time

Value Range:

0s to 65535s

Description

The resonance detection suppression function is turned off automatically after the time defined by this parameter elapses. To suppress the resonance suppression function, set this parameter to 65536 (in seconds).

H09.38 Frequency of low-frequency resonance suppression 1 at the mechanical end

Address:	0x0926	Effective mode:	Real-time
Min.:	1.0	Unit:	Hz
Max.:	100.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:

1.0 Hz–100.0 Hz

Description

Set this parameter based on the actual jitter frequency.

H09.39 Low-frequency resonance suppression 1 at the mechanical end

Address:	0x0927	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:
0 to 3
Description
Defines different low-frequency resonance suppression types at the mechanical load. Type 1 features the shortest delay.

H09.41 Frequency of the 5th notch

Address:	0x0929	Effective mode:	Real-time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
50 Hz–8000 Hz
Description
Sets the frequency of the 5th notch.

H09.42 Width level of the 5th notch

Address:	0x092A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0 to 20
Description
Set the width level of the 5th notch.

H09.43 Depth level of the 5th notch

Address:	0x092B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 99
Description
Set the depth level of the 5th notch.

H09.44 Frequency of low-frequency resonance suppression 2 at the mechanical end

Address:	0x092C	Effective mode:	Real-time
Min.:	0.0	Unit:	Hz
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:
0.0 Hz–200.0 Hz
Description
Set this parameter based on the actual jitter frequency.

H09.45 **Responsiveness of low-frequency resonance suppression 2 at mechanical load end**

Address:	0x092D	Effective mode:	Real-time
Min.:	0.01	Unit:	-
Max.:	10.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:
0.01 to 10.00
Description
Use the default setpoint in general cases. To increase the setpoint, reduce the delay time.

H09.47 **Width of low-frequency resonance suppression 2 at mechanical load end**

Address:	0x092F	Effective mode:	Real-time
Min.:	0.00	Unit:	-
Max.:	2.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:
0.00 to 2.00
Description
Use the default setpoint in general cases. To increase the setpoint, increase the delay time.

H09.49 **Frequency of low-frequency resonance suppression 3 at the mechanical end**

Address:	0x0931	Effective mode:	Real-time
Min.:	0.0	Unit:	Hz
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:
0.0 Hz–200.0 Hz
Description
Set the frequency of low-frequency resonance suppression 3 at mechanical load end.

H09.50 **Responsiveness of low-frequency resonance suppression 3 at mechanical load end**

Address:	0x0932	Effective mode:	Real-time
Min.:	0.01	Unit:	-
Max.:	10.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:
0.01 to 10.00
Description
Set the responsiveness of low-frequency resonance suppression 3 at mechanical load end.

H09.52 **Width of low-frequency resonance suppression 3 at mechanical load end**

Address:	0x0934	Effective mode:	Real-time
Min.:	0.00	Unit:	-
Max.:	2.00	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:

0.00 to 2.00

Description

Set the width of low-frequency resonance suppression 3 at mechanical load end.

H09.54 Resonance detection torque threshold

Address:	0x0936	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	50.0	Change:	Real-time

Value Range:

0.0% to 300.0%

Description

If the torque fluctuation exceeds the setpoint, an error will be reported. Setting this parameter to 0 hides the resonance detection function.

H09.56 Max. overshoot allowed by ETune

Address:	0x0938	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	2936	Change:	Real-time

Value Range:

0 to 65535

Description

Defines the maximum overshoot value allowed during ETune adjustment.

H09.57 STune resonance suppression switchover frequency

Address:	0x0939	Effective mode:	Real-time
Min.:	0	Unit:	Hz
Max.:	4000	Data Type:	UInt16
Default:	650	Change:	Real-time

Value Range:

0 Hz–4000 Hz

Description

If the resonance frequency is lower than the setpoint, use medium-frequency resonance suppression 2 to suppress resonance. Otherwise, use the notch to suppress resonance. When the setpoint of 09.57 exceeds the upper limit of the medium-frequency suppression frequency 2 (1000 Hz), the medium-frequency suppression does not take effect.

H09.58 STune resonance suppression reset selection

Address:	0x093A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

Used to enable STune resonance suppression reset to clear parameters related to resonance suppression, medium-frequency resonance suppression 2 and notches 3 and 4.
0: Disabled
1: Enabled

H09.62 Stune stop delay judgment

Address:	0x093E	Effective mode:	Real-time
Min.:	0.00	Unit:	ms
Max.:	50.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:
0.00 ms–50.00 ms
Description
Set Stune stop delay threshold.

H09.63 STune quick convergence speed

Address:	0x093F	Effective mode:	Real-time
Min.:	0.00	Unit:	-
Max.:	50.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:
0.00 to 50.00
Description
Set STune quick convergence speed.

H09.71 Starting frequency

Address:	0x0947	Effective mode:	Real-time
Min.:	0	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	15	Change:	Real-time

Value Range:
0 Hz–8000 Hz
Description
Set the starting frequency for high-performance auto-tuning sweep frequency.

H09.72 End frequency

Address:	0x0948	Effective mode:	Real-time
Min.:	0	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
0 Hz–8000 Hz
Description
Set the end frequency for high-performance auto-tuning sweep frequency.

H09.73 Frequency subdivision

Address:	0x0949	Effective mode:	Real-time

Min.:	0	Unit:	-
Max.:	500	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:
0 to 500
Description
Set the frequency resolution for high-performance auto-tuning low frequency band (start frequency–start frequency 2). The larger the setting, the smaller the resolution.

H09.74 **Excitation amplitude**

Address:	0x094A	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	15.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
Set the excitation amplitude for high-performance auto-tuning sweep frequency.

H09.75 **Starting frequency 2**

Address:	0x094B	Effective mode:	Real-time
Min.:	0	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
0 Hz–8000 Hz
Description
Set the starting frequency for medium and high frequency in high-performance auto-tuning.

H09.76 **Frequency subdivision 2**

Address:	0x094C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1000	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
0 to 1000
Description
Set the frequency resolution for high-performance auto-tuning low frequency band (start frequency 2–end frequency). The larger the setting, the smaller the resolution.

H09.77 **Biquad filter mode**

Address:	0x094D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	6	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled
1: First-order low-pass
2: Second-order low-pass
3: Notch
4: Lead-lag
5: User-defined

Description

Used to select biquad filter mode.

0: Disabled
1: First-order low-pass
2: Second-order low-pass
3: Notch
4: Lead-lag
5: User-defined

H09.78 Biquad filter numerator frequency

Address:	0x094E	Effective mode:	Real-time
Min.:	0	Unit:	Hz
Max.:	16000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

0 Hz–16000 Hz

Description

Set the biquad filter numerator frequency.

H09.79 Biquad filter numerator damping coefficient

Address:	0x094F	Effective mode:	Real-time
Min.:	0.001	Unit:	-
Max.:	10.000	Data Type:	UInt16
Default:	1.000	Change:	Real-time

Value Range:

0.001 to 10.000

Description

Set the biquad filter numerator damping coefficient.

H09.80 Biquad filter denominator frequency

Address:	0x0950	Effective mode:	Real-time
Min.:	0	Unit:	Hz
Max.:	16000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

0 Hz–16000 Hz

Description

Set the biquad filter denominator frequency.

H09.81 Biquad filter denominator damping coefficient

Address:	0x0951	Effective mode:	Real-time

Min.:	0.001	Unit:	-
Max.:	10.000	Data Type:	UInt16
Default:	1.000	Change:	Real-time

Value Range:
0.001 to 10.000
Description
Set the biquad filter denominator damping coefficient.

16.11 H0A Fault and Protection Parameters

H0A.00 **Power input phase loss and failure protection**

Address:	0x0A00	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Enable
1: Disable
Description
Servo drives supporting single-phase/three-phase 220 V and three-phase 380 V power supplies Objects available. When voltage fluctuation or phase loss occurs on the power supply, the drive triggers power input phase loss protection based on H0A.00.
0: Enable
1: Disable

H0A.01 **Absolute position limit**

Address:	0x0A01	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Disabled
1: Enabled
2: Enabled after homing
Description
Used to set the activation condition for enabling the software position limit function and the software limit.
0: Disabled
1: Enabled
2: Enabled after homing

H0A.04 **Motor overload protection gain**

Address:	0x0A04	Effective mode:	Real-time
Min.:	50	Unit:	-
Max.:	300	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
50 to 300
Description
When the internal overload curve is used (H32.70 = 0), set E620.0 (Motor overload fault) by H0A.04. You can change the setpoint to advance or delay the time when overload protection is triggered based on the motor temperature. The setpoint 50% indicates the time is cut by half; 150% indicates the time is increased by 50%.
Set this parameter based on the actual temperature of the motor.

H0A.08 **Overspeed threshold**

Address:	0x0A08	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	20000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0[mm/s]/[rpm]–20000[mm/s]/[rpm]
Description
Defines the overspeed threshold of the motor.

H0A.10 **Threshold of excessive local position deviation**

Address:	0x0A0A	Effective mode:	Real-time
Min.:	0	Unit:	encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	219895614	Change:	Real-time

Value Range:
0 to 4294967295
Description
Defines the threshold for excessive position deviation in the position control mode.
When the position deviation exceeds this threshold, the drive reports EB00.0 (Position deviation too large).

H0A.12 **Runaway protection enable**

Address:	0x0A0C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
0: Disable
1: Enable
Description
Defines whether to enable runaway protection.
0: Disables E234.0 detection when the motor drives a vertical axis or is driven by the load
1: Enables runaway protection

H0A.13 **Angle auto-tuning mode**

Address:	0x0A0D	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	10	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: pre-positioning

1: Inching

2: Voltage injection

8: Closed-loop pre-positioning

9: Position locking

Description

Selects the motor angle auto-tuning mode:

0: pre-positioning

1: Inching

2: Voltage injection

8: Closed-loop pre-positioning9: Position locking

Limitation for method 2:

1. It is only applicable to motors with iron cores, like ROT motors.

2. If other auto-tuning methods fail, you can use method 2 after performing the following test. Without power-off and without a software reset, perform angle auto-tuning with method 2 at five different positions and record the results (H00.28). If the maximum deviation among the five results is within 5400, you can use method 2 on the motor.

H0A.18 IGBT over-temperature threshold

Address:	0x0A12	Effective mode:	Real-time
Min.:	120	Unit:	℃
Max.:	175	Data Type:	UInt16
Default:	140	Change:	Real-time

Value Range:

120℃–175℃

Description

Defines the threshold for reporting E640.0 (IGBT overtemperature) and E640.1 (Flywheel diode overtemperature).

H0A.19 Filter time constant of touch probe 1

Address:	0x0A13	Effective mode:	Real-time
Min.:	0.00	Unit:	μs
Max.:	6.30	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:

0.00μs to 6.30μs

Description

Defines the filter time of touch probe 1. An active input must last for the time defined by H0A.19.

H0A.20 Filter time constant of touch probe 2

Address:	0x0A14	Effective mode:	Real-time
Min.:	0.00	Unit:	μs
Max.:	6.30	Data Type:	UInt16

Default:	2.00	Change:	Real-time

Value Range:
0.00μs to 6.30μs
Description
Defines the filter time of touch probe 2. An active input must last for the time defined by H0A.20.

H0A.21 STO function display selection

Address:	0x0A15	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	5	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 5
Description
Defines whether to display the STO status or report E150.0 after the STO function is triggered.

Bit0 = 0: Displays the STO status. The keypad displays "sto_" after the STO function is triggered. In this case, no fault is reported and no output is generated from the fault DO.

Bit0 = 1: Displays the STO fault. The keypad displays "E150.0" after the STO function is triggered. In this case, the servo drive reports E150.0 and the fault DO generates output.

Bit1 is disabled.

Bit2 = 0: Performs STO noise diagnosis, and displays E150.5.

Bit2 = 1: Hides STO noise diagnosis, and does not display E150.5.

H0A.23 TZ signal filter time

Address:	0x0A17	Effective mode:	Upon the next power-on
Min.:	0	Unit:	25ns
Max.:	31	Data Type:	UInt16
Default:	15	Change:	At stop

Value Range:
0 ns–31 ns
Description
Set TZ signal filter time.

H0A.25 Speed display DO low-pass filter time

Address:	0x0A19	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	5000	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 ms–5000 ms
Description
Defines the low-pass filter time constant of the speed information for speed feedback and position references.

H0A.26 **Motor overload detection**

Address:	0x0A1A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Show motor overload alarm (A909.0) and fault (E620.0)

1: Hide motor overload alarm (E909.0) and fault (E620.0)

Description

Defines whether to enable motor overload detection.

0: Show motor overload alarm (A909.0) and fault (E620.0)

1: Hide motor overload alarm (E909.0) and fault (E620.0)

H0A.27 **Average filter time for speed display DO**

Address:	0x0A1B	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	50	Change:	At stop

Value Range:

0 ms–100 ms

Description

Defines the average filter time constant of the speed information for speed feedback and position references.

H0A.28 **Quadrature encoder filter time**

Address:	0x0A1C	Effective mode:	Upon the next power-on
Min.:	0	Unit:	25ns
Max.:	255	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0 ns–255 ns

Description

Defines the quadrature encoder feedback filter time.

H0A.29 **Fully closed-loop encoder (ABZ) filter time**

Address:	0x0A1D	Effective mode:	Upon the next power-on
Min.:	0	Unit:	25ns
Max.:	65535	Data Type:	UInt16
Default:	4111	Change:	At stop

Value Range:

bit0–bit7: Fully closed loop encoder (ABZ) pulse signal filtering time

bit8–bit15: Fully closed loop encoder (ABZ) wire breakage filter time

Description

Bit0–bit7: Fully closed-loop encoder (ABZ) pulse signal filter time

Bit8–bit15: Fully closed-loop encoder (ABZ) wire breakage filter time

H0A.32 **Time threshold for locked motor overheat protection**

Address:	0x0A20	Effective mode:	Real-time
Min.:	10	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

10 ms–65535 ms

Description

Defines the overtemperature duration before E630.0 (Motor stall) is detected by the servo drive. H0A.32 can be used to adjust the sensitivity of motor stall over-temperature detection.

H0A.33 **Locked motor overheat protection**

Address:	0x0A21	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

Enables or disables the detection for E630.0 (Motor stall overtemperature protection).

0: Disabled

1: Enabled

H0A.36 **Encoder multi-turn overflow fault selection**

Address:	0x0A24	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Not hide

1: Hide

Description

Defines whether to hide the encoder multi-turn overflow fault in the absolute position linear mode (H02.01 = 1).

0: Not hide

1: Hide

H0A.40 **Compensation function selection**

Address:	0x0A28	Effective mode:	Real-time
Min.:	0x0	Unit:	-
Max.:	0x1F	Data Type:	UInt16
Default:	0x6	Change:	At stop

Value Range:

bit0: Overtravel compensation

0: Enabled

1: Disabled

bit1: Touch probe rising edge compensation

0: Disabled

1: Enabled

bit2: Touch probe falling edge compensation

0: Disabled

1: Enabled

bit3: Touch probe scheme

0: New scheme

1: Old scheme (same as SV660N)

bit4: Probe 2 separate compensation time enable

0: Disabled

1: Enabled

Description

Select compensation.

Bit0: Overtravel compensation

0: Enabled

1: Disabled

bit1: Probe rising edge compensation

0: Disabled

1: Enabled

bit2: Probe falling edge compensation

0: Disabled

1: Enabled

bit3: Probe scheme

0: New scheme

1: Old scheme (same as SV660N)

bit4: Probe 2 separate compensation time

0: Disabled

1: Enabled

H0A.41 **Forward position of software position limit**

Address:	0x0A29	Effective mode:	Real-time
Min.:	-2147483648	Unit:	reference unit
Max.:	2147483647	Data Type:	Int32
Default:	2147483647	Change:	At stop

Value Range:

-2147483648 to 2147483647

Description

When the absolute position counter (H0b.07) is larger than H0A.41, the servo drive reports E950.0/ A950.0 and executes stop at forward limit.

H0A.43 **Reverse position of software position limit**

Address:	0x0A2B	Effective mode:	Real-time
Min.:	-2147483648	Unit:	reference unit

Max.:	2147483647	Data Type:	Int32
Default:	-2147483648	Change:	At stop

Value Range:
-2147483648 to 2147483647
Description
When the absolute position counter (H0b.07) is smaller than H0A.43, the servo drive reports E952.0/ A952.0 and executes stop at reverse limit.

H0A.50 **Encoder communication fault tolerance threshold**

Address:	0x0A32	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	31	Change:	Real-time

Value Range:
0 to 31
Description
When the communication between the encoder and the drive fails continuously for more than H0A.50 times, it is considered as a communication failure with the encoder. When overspeed point mask is enabled, if the number of consecutive overspeed points exceed H0A.50, it is considered as a communication failure with the encoder.

H0A.51 **Phase loss detection filter times**

Address:	0x0A33	Effective mode:	Real-time
Min.:	3	Unit:	55ms
Max.:	36	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:
3 ms–36 ms
Description
Phase loss fault is reported when phase loss keeps active for a period longer than H0A.51.

H0A.52 **Encoder temperature protection threshold**

Address:	0x0A34	Effective mode:	Real-time
Min.:	0	Unit:	°C
Max.:	175	Data Type:	UInt16
Default:	120	Change:	Real-time

Value Range:
0°C–175°C
Description
Defines the temperature threshold for encoder overtemperature protection.

H0A.53 **Probe DI ON compensation time**

Address:	0x0A35	Effective mode:	Real-time
Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16
Default:	200	Change:	Real-time

Value Range:

-3000 ns–3000 ns

Description

Used to compensate for the action time when the touch probe is switched on.

H0A.54 **Probe DI OFF compensation time**

Address:	0x0A36	Effective mode:	Real-time
Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16
Default:	1512	Change:	Real-time

Value Range:

-3000 ns–3000 ns

Description

Used to compensate for the action time when the touch probe is switched off.

H0A.55 **Runaway current threshold**

Address:	0x0A37	Effective mode:	Real-time
Min.:	100.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	200.0	Change:	Real-time

Value Range:

100.0% to 400.0%

Description

Defines the current threshold for runaway protection detection.

H0A.56 **Fault reset delay**

Address:	0x0A38	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	60000	Data Type:	UInt16
Default:	10000	Change:	Real-time

Value Range:

0 ms–60000 ms

Description

Set the fault reset delay.

H0A.57 **Runaway speed threshold**

Address:	0x0A39	Effective mode:	Real-time
Min.:	1	Unit:	[mm/s]/[rpm]
Max.:	1000	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

1[mm/s]/[rpm]–1000[mm/s]/[rpm]

Description

Defines the overspeed threshold for runaway protection detection.

H0A.58 **Runaway speed filter time**

Address:	0x0A3A	Effective mode:	Upon the next power-on

Min.:	0.1	Unit:	ms
Max.:	100.0	Data Type:	UInt16
Default:	2.0	Change:	Real-time

Value Range:
0.1 ms–100.0 ms
Description
Defines the speed feedback filter time for runaway protection detection.

H0A.59 Runaway protection detection time

Address:	0x0A3B	Effective mode:	Real-time
Min.:	10	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:
10 ms–1000 ms
Description
The runaway fault will be reported when runaway keeps active for a period longer than H0A.59.

H0A.60 Black box function mode

Address:	0x0A3C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
0: Disable
1: Any fault
2: Designated fault
3: Triggered based on designated condition
Description
Defines the condition for triggering black box sampling.
0: Disable
1: Any fault
2: Designated fault
3: Triggered based on designated condition

H0A.61 Designated fault code

Address:	0x0A3D	Effective mode:	Real-time
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0 to 6553.5
Description
Defines the fault code for triggering the black box function.

H0A.62 Trigger source

Address:	0x0A3E	Effective mode:	Real-time

Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 31
Description
Defines the fault code for triggering the black box function through designated channel.

H0A.63 **Trigger level**

Address:	0x0A3F	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
Defines the trigger level for triggering the black box function through designated channel.

H0A.65 **Trigger level**

Address:	0x0A41	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Rising edge
1: Equal
2: Falling edge
3: Edge-triggered
Description
Defines the trigger mode for triggering the black box function through H0A.63.
0: Rising edge
1: Equal
2: Falling edge
3: Edge-triggered

H0A.66 **Trigger position**

Address:	0x0A42	Effective mode:	Real-time
Min.:	0	Unit:	%
Max.:	100	Data Type:	UInt16
Default:	75	Change:	Real-time

Value Range:
0% to 100%
Description
Defines the pre-trigger position for triggering black box sampling.

H0A.67 **Sampling frequency**

Address:	0x0A43	Effective mode:	Real-time

Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Current loop

1: Position loop

2: Main cycle

Description

Defines the frequency sampling mode during black box sampling.

0: Current loop

1: Position loop

2: Main cycle

H0A.70 Overspeed threshold 2

Address:	0x0A46	Effective mode:	Real-time
Min.:	0	Unit:	[mm/s]/[rpm]
Max.:	20000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0[mm/s]/[rpm]–20000[mm/s]/[rpm]

Description

Defines the speed threshold for reporting E500.2 (Position feedback pulse overspeed).

H0A.71 Internal function switch

Address:	0x0A47	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	4098	Change:	Real-time

Value Range:

0 to 65535

Description

bit	Function	Description
0	MS1 overload curve selection	0: New 1: Old
1	Power failure bleeder switch	0: Enabled 1: Hide
2	Forced brake motor stop mode	0: Forced stop 1: Non-forced stop
3	New external characteristics switch of multi-speed DI mode	0: Old characteristics 1: New characteristics
4	A120.3 hide switch	0: Hide 1: Not hide
5	Prohibit software reading parameters	0: Disabled 1: Enabled

bit	Function	Description
6	A108.4 hide switch	0: Not hide 1: Hide
7	CSV command interpolation	0: Sync interrupt interpolation 1: IRQ interrupt interpolation
8	Data type of motor rated current, inertia and back EMF coefficient	0: 16-bit 1: 32-bit
9	Wire breakage detection	0: Enabled 1: Disabled
10	Torque limit source	0: Auto switch acc. to H02.00 1: H07.09 and H07.10
11	Ultra-accurate speed feedback switch	0: Disable 1: Enabled
12	Power failure retention of homing completion flag	0: Disabled 1: Enabled
13	STO status word fallback switch	0: Switch on disable 1: Fault
14	Encoder adaptive function switch	0: Enabled 1: Disable
15	Interrupt positioning external characteristics	0: Old external characteristics, follows motor operation direction 1: New external characteristics, direction set by parameter

H0A.72 **Maximum stop time in ramp-to-stop**

Address:	0x0A48	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10000	Change:	At stop

Value Range:

0 ms–65535 ms

Description

Defines the time for the motor to decelerate from the maximum speed to 0[mm/s]/[rpm] during ramp-to-stop.

H0A.73 **STO 24 V disconnection filter time**

Address:	0x0A49	Effective mode:	Real-time
Min.:	1	Unit:	ms
Max.:	5	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1 ms–5 ms

Description

Defines the delay from the moment when 24V is disconnected to the moment when the STO state applies.

H0A.74 **Filter time for two inconsistent STO channels**

Address:	0x0A4A	Effective mode:	Real-time
Min.:	1	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
1 ms–1000 ms
Description
Defines the delay from the moment the inconsistent 24V is input to the drive through two channels to the moment when the STO state applies.

H0A.75 **Servo OFF delay after STO triggered**

Address:	0x0A4B	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	25	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:
0 ms–25 ms
Description
Defines the delay from the moment the STO state is triggered to the moment the S-ON signal is switched off.

H0A.81 **Voltage drop protection enable**

Address:	0x0A51	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: No operation
1: Host controller executes torque limit
2: Servo executes torque limit
Description
Set the voltage drop protection selection.
0: No operation
1: Host controller executes torque limit
2: Servo executes torque limit

H0A.82 **Voltage drop torque limit**

Address:	0x0A52	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	50.0	Change:	Real-time

Value Range:
0.0% to 100.0%
Description
Set the voltage drop torque limit.

H0A.83 **Torque limit cancel time**

Address:	0x0A53	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
0 ms–1000 ms
Description
Set the torque limit cancel time.

H0A.84 **Instantaneous power failure holding time**

Address:	0x0A54	Effective mode:	Real-time
Min.:	20	Unit:	ms
Max.:	50000	Data Type:	UInt16
Default:	1000	Change:	Real-time

Value Range:
20 ms–50000 ms
Description
Set the instantaneous power failure holding time.

H0A.88 **BiSS-C data alarm enabled**

Address:	0x0A58	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 1
Description
Used to enable original BiSS-C data alarm function, which is only applicable to the encoder that adopts BiSS-C protocol.

H0A.89 **Correct state of BiSS-C data**

Address:	0x0A59	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0 to 31
Description
Defines the fault bit state during normal operation of BiSS-C.

H0A.90 **Speed display low-pass filter time**

Address:	0x0A5A	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 ms–100 ms
Description
Defines the low-pass filter time constant for displayed speed values.

H0A.91 Moving average filter time for torque display values

Address:	0x0A5B	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 ms–100 ms
Description
Defines the moving average filter time constant for torque display values.

H0A.92 Moving average filter time for position display values

Address:	0x0A5C	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	100	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 ms–100 ms
Description
Defines the moving average filter time constant for position display values.

H0A.93 Low-pass filter time for voltage display values

Address:	0x0A5D	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	250	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 ms–250 ms
Description
Defines the low-pass filter time constant for voltage display values.

H0A.94 Low-pass filter time for thermal display values

Address:	0x0A5E	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	250	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 ms–250 ms
Description
Defines the filter time constant for thermal display values.

16.12 H0b Monitoring Parameters

H0b.00 Motor speed actual value

Address:	0x0B00	Effective mode:	-
Min.:	-32767	Unit:	[mm/s]/[rpm]
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]
Description
Indicates the actual motor speed after round-off, which is accurate to 1 [mm/s]/[rpm].
Set in H0A.25 (Filter time constant of speed feedback display) the filter time constant for H0b.00.

H0b.01 Speed reference

Address:	0x0B01	Effective mode:	-
Min.:	-32767	Unit:	[mm/s]/[rpm]
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]
Description
Indicates the present speed reference (accurate to 1 [mm/s]/[rpm]) of the drive in the position and speed control modes.

H0b.02 Internal torque reference

Address:	0x0B02	Effective mode:	-
Min.:	-3276.7	Unit:	%
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:
-3276.7% to 3276.7%
Description
Displays present torque reference (accurate to 0.1%). The value 100.0% corresponds to the rated torque of the motor.

H0b.03 Input (DI) signal monitoring

Address:	0x0B03	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the level status of 5 DI terminals without filtering.
Upper LED segments ON: high level (indicated by "1") Lower LED segments ON: low level (indicated by "0")

H0b.05 **Output (DO) signal monitoring**

Address:	0x0B05	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the level status of 2 DO terminals without filtering.
Upper LED segments ON: high level (indicated by "1") Lower LED segments ON: low level (indicated by "0")

H0b.07 **Absolute position counter**

Address:	0x0B07	Effective mode:	-
Min.:	-2147483648	Unit:	reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Displays current absolute position of the motor (reference unit).
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.09 **Mechanical angle**

Address:	0x0B09	Effective mode:	-
Min.:	0.0	Unit:	°
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0° to 360.0°
Description
Displays present mechanical angle (encoder unit) of the motor. The setpoint 0 indicates the mechanical angle is 0°.
Actual mechanical angle = 360° x H0b.09/(Maximum value of H0b.09 + 1)

Maximum value of H0b.09 for an absolute encoder is 65535.

H0b.10 **Electrical angle**

Address:	0x0B0A	Effective mode:	-
Min.:	0.0	Unit:	°
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0° to 360.0°
Description

Indicates the present electrical angle of the motor, which is accurate to 0.1°.
The electrical angle variation range is ±360.0° during rotation. If the motor has four pairs of poles, each revolution generates four rounds of angle change from 0° to 359°. Similarly, if the motor has five pairs of poles, each revolution generates five rounds of angle change from 0° to 359°.

H0b.12 Average load ratio

Address:	0x0B0C	Effective mode:	-
Min.:	0.0	Unit:	%
Max.:	800.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0% to 800.0%
Description
Displays the percentage of the average load torque to the rated torque of the motor, which is accurate to 0.1%. The value 100.0% corresponds to the rated torque of the motor.

H0b.15 Position following error (encoder unit)

Address:	0x0B0F	Effective mode:	-
Min.:	-2147483648	Unit:	encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Used to count and display the position deviation value after being divided or multiplied by the electronic gear ratio in the position control mode.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.
Note:
H0b.15 can be clear when the condition defined in H05.16 (Clear action) is met.

H0b.17 Feedback pulse counter

Address:	0x0B11	Effective mode:	-
Min.:	-2147483648	Unit:	encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Used to count the position pulses fed back by the encoder in any control mode.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.19 Total power-on time

Address:	0x0B13	Effective mode:	-
Min.:	0.0	Unit:	s
Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:

0.0s–429496729.5s

Description

Used to record the total operating time of the servo drive.

This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

Note:

If the servo drive is switched on and off repeatedly within a short period of time, a deviation within 1h may be present in the total power-on time record.

H0b.21 Displayed AI1 voltage

Address:	0x0B15	Effective mode:	-
Min.:	-327.67	Unit:	V
Max.:	327.67	Data Type:	Int16
Default:	0.00	Change:	Unchangeable

Value Range:

-327.67 V to 327.67 V

Description

Displays the actual sampling voltage of AI1.

H0b.22 Displayed AI2 voltage

Address:	0x0B16	Effective mode:	-
Min.:	-327.67	Unit:	V
Max.:	327.67	Data Type:	Int16
Default:	0.00	Change:	Unchangeable

Value Range:

-327.67 V to 327.67 V

Description

Displays the actual sampling voltage of AI2.

H0b.24 Phase current RMS value

Address:	0x0B18	Effective mode:	-
Min.:	0.0	Unit:	A
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 A to 6553.5 A

Description

Displays the RMS value of the phase current of the motor, accurate to 0.1 A.

H0b.25 Angle obtained upon voltage injection auto-tuning

Address:	0x0B19	Effective mode:	-
Min.:	0.0	Unit:	°
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0° to 360.0°

Description

Display the angle obtained upon voltage injection auto-tuning.

H0b.26 Bus voltage

Address:	0x0B1A	Effective mode:	-
Min.:	0.0	Unit:	V
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0 V to 6553.5 V
Description
Displays the DC bus voltage of the main circuit input voltage after rectification, which is accurate to 0.01 V.

H0b.27 Module temperature

Address:	0x0B1B	Effective mode:	-
Min.:	-20	Unit:	°C
Max.:	200	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-20°C–200°C
Description
Indicates the temperature of the module inside the servo drive, which can be used as a reference for estimating the actual temperature of the drive.

H0b.28 Absolute encoder fault information given by FPGA

Address:	0x0B1C	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the absolute encoder fault information given by FPGA.

H0b.29 Axis status information given by FPGA

Address:	0x0B1D	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display axis status information given by FPGA.

H0b.30 Axis fault information given by FPGA

Address:	0x0B1E	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16

Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display axis fault information given by FPGA.

H0b.31 Encoder fault information

Address:	0x0B1F	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display encoder internal fault information.

H0b.33 Fault log

Address:	0x0B21	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	19	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Present fault
1: Last fault
2: 2nd to last fault
3: 3rd to last fault
4: 4th to last fault
5: 5th to last fault 6: 6th to last fault
7: 7th to last fault
8: 8th to last fault
9: 9th to last fault
10: 10th to last fault
11: 11th to last fault
12: 12th to last fault
13: 13th to last fault
14: 14th to last fault
15: 15th to last fault
16: 16th to last fault
17: 17th to last fault
18: 18th to last fault
19: 19th to last fault
Description

Used to view the latest 20 faults of the drive.
0: Present fault
1: Last fault
2: 2nd to last fault
3: 3rd to last fault
4: 4th to last fault
5: 5th to last fault 6: 6th to last fault
7: 7th to last fault
8: 8th to last fault
9: 9th to last fault
10: 10th to last fault
11: 11th to last fault
12: 12th to last fault
13: 13th to last fault
14: 14th to last fault
15: 15th to last fault
16: 16th to last fault
17: 17th to last fault
18: 18th to last fault
19: 19th to last fault

H0b.34 Fault code of the selected fault

Address:	0x0B22	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the fault code of the selected fault.

H0b.35 Timestamp of the selected fault

Address:	0x0B23	Effective mode:	-
Min.:	0.0	Unit:	s
Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:
0.0s–429496729.5s
Description
Display timestamp of the selected fault.

H0b.37 Motor speed upon occurrence of the selected fault

Address:	0x0B25	Effective mode:	-
Min.:	-32767	Unit:	[mm/s]/[rpm]
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-32767[mm/s]/[rpm]–32767[mm/s]/[rpm]
Description
Display motor speed upon occurrence of the selected fault.

H0b.38 Motor phase U current upon occurrence of the selected fault

Address:	0x0B26	Effective mode:	-
Min.:	-3276.7	Unit:	A
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:
-3276.7 A to 3276.7 A
Description
Display the motor phase U current upon occurrence of the selected fault.

H0b.39 Motor phase V current upon occurrence of the selected fault

Address:	0x0B27	Effective mode:	-
Min.:	-3276.7	Unit:	A
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:
-3276.7 A to 3276.7 A
Description
Display the motor phase V current upon occurrence of the selected fault.

H0b.40 Bus voltage upon occurrence of the selected fault

Address:	0x0B28	Effective mode:	-
Min.:	0.0	Unit:	V
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0 V to 6553.5 V
Description
Display the bus voltage upon occurrence of the selected fault.

H0b.41 Input terminal state on selected fault

Address:	0x0B29	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Display input terminal state on selected fault.

H0b.43 Output terminal status upon occurrence of the selected fault

Address:	0x0B2B	Effective mode:	-

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Display output terminal status upon occurrence of the selected fault.

H0b.45 Internal fault code

Address:	0x0B2D	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the internal fault code.

H0b.46 Absolute encoder fault information given by FPGA upon occurrence of the selected fault

Address:	0x0B2E	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the absolute encoder fault information given by FPGA upon occurrence of the selected fault.

H0b.47 System status information given by FPGA upon occurrence of the selected fault

Address:	0x0B2F	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the system status information given by FPGA upon occurrence of the selected fault.

H0b.48 System fault information given by FPGA upon occurrence of the selected fault

Address:	0x0B30	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF

Description
Display the system fault information given by FPGA upon occurrence of the selected fault.

H0b.49 Encoder fault information upon occurrence of the selected fault

Address:	0x0B31	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the encoder fault information upon occurrence of the selected fault.

H0b.51 Internal fault code upon occurrence of the selected fault

Address:	0x0B33	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display internal fault code upon occurrence of the selected fault.

H0b.52 FPGA timeout fault standard bit upon occurrence of the selected fault

Address:	0x0B34	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display the FPGA timeout fault standard bit upon occurrence of the selected fault.

H0b.53 Position following error (reference unit)

Address:	0x0B35	Effective mode:	-
Min.:	-2147483648	Unit:	reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Indicates the position deviation value which has not been divided or multiplied by the electronic gear ratio in the position control mode.
Position deviation (reference unit) is the value obtained after encoder position deviation calculation. The precision is compromised during division.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.55 Actual motor speed 2

Address:	0x0B37	Effective mode:	-
Min.:	-214748364.8	Unit:	[mm/s]/[rpm]
Max.:	214748364.7	Data Type:	Int32
Default:	0.0	Change:	Unchangeable

Value Range:
-214748364.8[mm/s]/[rpm]–214748364.7[mm/s]/[rpm]
Description
Displays the actual motor speed, accurate to 0.1 [mm/s]/[rpm].
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.
H0A.25 (Filter time constant of speed feedback display) can be used to set the filter time constant of the speed feedback.

H0b.57 Control circuit bus voltage

Address:	0x0B39	Effective mode:	-
Min.:	0.0	Unit:	V
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0 V to 6553.5 V
Description
Displays the bus voltage of the control circuit.

H0b.58 Mechanical absolute position (low 32 bits)

Address:	0x0B3A	Effective mode:	-
Min.:	0	Unit:	encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0 to 4294967295
Description
Displays the low 32-bit value (encoder unit) of the mechanical position feedback when the absolute encoder is used.

H0b.60 Mechanical absolute position (high 32 bits)

Address:	0x0B3C	Effective mode:	-
Min.:	-2147483648	Unit:	encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Displays the high 32-bit value (encoder unit) of the mechanical position feedback when the absolute encoder is used.

H0b.63 NotRdy state

Address:	0x0B3F	Effective mode:	-

Min.:	0	Unit:	-
Max.:	9	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0: Normal

1: Control circuit error

2: Main circuit power input error

3: Bus undervoltage

4: Soft start failed

5: Encoder initialization undone

6: Short circuit to ground failed

7: Others

9: Fully closed-loop encoder initialization not completed

Description

Displays the reason for the NRD state.

0: Normal

1: Control circuit error

2: Main circuit power input error

3: Bus undervoltage

4: Soft start failed

5: Encoder initialization undone

6: Short circuit to ground failed

7: Others

9: Fully closed-loop encoder initialization not completed

H0b.66 Encoder temperature

Address:	0x0B42	Effective mode:	-
Min.:	-32768	Unit:	°C
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32768°C–32767°C

Description

Indicates the encoder temperature value.

H0b.67 Load rate of braking resistor

Address:	0x0B43	Effective mode:	-
Min.:	0.0	Unit:	%
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0% to 200.0%

Description

Display load rate of the braking resistor.

H0b.70 **Number of absolute encoder revolutions**

Address:	0x0B46	Effective mode:	-
Min.:	-32768	Unit:	Rev
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-32768Rev to 32767Rev
Description
Indicates the number of revolutions of the absolute encoder.

H0b.71 **Single-turn position fed back by the absolute encoder**

Address:	0x0B47	Effective mode:	-
Min.:	0	Unit:	encoder unit
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0 to 2147483647
Description
Displays the position feedback of the absolute encoder within one turn.

H0b.74 **System fault information given by FPGA**

Address:	0x0B4A	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Display system fault information given by FPGA.

H0b.77 **Encoder position (low 32 bits)**

Address:	0x0B4D	Effective mode:	-
Min.:	0	Unit:	encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0 to 4294967295
Description
Displays the low 32-bit value of the position feedback of the absolute encoder.

H0b.79 **Encoder position (high 32 bits)**

Address:	0x0B4F	Effective mode:	-
Min.:	-2147483648	Unit:	encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Displays the high 32-bit value of the position feedback of the absolute encoder.

H0b.81 Single-turn position of the rotary load (low 32 bits)

Address:	0x0B51	Effective mode:	-
Min.:	0	Unit:	encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0 to 4294967295

Description

Displays the low 32-bit value of the position feedback of the rotary load when the absolute system works in the rotation mode.

H0b.83 Single-turn position of the rotary load (high 32 bits)

Address:	0x0B53	Effective mode:	-
Min.:	-2147483648	Unit:	encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Displays the high 32-bit value of the position feedback of the rotary load when the absolute system works the rotation mode.

H0b.85 Single-turn position of the rotary load (reference unit)

Address:	0x0B55	Effective mode:	-
Min.:	0	Unit:	reference unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0 to 4294967295

Description

Displays the high 32-bit value of the position feedback of the rotary load when the absolute system works the rotation mode.

H0b.87 IGBT junction temperature

Address:	0x0B57	Effective mode:	-
Min.:	0	Unit:	°C
Max.:	200	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0°C–200°C

Description

Display IGBT junction temperature.

H0b.90 **Group No. of the abnormal parameter**

Address:	0x0B5A	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Set the group number of the abnormal parameter.

H0b.91 **Offset within the group of the abnormal parameter**

Address:	0x0B5B	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Display offset within the group of the abnormal parameter.

H0b.93 **Closed loop state**

Address:	0x0B5D	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0: Half closed loop
1: Fully closed loop
Description
Displays the closed loop state in position control mode.
0: Half closed loop
1: Fully closed loop

H0b.94 **Individual power-on time**

Address:	0x0B5E	Effective mode:	-
Min.:	0.0	Unit:	s
Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:
0.0s–429496729.5s
Description
Display the individual power-on time of the drive.

H0b.96 **Individual power-on time upon occurrence of the selected fault**

Address:	0x0B60	Effective mode:	-
Min.:	0.0	Unit:	s

Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:
0.0s–429496729.5s
Description
Display the individual power-on time upon occurrence of the selected fault.

H0b.98 **Dynamic braking resistor load rate**

Address:	0x0B62	Effective mode:	-
Min.:	0.0	Unit:	%
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0% to 200.0%
Description
Display dynamic braking resistor load rate.

16.13 H0C Fault and Protection Parameters 2

H0C.53 **Probe DI ON compensation time 2**

Address:	0x0C35	Effective mode:	Real-time
Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16
Default:	200	Change:	Real-time

Value Range:
-3000 ns–3000 ns
Description
Used to compensate for the action time when touch probe 2 is switched on. (Effective when H0A_40 bit4 = 1)

H0C.54 **Probe DI OFF compensation time 2**

Address:	0x0C36	Effective mode:	Real-time
Min.:	-3000	Unit:	25ns
Max.:	3000	Data Type:	Int16
Default:	1512	Change:	Real-time

Value Range:
-3000 ns–3000 ns
Description
Used to compensate for the action time when touch probe 2 is switched off. (Effective when H0A_40 bit4 = 1)

H0C.71 **Internal function switch**

Address:	0x0C47	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	520	Change:	Real-time

Value Range:
0 to 65535
Description
Bit 3: AC3 software limit pre-planning switch
bit9: FPGA encoder feedback overspeed point hide switch

H0C.73 **Servo function switchover switch 3**

Address:	0x0C49	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Bit1: Switch encoder communication baud rate to 2M upon power-on

0: Enabled

1: Disabled

Bit6: Prohibit soft/hard limit under AC4

0: Prohibited

1: Not prohibited

Bit9: Prohibit ramp generation time under AC4

0: Prohibited

1: Not prohibited
Description
Bit1: Switch encoder communication baud rate to 2M upon power-on.

Bit6: When this bit is set to 0 and H02.07 is not 8, the DI limit and soft limit function is prohibited under AC4.

Bit9: Whether to prohibit homing and whether the ramp generation time is non-zero under AC4.

16.14 H0d Auxiliary Function Parameters

H0d.00 **Software Reset**

Address:	0x0D00	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: No operation
1: Enable
Description
0: No operation
1: Enabled
Programs in the drive are reset automatically (similar to the program reset upon power-on) after the software reset function is enabled, without the need for a power cycle.

H0d.01 **Fault reset**

Address:	0x0D01	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enable

Description

0: No operation

1: Enable

Resettable faults of Level 1 and level 2 can be reset only when the servo drive is not in running state after the fault causes are eliminated. Then, the servo drive do not display the faults and enters the "rdy" state.

When a No. 3 alarm occurs, you can enable the fault reset function directly, regardless of the servo drive status.

H0d.02 **Inertia auto-tuning enable**

Address:	0x0D02	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 65

Description

Used to enable offline inertia auto-tuning through the keypad. In the parameter display mode, switch to H0d.02 and press the SET key to enable offline inertia auto-tuning.

H0d.04 **Read/write in encoder ROM**

Address:	0x0D04	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Write ROM

2: Read ROM

3: ROM failure

Description

For Inovance encoders, the USB and control circuit need to be disconnected after writing in ROM to activate parameters. Also ensure that the drive is powered on during parameter writing.

0: No operation

1: Write ROM

2: Read ROM

3: ROM failure

H0d.05 **Emergency stop**

Address:	0x0D05	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No operation

1: Emergency stop

Description

Trigger emergency stop.

Note: The emergency stop mode corresponding to H0D.05 is defined by H02.05.

H0d.06 **Current loop auto-tuning test**

Address:	0x0D06	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	6	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enable current loop auto-tuning

2: Enable current loop step test (static)

3: Enable current loop step test

Description

0: No operation

1: Enable current loop auto-tuning

2: Enable current loop step test (static)

3: Enable current loop step test

H0d.10 **Analog channel auto adjusting**

Address:	0x0D0A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Adjusted through AI1

2: Adjusted through AI2

Description

When automatic adjustment of the analog channel is enabled, the drive automatically corrects the zero drift voltage of the analog channel to improve signal detection accuracy.

0: No operation

1: Adjusted through AI1

2: Adjusted through AI2

H0d.12 **Phase U/V current balance correction**

Address:	0x0D0C	Effective mode:	Upon the next power-on

Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Enable/disable phase U/V current balance correction.

0: Disabled

1: Enabled

H0d.17 Forced DI/DO enable switch

Address:	0x0D11	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: Forced DI enable switch

0: Disabled

1: Enabled

bit1: Forced DO enable switch

0: Disabled

1: Enabled

Description

Forced DI/DO selection.

Bit0: Forced DI enable switch

0: Disabled

1: Enabled

bit1: Forced DO enable switch

0: Disabled1: Enabled

H0d.18 Forced DI value

Address:	0x0D12	Effective mode:	Real-time
Min.:	0x0	Unit:	-
Max.:	0x1F	Data Type:	UInt16
Default:	0x1F	Change:	Real-time

Value Range:

0x0 to 0x1F

Description

Defines whether the DI functions set in group H03 is active when forced DI is activated (H0d.17 = 1 or 3).

The value of H0d.18 is displayed as a hexadecimal on the keypad. When it is converted to a binary value, "bit(n) = 1" indicates the level logic of DI function is high level; "bit(n) = 0" indicates the level logic of the DI function is low level.

H0d.19 Forced DO value

Address:	0x0D13	Effective mode:	Real-time

Min.:	0x0	Unit:	-
Max.:	0x3	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:
0x0 to 0x3
Description
Defines whether the DO functions assigned in group H04 are active when forced DO is active (H0d.17 = 2 or 3).
The value of H0d.19 is displayed as a hexadecimal on the keypad. When it is converted to a binary value, "bit(n) = 1" indicates the DO function is active; "bit(n) = 0" indicates the DO function is inactive.

H0d.20 Absolute encoder reset

Address:	0x0D14	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: No operation
1: Reset fault
2: Reset fault and multi-turn data
3: Reset Inovance 2nd encoder fault
4: Reset Inovance 2nd encoder fault and multi-turn data
Description
You can reset the encoder error or the multi-turn data fed back by the encoder by setting H0d.20.
0: No operation
1: Reset fault
2: Reset fault and multi-turn data3: Reset Inovance 2nd encoder fault
4: Reset Inovance 2nd encoder fault and multi-turn data

Note: Fault reset is only available for the Inovance communication encoder.

H0d.21 Read error status bit of EnDat2.2 encoders

Address:	0x0D15	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: No operation
1: Reading error status bit
Description
Read error status bit of EnDat2.2 encoders.
0: No operation
1: Reading error status bit

H0d.29 Motor parameter auto-tuning

Address:	0x0D1D	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Enabled

Description

Resistor inductance auto-tuning.

0: No operation

1: Enabled

16.15 H0E Communication Function Parameters

H0E.01 **Save objects written through communication to EEPROM**

Address:	0x0E01	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Do not save

1: Save upon parameter writing

Description

Save/do not save settings during parameter writing through serial port or aperiodic communication.

0: Do not save

1: Save upon parameter writing

H0E.80 **Modbus baud rate**

Address:	0x0E50	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	9	Data Type:	UInt16
Default:	9	Change:	Real-time

Value Range:

0: 300 bps

1: 600 bps

2: 1200 bps

3: 2400 bps

4: 4800 bps

5: 9600 bps

6: 19200 bps

7: 38400 bps

8: 57600 bps

9: 115200 bps

Description

Defines the communication rate between the servo drive and the host controller. The baud rate set in the servo drive must be the same as that in the host controller. Otherwise, communication will fail.

0: 300 bps
1: 600 bps
2: 1200 bps
3: 2400 bps
4: 4800 bps
5: 9600 bps
6: 19200 bps
7: 38400 bps
8: 57600 bps
9: 115200 bps

H0E.81 **Modbus data format**

Address:	0x0E51	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:

0: No parity, 2 stop bits (N-2)
1: Even parity, 1 stop bit (E-1)
2: Odd parity, 1 stop bit (O-1)
3: No parity, 1 stop bit (N-1)

Description

Defines the data check mode between the servo drive and the host controller during communication.

0: No parity, 2 stop bits
1: Even parity, 1 stop bit
2: Odd parity, 1 stop bit
3: No parity, 1 stop bit

The data format of the servo drive must be the same as that of the host controller. Otherwise, communication will fail.

H0E.82 **Modbus response delay**

Address:	0x0E52	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	20	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 ms–20 ms

Description

Defines the delay from the moment when the slave receives a command from the host controller to the moment when the slave returns a response.

H0E.83 **Modbus communication timeout**

Address:	0x0E53	Effective mode:	Real-time

Min.:	0	Unit:	ms
Max.:	600	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–600 ms
Description
Set the Modbus communication timeout time.

H0E.84 **Sequence of Modbus communication data bits**

Address:	0x0E54	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
0: High bits before low bits
1: Low bits before high bits
Description
Defines the 32-bit data transmission format of Modbus communication.
0: High 16 bits before low 16 bits
1: Low 16 bits before high 16 bits

H0E.90 **Communication version**

Address:	0x0E5A	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:
0.00 to 655.35
Description
Display the communication version.

16.16 H0F Fully Closed-loop Mode

H0F.00 **Encoder feedback mode**

Address:	0x0F00	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Internal encoder feedback
1: External encoder feedback
2: Inner/Outer loop switchover
Description
Defines the encoder feedback signal source in fully closed-loop control.

0: Internal encoder feedback. The position feedback signals come from the motor encoder.
1: External encoder feedback. The position feedback signals come from the fully closed-loop external encoder and electronic gear ratio 1 is used.
2: Inner/Outer loop switchover: The DI assigned with FunIN.24 (GEAR_SEL, electronic gear ratio switchover) is switch between inner and outer position closed loops.
DI function disabled: internal encoder feedback and electronic gear ratio 1 are used.
DI function enabled: external encoder feedback and electronic gear ratio 2 are used.

H0F.01 **Fully closed-loop encoder application mode**

Address:	0x0F01	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Standard operating direction
1: Reverse operating direction
Description
Defines the feedback pulse counting direction of internal and external encoders when the motor rotates in the fully closed-loop mode.
0: Standard operating direction: The pulse feedback counter of the internal encoder (H0F.18) is in the same direction as that of the external encoder (H0F.20) during rotation of the motor.
1: Reverse operating direction: The pulse feedback counter of the internal encoder (H0F.18) is in the opposite direction as that of the external encoder (H0F.20) during rotation of the motor.

H0F.02 **Fully closed-loop encoder absolute value**

Address:	0x0F02	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Incremental mode
1: Absolute linear mode
Description
Set fully closed-loop encoder absolute value
0: Incremental mode
1: Absolute linear mode

H0F.03 **Fully closed-loop encoder feedback type**

Address:	0x0F03	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Quadrature pulse
1: Inovance
2: BiSS-C
3: EnDat2.2
4: SSI

Description

Set the fully closed-loop encoder feedback type
0: Quadrature pulse
1: Inovance
2: BiSS-C
3: EnDat2.2
4: SSI

H0F.04 Number of fully closed-loop encoder pulses per revolution

Address:	0x0F04	Effective mode:	Upon the next power-on
Min.:	1	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	10000	Change:	At stop

Value Range:

1 to 2147483647

Description

Defines the pulses fed back by the external encoder per revolution of the motor.
It defines the quantity relation between feedback pulses from the external encoder and those from the internal encoder.
Calculate the value of this parameter through analyzing mechanical parameters. When rigid connection is applied between the motor and the external encoder (scale), you can also set this parameter using the following method:
1: Manually rotate the motor and observe H0F.18 (Feedback pulse counter of internal encoder) in the meantime. After ensuring that the motor has rotated for a full turn (H0F.18 = Motor resolution), calculate the change of H0F.20 (Feedback pulse counter of external encoder) and use the absolute value of the change as the value of H0F.04.
2: Assume values of H0F.18 and H0F.20 are X1 and Y1 before the motor rotates and X2 and Y2 after the motor rotates, then the following formula applies: H0F.04 = Motor resolution x (Y2 - Y1)/(X2 - X1)
The calculated result must be positive; if not, perform step 1 again.
For non-rigid connection, an error may exist in the calculation result.
Note:
Ensure H0F.04 is set properly. Otherwise, EB02.0 (Position deviation too large in fully closed loop) may occur after the drive operates.

H0F.06 Fully closed-loop encoder interface

Address:	0x0F06	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: CN2
1: CN7

Description

Used to set the drive interface used by the fully closed-loop encoder.

0: CN2

1: CN7

H0F.08 **Excessive deviation threshold in compound control mode**

Address:	0x0F08	Effective mode:	Real-time
Min.:	0	Unit:	encoder unit
Max.:	2147483647	Data Type:	UInt32
Default:	1000	Change:	Real-time

Value Range:

0 to 2147483647

Description

Defines the position deviation threshold at which the servo drive reports EB02.0 (Position deviation too large in fully closed-loop mode).

When H0F.08 is set to 0, the drive does not detect EB02.0 and always clears the fully closed-loop position deviation.

H0F.10 **Clear deviation in compound control mode**

Address:	0x0F0A	Effective mode:	Real-time
Min.:	0	Unit:	Rev
Max.:	100	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0 Rev–100 Rev

Description

Defines the number of revolutions rotated by the motor per a clear of the fully closed-loop position deviation during operation. The number of revolutions is reflected by H0F.18 (Feedback pulse counter of internal encoder). The number of motor revolutions will not be cleared when the drive is not in the operational state.

H0F.13 **Compound vibration suppression filter time**

Address:	0x0F0D	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0 ms–6553.5 ms

Description

Defines the time constant for compound vibration suppression in fully closed-loop control when external encoder feedback (H0F.00 = 1 or 2) is used.

Increase the setpoint gradually and check the response change.

When the stiffness of the transmission mechanism between fully closed loop and internal loop is insufficient, set H0F.13 properly to improve system stability, which is to generate the effect of internal loop temporarily and form a fully closed loop again after the system is stabilized. When the stiffness is sufficient, there is no need to adjust this parameter.

H0F.16 **Pulse deviation display in compound control mode**

Address:	0x0F10	Effective mode:	-
Min.:	-2147483648	Unit:	encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Used to count and display the position deviation absolute value in fully closed loop control.

Pulse deviation in compound control = Absolute position feedback of external encoder - Absolute position feedback conversion value of internal encoder.

The alignment of inner and outer loop feedbacks is performed each time the deviation is cleared.

H0F.18 **Internal position pulse feedback display**

Address:	0x0F12	Effective mode:	-
Min.:	-2147483648	Unit:	encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Used to count and display the number of feedback pulses of the internal encoder (after being divided or multiplied by electronic gear ratio, in internal encoder unit).

H0F.20 **Fully closed-loop encoder position pulse feedback display**

Address:	0x0F14	Effective mode:	-
Min.:	-2147483648	Unit:	encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Used to count and display the number of feedback pulses of the external encoder (after being divided or multiplied by electronic gear ratio, in external encoder unit).

H0F.22 **Quadrature pulse phase Z detection invalid in fully closed-loop mode**

Address:	0x0F16	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Detected

1: Not detected

Description

Quadrature pulse phase Z detection in fully closed-loop mode

0: Detected

1: Not detected

H0F.23 **BiSS-C/SSI/EDNAT2.2 fully closed-loop encoder absolute homing offset**

Address:	0x0F17	Effective mode:	Real-time
Min.:	-2147483648	Unit:	encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

The homing offset is updated automatically after homing is done. It is only necessary to write this value manually when you replace the drive. When the full closed-loop encoder is in absolute linear mode, the power-on initial position = Encoder position feedback original value + Homing offset – Absolute feedback offset.

H0F.25 **Set the source of touch probe Z signal in fully closed-loop mode.**

Address:	0x0F19	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Motor Z signal

1: External feedback Z signal

Description

Set the source of touch probe Z signal in fully closed-loop mode.

0: Motor Z signal

1: External feedback Z signal

H0F.26 **BiSS-C/SSI/EDNAT2.2 fully closed-loop encoder absolute feedback offset**

Address:	0x0F1A	Effective mode:	Real-time
Min.:	-2147483648	Unit:	encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

When the full closed-loop encoder is in absolute linear mode, the absolute feedback offset is updated after homing is completed. It is only necessary to write this value manually when you replace the drive.

H0F.28 **Index value of BiSS-C/SSI communication alarm**

Address:	0x0F1C	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Set the index value of BiSS-C/SSI communication alarm.

H0F.29 **CRC of BiSS-C/SSI fully closed-loop encoder feedback**

Address:	0x0F1D	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Positive

1: Negative

Description

Set the CRC of BiSS-C/SSI fully closed-loop encoder feedback.

0: Positive

1: Negative

H0F.30 **BiSS-C/SSl/EDNAT2.2 valid bits of encoder communication position feedback in full closed-loop mode**

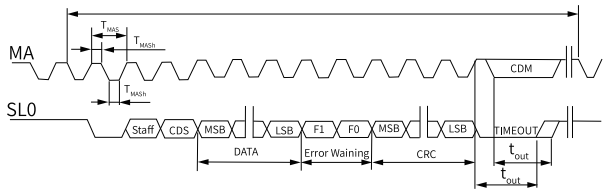
Address:	0x0F1E	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	127	Data Type:	UInt16
Default:	29	Change:	At stop

Value Range:

0 to 127

Description

Set the BiSS-C/SSl/EDNAT2.2 valid bits of encoder communication position feedback in full closed-loop mode.



- DATA: Position data, CRC: 6-digit CRC check code
- $100ns \leqslant T_{MAS} \leqslant 2t_{out} 25ns \leqslant T_{MASh} \leqslant t_{out} 25ns \leqslant T_{MASh} \leqslant t_{out}$
- t_{out}= 1.5 MA clock cycle
- MA: master clock output; SL0: slave data output
  Transmission speed up to 10 Mbps
- CDM: register communication master transmit bit;
  CDS: register communication slave return bit.
- Error Warning: Error bit and alarm bit index
  (F1 low level indicates an error, and F0 low level indicates an alarm)
- The input and output of the optical scale comply with the standard RS-422A interface.
  Differential line drive and line receiver are required.
- CRC generator polynomial: X6 + X1 + 1, initial value 0, check range "DATA", "Error Warning".

In the figure, MA SL0 is not displayed.

H0F.30 is the valid bits of position feedback. For details, see the user manual of any third-party BiSS-C encoder.

H0F.31 **Valid bit of BiSS-C/SSl encoder communication alarm index in full closed-loop mode**

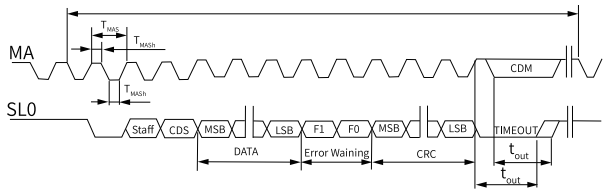
Address:	0x0F1F	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0 to 31

Description

Set the valid bit of BiSS-C/SSl encoder communication alarm index in full closed-loop mode.



- DATA: Position data, CRC: 6-digit CRC check code
- $100ns \leqslant T_{MAS} \leqslant 2t_{out} 25ns \leqslant T_{MASh} \leqslant t_{out} 25ns \leqslant T_{MASh} \leqslant t_{out}$
- t_{out}= 1.5 MA clock cycle
- MA: master clock output; SL0: slave data output
  Transmission speed up to 10 Mbps
- CDM: register communication master transmit bit;
  CDS: register communication slave return bit.
- Error Warning: Error bit and alarm bit index
  (F1 low level indicates an error, and F0 low level indicates an alarm)
- The input and output of the optical scale comply with the standard RS-422A interface.
  Differential line drive and line receiver are required.
- CRC generator polynomial: X6 + X1 + 1, initial value 0, check range "DATA", "Error Warning".

In the figure, MA SL0 is not displayed.

H0F.31: Error alarm set bit, error and alarm bit index. Its value is the difference between DATA and CRC.

H0F.32 BiSS-C/SSl/ENDAT encoder communication frequency in fully closed-loop mode

Address:	0x0F20	Effective mode:	Upon the next power-on
Min.:	0	Unit:	kHz
Max.:	10000	Data Type:	UInt16
Default:	2000	Change:	Real-time

Value Range:

0 kHz–10000 kHz

Description

Set the BiSS-C/SSl/ENDAT encoder communication frequency in fully closed-loop mode.

H0F.33 SSl/ENDAT encoder recovery time in fully closed-loop mode

Address:	0x0F21	Effective mode:	Upon the next power-on
Min.:	0.000	Unit:	μs
Max.:	40.000	Data Type:	UInt16
Default:	0.500	Change:	Real-time

Value Range:

0.000μs to 40.000μs

Description

Set the SSl/ENDAT encoder recovery time in fully closed-loop mode.

H0F.35 BiSS-C error detection enable in fully closed-loop mode

Address:	0x0F23	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Detection on error bits of BiSS-C protocol by FPGA software.

0: Disabled

1: Enabled

H0F.36 **BiSS-C error bit polarity in fully closed-loop mode**

Address:	0x0F24	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Positive

1: Negative

Description

BiSS-C error bit polarity

0: Positive

1: Negative

H0F.40 **Fully closed-loop communication encoder fault info**

Address:	0x0F28	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Display fault information of the fully closed-loop communication encoder.

Table 16–1 Inovance encoder

bit	Name
0	Full closed-loop serial encoder communication timeout (RX side[1])
1	Full closed-loop serial encoder frame stop bit error (RX side)
2	Full closed-loop serial encoder CRC error (RX side)[2]
3	Full closed-loop serial encoder data field error (RX side)
4	Full closed-loop serial encoder position count error (TX side[1])
5	Full closed-loop serial encoder frame overspeed (TX side)
6	Full closed-loop serial encoder over-temperature (TX side)
7	Full closed-loop serial encoder single-turn count error (TX side)
8	Full closed-loop serial encoder multi-turn count error (TX side)
9	Full closed-loop serial encoder battery alarm (TX side)
10	Full closed-loop serial encoder battery failure (TX side)
11 to 12	Undefined
13[3]	Full closed-loop serial encoder count increment error (algorithm[1])
14 to 15	Undefined
16 to 23	Full closed-loop serial encoder expansion data 1
24 to 31	Full closed-loop serial encoder expansion data 2

Table 16–2 EnDat encoder

bit	Name
0	EnDat encoder communication timeout (RX side)
1	EnDat level 1 fault (RX side)
2	EnDat encoder CRC error (RX side)[2]

bit	Name
3	EnDat level 2 fault (RX side)
4	EnDat fault information 1 (TX side)
5	EnDat fault information 2 (TX side)
6 to 8	Undefined
9	EnDat additional data 1 CRC error
10	EnDat additional data 2 CRC error
11 to 12	Undefined
13[3]	Full closed-loop serial encoder count increment error (algorithm)
14	EnDat level 3 fault (RX side)
15	EnDat level 3 fault (RX side)
16 to 23	Full closed-loop serial encoder expansion data 1
24 to 31	Full closed-loop serial encoder expansion data 2

Table 16–3 BiSS-C and SSI encoders

bit	Name
0	Full closed-loop serial encoder communication timeout (RX side)
1	Undefined
2	Full closed-loop serial encoder CRC error (RX side)[2]
3 to 10	Undefined
7	Full closed-loop serial encoder single-turn count error (TX side)
11 to 12	Undefined
13[3]	Full closed-loop serial encoder count increment error (algorithm)
14 to 15	Undefined
16 to 23[4]	Full closed-loop serial encoder expansion data 1
24 to 31[4]	Full closed-loop serial encoder expansion data 2

Note

[1]: In the above table, the RX side refers to the drive and the TX side refers to the motor encoder. The algorithm refers to the type of the indirect error caused by a direct error on the RX or TX side.

[2]: When a BiSS-C encoder is used: 1-CRC error; 0-CRC is normal. When an SSI encoder is used: 1-Parity error; 0-Parity is normal.

[3]: When H0A.50 or more data transmission errors occur continuously, bit13 will be set to 1 and the drive must be stopped. For other error types, you can stop the drive as needed.

[4]: Full closed-loop serial encoder extended data 1/2 (when a BiSS-C encoder is used): This part is the status word of BiSS-C and SSI encoders.

H0F.41 **Inovance fully closed-loop encoder version**

Address:	0x0F29	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 to 6553.5

Description

Display the version number of the Inovance fully closed-loop encoder.

H0F.42 **Inovance fully closed-loop encoder resolution**

Address:	0x0F2A	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0 to 4294967295

Description

Display the resolution of the Inovance fully closed-loop encoder.

H0F.45 **Positioning completed/Position deviation threshold in fully closed-loop mode**

Address:	0x0F2D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Threshold scaled to outer loop unit

1: Same threshold used for inner and outer loops

Description

0: Fully closed-loop positioning completed threshold 6067/Excessive position deviation threshold 6065 (scaled to outer loop unit)

1: Same threshold used for inner and outer loops

H0F.51 **SSI encoder check bit selection in fully closed-loop mode**

Address:	0x0F33	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: No check

1: Check applied

Description

Select the SSI encoder check bit in full closed-loop mode.

0: No check

1: Check applied

H0F.52 **SSI encoder code system in full closed-loop mode**

Address:	0x0F34	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Binary

1: Gray code

Description

Select the SSI encoder code system in full closed-loop mode.
0: Binary
1: Gray code

H0F.53 SSI encoder state word code system in fully closed-loop mode

Address:	0x0F35	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0: Binary
1: Gray code

Description
Select the SSI encoder status word code system in full closed-loop mode.
0: Binary
1: Gray code

H0F.54 SSI encoder parity check in fully closed-loop mode

Address:	0x0F36	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Disabled
1: Enabled

Description
Enable/disable the SSI encoder parity check in fully closed-loop mode.
0: Disabled
1: Enabled

H0F.55 Fully closed-loop encoder communication timeout error count

Address:	0x0F37	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535

Description
Fully closed-loop encoder communication timeout error count

H0F.56 Encoder CRC error count in fully closed-loop mode

Address:	0x0F38	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535

Description
Encoder CRC error count in fully closed-loop mode

H0F.57 **Fully closed-loop encoder communication frame stop bit error count.**

Address:	0x0F39	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Fully closed-loop encoder communication frame stop bit error count.

16.17 H17 Virtual DI/DO

H17.00 **VDI1 function**

Address:	0x1700	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: No definition
3: Gain switchover
14: Positive limit switch
15: Negative limit switch
18: Forward jog
19: Reverse jog
24: Electronic gear Gear selection
31: Home switch
34: Emergency stop
35: Clear position deviation
56: External switch of the EEPOS program block
Description
Defines the function of VDI1.

H17.01 **VDI1 logic level selection**

Address:	0x1701	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Active when the written value is 1
1: Active when the written value changes from 0 to 1
Description
Set VDI1 active level

H17.02 **VDI2 function**

Address:	0x1702	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI2.

H17.03 **VDI2 logic level selection**

Address:	0x1703	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI2 active level

H17.04 **VDI3 function**

Address:	0x1704	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI3.

H17.05 **VDI3 logic level selection**

Address:	0x1705	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI3 active level

H17.06 **VDI4 function**

Address:	0x1706	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI4.

H17.07 **VDI4 logic level selection**

Address:	0x1707	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI4 active level

H17.08 **VDI5 function**

Address:	0x1708	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI5.

H17.09 **VDI5 logic level selection**

Address:	0x1709	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI5 active level

H17.10 **VDI6 function**

Address:	0x170A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI6.

H17.11 **VDI6 logic level selection**

Address:	0x170B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI6 active level

H17.12 **VDI7 function**

Address:	0x170C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI7.

H17.13 **VDI7 logic level selection**

Address:	0x170D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI7 active level

H17.14 **VDI8 function**

Address:	0x170E	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI8.

H17.15 **VDI8 logic level selection**

Address:	0x170F	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI8 active level

H17.16 **VDI9 function**

Address:	0x1710	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI9.

H17.17 **VDI9 logic level selection**

Address:	0x1711	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI9 active level

H17.18 **VDI10 function**

Address:	0x1712	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI10.

H17.19 **VDI10 logic level selection**

Address:	0x1713	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI10 active level

H17.20 **VDI11 function**

Address:	0x1714	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI11.

H17.21 **VDI11 logic level selection**

Address:	0x1715	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI11 active level

H17.22 **VDI12 function**

Address:	0x1716	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI12.

H17.23 VDI12 logic level selection

Address:	0x1717	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI12 active level

H17.24 VDI13 function

Address:	0x1718	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI13.

H17.25 **VDI13 logic level selection**

Address:	0x1719	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI13 active level

H17.26 **VDI14 function**

Address:	0x171A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI14.

H17.27 **VDI14 logic level selection**

Address:	0x171B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI14 active level

H17.28 **VDI15 function**

Address:	0x171C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI15.

H17.29 VDI15 logic level selection

Address:	0x171D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI15 active level

H17.30 VDI16 function

Address:	0x171E	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	56	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

3: Gain switchover

14: Positive limit switch

15: Negative limit switch

18: Forward jog

19: Reverse jog

24: Electronic gear Gear selection

31: Home switch

34: Emergency stop

35: Clear position deviation

56: External switch of the EEPOS program block

Description

Defines the function of VDI16.

H17.31 **VDI16 logic level selection**

Address:	0x171F	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active when the written value is 1

1: Active when the written value changes from 0 to 1

Description

Set VDI16 active level

H17.32 **VDO virtual level**

Address:	0x1720	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Display the VDO virtual level.

H17.33 **VDO1 function**

Address:	0x1721	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

1: Servo ready

9: Brake output signal

10: Warning

11: Fault

16: Homing completed

21: Enabled

26: Fully closed-lo op state

30: Alarm or fault output

32: EDM output

Description

Set the function of VDO1.

H17.34 **VDO1 logic level selection**

Address:	0x1722	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

Set VDO1 active level.

H17.35 **VDO2 function**

Address:	0x1723	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

1: Servo ready

9: Brake output signal

10: Warning

11: Fault

16: Homing completed

21: Enabled

26: Fully closed-lo op state

30: Alarm or fault output

32: EDM output

Description

See H17.33.

H17.36 **VDO2 logic level selection**

Address:	0x1724	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.37 **VDO3 function**

Address:	0x1725	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

See H17.33.

H17.38 VDO3 logic level selection

Address:	0x1726	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.39 VDO4 function

Address:	0x1727	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

See H17.33.

H17.40 VDO4 logic level selection

Address:	0x1728	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.41 VDO5 function

Address:	0x1729	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

1: Servo ready

9: Brake output signal

10: Warning

11: Fault

16: Homing completed

21: Enabled

26: Fully closed-lo op state

30: Alarm or fault output

32: EDM output

Description

See H17.33.

H17.42 VDO5 logic level selection

Address:	0x172A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.43 VDO6 function

Address:	0x172B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

See H17.33.

H17.44 **VDO6 logic level selection**

Address:	0x172C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.45 **VDO7 function**

Address:	0x172D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

See H17.33.

H17.46 **VDO7 logic level selection**

Address:	0x172E	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.47 VDO8 function

Address:	0x172F	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

1: Servo ready

9: Brake output signal

10: Warning

11: Fault

16: Homing completed

21: Enabled

26: Fully closed-lo op state

30: Alarm or fault output

32: EDM output

Description

See H17.33.

H17.48 VDO8 logic level selection

Address:	0x1730	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.49 VDO9 function

Address:	0x1731	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

See H17.33.

H17.50 **VDO9 logic level selection**

Address:	0x1732	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.51 **VDO10 function**

Address:	0x1733	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

See H17.33.

H17.52 **VDO10 logic level selection**

Address:	0x1734	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.53 VDO11 function

Address:	0x1735	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

1: Servo ready

9: Brake output signal

10: Warning

11: Fault

16: Homing completed

21: Enabled

26: Fully closed-lo op state

30: Alarm or fault output

32: EDM output

Description

See H17.33.

H17.54 VDO11 logic level selection

Address:	0x1736	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.55 VDO12 function

Address:	0x1737	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

See H17.33.

H17.56 **VDO12 logic level selection**

Address:	0x1738	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.57 **VDO13 function**

Address:	0x1739	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

See H17.33.

H17.58 **VDO13 logic level selection**

Address:	0x173A	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.59 VDO14 function

Address:	0x173B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition

1: Servo ready

9: Brake output signal

10: Warning

11: Fault

16: Homing completed

21: Enabled

26: Fully closed-lo op state

30: Alarm or fault output

32: EDM output

Description

See H17.33.

H17.60 VDO14 logic level selection

Address:	0x173C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.61 VDO15 function

Address:	0x173D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

See H17.33.

H17.62 **VDO15 logic level selection**

Address:	0x173E	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic
1: Output 0 upon active logic

Description

See H17.34.

H17.63 **VDO16 function**

Address:	0x173F	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No definition
1: Servo ready
9: Brake output signal
10: Warning
11: Fault
16: Homing completed
21: Enabled
26: Fully closed-lo op state
30: Alarm or fault output
32: EDM output

Description

See H17.33.

H17.64 **VDO16 logic level selection**

Address:	0x1740	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output 1 upon active logic

1: Output 0 upon active logic

Description

See H17.34.

H17.90 Communication VDI enable

Address:	0x175A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

To use the VDI function:

1. Set H17.90 to enable VDI.
2. Set the default level after power-on through H17.91.
3. Set the DI function of the VDI terminal through parameters in group H17.
4. Set VDI output through H31.00.

H17.91 VDI default value after power-on

Address:	0x175B	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: VDI1

bit1: VDI2

bit2: VDI3

bit3: VDI4

bit4: VDI5

bit5: VDI6

bit6: VDI7

bit7: VDI8

bit8: VDI9

bit9: VDI10

bit10: VDI11

bit11: VDI12

bit12: VDI13

bit13: VDI14

bit14: VDI15

bit15: VDI16

Description

Configures the initial value of VDI upon power-on.

Bit 0 corresponds to VDI1.
Bit 1 corresponds to VDI2.
…
Bit 15 corresponds to VDI16.

H17.92 Communication VDO enable

Address:	0x175C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Disabled
1: Enabled

Description
To use the VDO function:
1. Set H17.92 to enable VDO.
2. Set the default level after power-on through H17.93.
3. Set the DO function of the VDO terminal through parameters in group H17.
4: Read the output level of the VDO in H17.32.

H17.93 VDO default value after power-on

Address:	0x175D	Effective mode:	Real-time
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	At stop

Value Range:
bit0: VDO1
bit1: VDO2
bit2: VDO3
bit3: VDO4
bit4: VDO5
bit5: VDO6
bit6: VDO7
bit7: VDO8
bit8: VDO9
bit9: VDO10
bit10: VDO11
bit11: VDO12
bit12: VDO13
bit13: VDO14
bit14: VDO15
bit15: VDO16

Description
Configures the initial value of VDO upon power-on.
Bit 0 corresponds to VDO1.
Bit 1 corresponds to VDO2.

...

Bit 15 corresponds to VDO16.

16.18 H18 Position Comparison Output

H18.00 **Position comparison output selection**

Address:	0x1800	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disable

1: Enable (rising edge-triggered)

Description

0: Disable

1: Enable (rising edge-triggered)

H18.01 **Position comparison output feedback source**

Address:	0x1801	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Motor encoder feedback

1: Fully closed-loop position feedback

Description

Select position comparison output feedback source.

0: Motor encoder feedback

1: Fully closed-loop position feedback

H18.02 **Position comparison resolution**

Address:	0x1802	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: 24-bit

1: 23-bit

2: 22-bit

3: 21-bit

4: 20-bit

5: 19-bit

6: 18-bit

7: 17-bit

Description

Set position comparison resolution
0: 24-bit
1: 23-bit
2: 22-bit
3: 21-bit
4: 20-bit
5: 19-bit
6: 18-bit
7: 17-bit

H18.03 **Position comparison mode**

Address:	0x1803	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Individual comparison mode
1: Cyclic comparison mode
2: Fixed cyclic comparison mode
Description
Set position comparison mode
0: Individual comparison mode
1: Cyclic comparison mode
2: Fixed cyclic comparison mode

H18.04 **Current position as zero**

Address:	0x1804	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Disable
1: Enable (rising edge-triggered)
Description
Current position as zero

H18.05 **Position comparison output width**

Address:	0x1805	Effective mode:	Real-time
Min.:	0.1	Unit:	ms
Max.:	204.7	Data Type:	UInt16
Default:	0.1	Change:	Real-time

Value Range:
0.1 ms–204.7 ms
Description
Defines the active pulse width of the DO when the comparison point is reached. The value range is 0 to 204.7 (unit: 1 ms).

H18.06 **Position comparison output ABZ port polarity**

Address:	0x1806	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit 0: OCZ output logic

0: Positive, output high level upon active logic

1: Negative, output low level upon active logic

Bit 1: Z port output logic

0: Positive, output high level upon active logic

1: Negative, output low level upon active logic

bit2: A/B output logic

0: Positive, output high level upon active logic

1: Negative, output low level upon active logic

Description

0: Positive (output high level upon active logic) 1: Negative (output high level upon active logic)

bit0: OCZ output logic

Bit1: Z output logic

Bit2: A/B output logic

H18.07 **Position comparison start point**

Address:	0x1807	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1 to 40

Description

Set position comparison start point.

H18.08 **Position comparison end point**

Address:	0x1808	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1 to 40

Description

Set position comparison end point.

H18.09 **Current state of position comparison**

Address:	0x1809	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1024	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 1024
Description
Display current state of position comparison.

H18.10 Real-time position of position comparison

Address:	0x180A	Effective mode:	-
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
Display the real-time position of position comparison.

H18.12 Zero offset of position comparison

Address:	0x180C	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
Set the zero offset of position comparison.

H18.14 Position comparison output delay compensation

Address:	0x180E	Effective mode:	Upon the next power-on
Min.:	-12.00	Unit:	μs
Max.:	12.00	Data Type:	Int16
Default:	0.00	Change:	Real-time

Value Range:
-12.00μs to 12.00μs
Description
Compensates the delay caused by hardware signal output.

H18.15 Fixed cyclic comparison

Address:	0x180F	Effective mode:	Real-time
Min.:	1	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
1 to 65535
Description
Set fixed cyclic comparison.

H18.16 ABZ output function setting

Address:	0x1810	Effective mode:	Real-time

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit0: OCZ output function

0: Frequency-division output

1: Position comparison

bit1: Z port output function

0: Frequency-division output

1: Position comparison

bit2: A/B port output function

0: Frequency-division output

1: Position comparison

Description

Set ABZ output function.

bit0: OCZ (0: Frequency-division output; 1: Position comparison)

bit1: Z (0: Frequency-division output; 1: Position comparison)

bit2: A/B (0: Frequency-division output; 1: Position comparison)

H18.17 Number of fixed mode cycles

Address:	0x1811	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Set the number of fixed mode cycles.

16.19 H19 Target Position Parameters

H19.00 Target value of position comparison 1

Address:	0x1900	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Set the target value of position comparison 1.

H19.02 Attribute value of position comparison 1

Address:	0x1902	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point

bit2: N/A

bit3: N/A

bit4: N/A

bit5: N/A

bit6: N/A

bit7: DO1 output

bit8: DO2 output

bit9: N/A

bit10:

bit10: N/A

bit11: N/A

bit12: Frequency-division A output

bit13: Frequency-division B output

bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

Attribute setting of position comparison point 1

Bit0: 1: Current position changes from "less than" to "more than" the comparison point; 0: N/A

Bit0: 1: Current position changes from "more than" to "less than" the comparison point; 0: N/A

Bit2 to bit6: NA

Bit7: 1: DO1 output enabled; 0: N/A

Bit8: 1: DO2 output enabled; 0: N/A

Bit9 to bit11: N/A

Bit12: 1: Frequency-division A output enabled; 0: N/A

Bit13: 1: Frequency-division B output enabled; 0: N/A

Bit14: 1: Frequency-division C output enabled; 0: N/A

Bit15: 1: Frequency-division OCZ output enabled; 0: N/A

H19.03 Target value of position comparison 2

Address:	0x1903	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.05 Attribute value of position comparison 2

Address:	0x1905	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point

bit1: Current position changes from "more than" to "less than" the comparison point

bit2: N/A

bit3: N/A

bit4: N/A

bit5: N/A

bit6: N/A

bit7: DO1 output

bit8: DO2 output

bit9: N/A

bit10:

bit10: N/A

bit11: N/A

bit12: Frequency-division A output

bit13: Frequency-division B output

bit14: Frequency-division Z output

bit15: Frequency-division OCZ output

Description

See H19.02.

H19.06 Target value of position comparison 3

Address:	0x1906	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.08 Attribute value of position comparison 3

Address:	0x1908	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.09 **Target value of position comparison 4**

Address:	0x1909	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.11 **Attribute value of position comparison 4**

Address:	0x190B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.12 Target value of position comparison 5

Address:	0x190C	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.14 Attribute value of position comparison 5

Address:	0x190E	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.15 Target value of position comparison 6

Address:	0x190F	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.17 Attribute value of position comparison 6

Address:	0x1911	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.18 Target value of position comparison 7

Address:	0x1912	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.20 Attribute value of position comparison 7

Address:	0x1914	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.21 Target value of position comparison 8

Address:	0x1915	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.23 Attribute value of position comparison 8

Address:	0x1917	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.24 Target value of position comparison 9

Address:	0x1918	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.26 Attribute value of position comparison 9

Address:	0x191A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.27 **Target value of position comparison 10**

Address:	0x191B	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.29 **Attribute value of position comparison 10**

Address:	0x191D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.30 Target value of position comparison 11

Address:	0x191E	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.32 Attribute value of position comparison 11

Address:	0x1920	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.33 Target value of position comparison 12

Address:	0x1921	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.35 Attribute value of position comparison 12

Address:	0x1923	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.36 Target value of position comparison 13

Address:	0x1924	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.38 Attribute value of position comparison 13

Address:	0x1926	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.39 Target value of position comparison 14

Address:	0x1927	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.41 Attribute value of position comparison 14

Address:	0x1929	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.42 Target value of position comparison 15

Address:	0x192A	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.44 Attribute value of position comparison 15

Address:	0x192C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.45 **Target value of position comparison 16**

Address:	0x192D	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.47 **Attribute value of position comparison 16**

Address:	0x192F	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.48 Target value of position comparison 17

Address:	0x1930	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.50 Attribute value of position comparison 17

Address:	0x1932	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.51 **Target value of position comparison 18**

Address:	0x1933	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.53 **Attribute value of position comparison 18**

Address:	0x1935	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.54 **Target value of position comparison 19**

Address:	0x1936	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.56 **Attribute value of position comparison 19**

Address:	0x1938	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.57 Target value of position comparison 20

Address:	0x1939	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.59 Attribute value of position comparison 20

Address:	0x193B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.60 **Target value of position comparison 21**

Address:	0x193C	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.62 **Attribute value of position comparison 21**

Address:	0x193E	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.63 **Target value of position comparison 22**

Address:	0x193F	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.65 **Attribute value of position comparison 22**

Address:	0x1941	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.66 Target value of position comparison 23

Address:	0x1942	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.68 Attribute value of position comparison 23

Address:	0x1944	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.69 Target value of position comparison 24

Address:	0x1945	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.71 Attribute value of position comparison 24

Address:	0x1947	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.72 **Target value of position comparison 25**

Address:	0x1948	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.74 **Attribute value of position comparison 25**

Address:	0x194A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.75 **Target value of position comparison 26**

Address:	0x194B	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.77 **Attribute value of position comparison 26**

Address:	0x194D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.78 Target value of position comparison 27

Address:	0x194E	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.80 Attribute value of position comparison 27

Address:	0x1950	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.81 **Target value of position comparison 28**

Address:	0x1951	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.83 **Attribute value of position comparison 28**

Address:	0x1953	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.84 **Target value of position comparison 29**

Address:	0x1954	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.86 **Attribute value of position comparison 29**

Address:	0x1956	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.87 **Target value of position comparison 30**

Address:	0x1957	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.89 **Attribute value of position comparison 30**

Address:	0x1959	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.90 **Target value of position comparison 31**

Address:	0x195A	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.92 **Attribute value of position comparison 31**

Address:	0x195C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.93 **Target value of position comparison 32**

Address:	0x195D	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.95 **Attribute value of position comparison 32**

Address:	0x195F	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.96 **Target value of position comparison 33**

Address:	0x1960	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.98 **Attribute value of position comparison 33**

Address:	0x1962	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.99 **Target value of position comparison 34**

Address:	0x1963	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.101 **Attribute value of position comparison 34**

Address:	0x1965	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.102 Target value of position comparison 35

Address:	0x1966	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.104 Attribute value of position comparison 35

Address:	0x1968	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.105 Target value of position comparison 36

Address:	0x1969	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.107 Attribute value of position comparison 36

Address:	0x196B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.108 Target value of position comparison 37

Address:	0x196C	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.110 Attribute value of position comparison 37

Address:	0x196E	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.111 Target value of position comparison 38

Address:	0x196F	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.113 Attribute value of position comparison 38

Address:	0x1971	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.114 Target value of position comparison 39

Address:	0x1972	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.116 Attribute value of position comparison 39

Address:	0x1974	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

H19.117 Target value of position comparison 40

Address:	0x1975	Effective mode:	Real-time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

See H19.00.

H19.119 Attribute value of position comparison 40

Address:	0x1977	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Current position changes from "less than" to "more than" the comparison point
bit1: Current position changes from "more than" to "less than" the comparison point
bit2: N/A
bit3: N/A
bit4: N/A
bit5: N/A
bit6: N/A
bit7: DO1 output
bit8: DO2 output
bit9: N/A
bit10:
bit10: N/A
bit11: N/A
bit12: Frequency-division A output
bit13: Frequency-division B output
bit14: Frequency-division Z output
bit15: Frequency-division OCZ output

Description

See H19.02.

16.20 H21 Current Loop Gain Switchover

H21.00 **Current loop gain switchover**

Address:	0x2100	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No operation
1: Enabled

Description

Used to enable or disable the current loop gain switchover function.
0: No operation, turned off
1: Enabled, turned on

16.21 H24 PN Bus Communication Parameters

H24.00 **Telegram number selection [PN922]**

Address:	0x2400	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	3	Change:	Unchangeable

Value Range:

0 to 65535

Description
Displays the telegram sent and received and receives the telegram set by the host controller.

H24.01 **Heartbeat warning threshold [PN925]**

Address:	0x2401	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	5	Change:	At stop

Value Range:
0 to 65535
Description
Defines the number of heartbeat errors that can occur continuously on the isochronous real-time master station.

H24.02 **Fault message counter [PN944]**

Address:	0x2402	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the counter of the fault buffer.

H24.03 **Fault code [PN947]**

Address:	0x2403	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Displays the number of the fault.

H24.04 **Fault No.**

Address:	0x2404	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	63	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 63
Description
Displays the fault serial number.

H24.05 **Fault condition counter [PN952]**

Address:	0x2405	Effective mode:	-

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Number of faults after the last reset.

H24.06 **Sensor header [PN979[0]]**

Address:	0x2406	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x5112	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Displays the sensor header [PN979[0]].

H24.08 **Sensor type [PN979[1]]**

Address:	0x2408	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x80000002	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Displays the sensor type [PN979[1]].

H24.10 **Sensor resolution [PN979[2]]**

Address:	0x240A	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	256	Change:	Unchangeable

Value Range:
0 to 4294967295
Description
Displays the sensor resolution [PN979[2]].

H24.12 **Sensor G1_X1ST1 displacement factor [PN979[3]]**

Address:	0x240C	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	15	Change:	Unchangeable

Value Range:
0 to 4294967295
Description
Displays the Sensor G1_X1ST1 displacement factor [PN979[3]].

H24.14 **Sensor G1_X1ST2 displacement factor [PN979[4]]**

Address:	0x240E	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	15	Change:	Unchangeable

Value Range:
0 to 4294967295
Description
Displays the Sensor G1_X1ST2 displacement factor [PN979[4]].

H24.16 **Sensor multi-turn number [PN979[5]]**

Address:	0x2410	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	512	Change:	Unchangeable

Value Range:
0 to 4294967295
Description
Displays the sensor multi-turn number [PN979[5]].

H24.19 **Synchronization cycle**

Address:	0x2413	Effective mode:	-
Min.:	0.000	Unit:	ms
Max.:	65.535	Data Type:	UInt16
Default:	0.000	Change:	Unchangeable

Value Range:
0.000 ms–65.535 ms
Description
Displays the synchronization period.

H24.22 **IP address**

Address:	0x2416	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0xC0A80002	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Displays the IP address.

H24.24 **Subnet mask**

Address:	0x2418	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0xFFFFFF00	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF

Description
Displays the subnet mask.

H24.26 **Default gateway**

Address:	0x241A	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Displays the default gateway.

H24.32 **Telegram 105 configuration**

Address:	0x2420	Effective mode:	Real-time
Min.:	0x0	Unit:	-
Max.:	0x3	Data Type:	UInt16
Default:	0x3	Change:	At stop

Value Range:

Bit0: Enable PLC position loop gain when DSC is on	Bit0 = 0: Local gain enabled Bit0 = 1: PLC gain enabled
Bit1: NSOLL_B enabled	Bit1 = 0: Disabled Bit1 = 1: Enabled

Description
Telegram 105 configuration
bit0: Enable PLC position loop gain when DSC is on

Bit1: NSOLL_B enabled
Note: When DSC is enabled in Telegram 105, NSOLL_B is used as the speed feedforward; when DSC is not enabled, NSOLL_B is used as the speed reference.

H24.33 **Number of Sync with advanced DSC position feedback**

Address:	0x2421	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	16	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0 to 16
Description
Set the number of Sync with advanced DSC position feedback.

H24.34 **DSC control word (DSC_STW)**

Address:	0x2422	Effective mode:	Real-time
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Real-time

Value Range:

Bit0: DSC with spline enabled	Bit0 = 0: Disabled Bit0 = 1: Enabled
Bit4: Speed feedforward enabled in DSC with spline	Bit0 = 0: Disabled Bit4 = 1: Enabled
Bit5: Torque feedforward enabled in DSC with spline	Bit5 = 0: Disabled Bit5 = 1: Enabled

Description

DSC control word, setting the DSC interpolation mode

Bit0: DSC with spline enabled

Bit4: Speed feedforward enabled in DSC with spline

Bit5: Torque feedforward enabled in DSC with spline

Note: When spline interpolation is enabled, check that the following conditions are fulfilled. Failure to comply will result in vibration and runaway.

1. Process object configuration: Position control in the drive device is enabled (DSC is enabled), PLC pre-control is set to 100%, and the revolution number control circuit substitution time is set to 0.

2. MC_POWER and MC_MOVEJOG are configured to the position control mode (position controlled axis).

3. H24.33 is configured properly.

H24.35 Customized telegram 850 transmission

Address:	0x2423	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment

1: VDO

2: External DI state

Description

Select the data sent by the servo drive to the PLC by means of additive telegram 850.

0: No assignment

1: VDO

2: External DI state

H24.36 Customized receive of telegram 850

Address:	0x2424	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No assignment

1: VDI

2: External DO state

Description

Select the data sent by the PLC to the servo drive by means of additive telegram 850.

0: No assignment

1: VDI

2: External DO state

H24.37 **Extra telegram**

Address:	0x2425	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	999	Data Type:	UInt16
Default:	999	Change:	At stop

Value Range:

0 to 999

Description

Displays the current additive telegram symbol. 999 indicates that there is no additive telegram.

H24.38 **Customized receive word**

Address:	0x2426	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function

1: Additive torque

2: Forced DO

Description

It is the user-defined data sent by the PLC to the servo drive through telegram 111.

H24.39 **Customized transmit word**

Address:	0x2427	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No function

1: Actual torque

2: Actual current

3: DI state

Description

It is the user-defined data sent by the servo drive to the PLC through telegram 111.

H24.41 **Device name loss warning selection**

Address:	0x2429	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 1
Description
When it is enabled and if the device name is lost, E18.0 is reported.

H24.42 Number of consecutive loss detections

Address:	0x242A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	8	Change:	At stop

Value Range:
0 to 65535
Description
Set the number of consecutive loss detections.

H24.44 FPGA synchronous detection deviation threshold

Address:	0x242C	Effective mode:	Real-time
Min.:	0	Unit:	ns
Max.:	65535	Data Type:	UInt16
Default:	3000	Change:	At stop

Value Range:
0 ns–65535 ns
Description
Set the FPGA synchronous detection deviation threshold.

H24.45 MAC address

Address:	0x242D	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Displays the MAC address.

H24.46 MAC address

Address:	0x242E	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Displays the MAC address.

H24.47 **MAC address**

Address:	0x242F	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Displays the MAC address.

H24.49 **PN disconnection fault code**

Address:	0x2431	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the PN disconnection fault code.

H24.50 **Acceleration time of AC1AC4 ramp generator**

Address:	0x2432	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	655350	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 ms–655350 ms
Description
AC1AC4, the ramp time for speed reference to accelerate from 0 rpm to the rated speed. It is recommended to set it to 0 when the AC4 and PLC are closed-looped.

H24.52 **Deceleration time of AC1AC4 ramp generator**

Address:	0x2434	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	655350	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 ms–655350 ms
Description
AC1AC4, indicates the ramp time for the speed reference to decelerate from the rated speed to 0 rpm. It is recommended to set it to 0 when the AC4 and PLC are closed-looped.

H24.54 **Speed reference filter time**

Address:	0x2436	Effective mode:	Real-time
Min.:	0.0	Unit:	ms
Max.:	100.0	Data Type:	UInt16

Default:	0.0	Change:	At stop

Value Range:
0.0 ms–100.0 ms
Description
Defines the speed reference average filter time.

H24.55 DSC maximum Kv coefficient estimation

Address:	0x2437	Effective mode:	-
Min.:	0.0	Unit:	1/s
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0/s to 6553.5/s
Description
It is recommended that the KV gain be set for the PLC in the DSC average interpolation mode.

Note: The gain Kv (factor) of the process object is H24.55.

H24.56 DSC symmetrical time constant estimation

Address:	0x2438	Effective mode:	-
Min.:	0.00	Unit:	ms
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:
0.00 ms–655.35 ms
Description
It is recommended to set the revolution control substitution time for the PLC in the DSC average interpolation mode.

Note: The revolution control substitution time for the process object is H24.56 × 0.001 (s).

H24.57 Ti

Address:	0x2439	Effective mode:	-
Min.:	0.000	Unit:	ms
Max.:	65.535	Data Type:	UInt16
Default:	0.000	Change:	Unchangeable

Value Range:
0.000 ms–65.535 ms
Description
Displays the Ti time of synchronization mode.

H24.58 To

Address:	0x243A	Effective mode:	-
Min.:	0.000	Unit:	ms
Max.:	65.535	Data Type:	UInt16
Default:	0.000	Change:	Unchangeable

Value Range:
0.000 ms–65.535 ms

Description

Displays the To time of synchronization mode.

H24.59 Safety telegram No. selection

Address:	0x243B	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Displays the safety telegram sent and received and receives the safety telegram set by the host controller.

H24.60 PN Function Selection

Address:	0x243C	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

Bit0-1: PN fault channel upload scheme

0: Upload drive local fault code to host controller

1: Upload by 20 fault types according to PN rules

2: Do not upload

Bit2: Internal switch

0: Internal switch

1: Internal switch

Bit 3: Customized PN reference speed switch

0: H24.64 and H00.14 are forcibly bound

1: H24.64 can be customized

Bit4: Hide AE19.7 unsupported overtravel stop

0: Not hide

1: Hide

Description

Defines the PN function.

Bit0-1: PN fault channel upload scheme

0: Upload drive local fault code to host controller

1: Upload by 20 fault types according to PN rules

2: Do not upload

Bit2: Internal switch

0: Internal switch

1: Internal switch

Bit 3: Customized PN reference speed switch

0: H24.64 and H00.14 are forcibly bound

1: H24.64 can be customized

Bit4: Hide AE19.7 unsupported overtravel stop

0: Not hide

1: Hide

H24.64 **Reference speed**

Address:	0x2440	Effective mode:	Real-time
Min.:	1.000	Unit:	rpm
Max.:	10000.000	Data Type:	UInt32
Default:	3000.000	Change:	At stop

Value Range:

1.000rpm to 10000.000rpm

Description

The speed parameter of PN telegram exchange is a percentage of reference speed. Telegram 1 uses 0x4000 as 100% and other telegrams use 0x40000000 as 100%. The maximum value is 200%. The percentage multiplied by the reference speed is the speed setpoint or feedback speed. When bit3 of H24.60 is set to 0, this parameter is forcibly written as the value of H00.14. When bit3 of H24.60 is set to 1, it can be modified freely.

16.22 H25 AC3 Control Parameters

H25.00 **EPOS max. speed**

Address:	0x2500	Effective mode:	Real-time
Min.:	0	Unit:	1000 LU/min
Max.:	40000000	Data Type:	UInt32
Default:	30000	Change:	Real-time

Value Range:

0 LU/min.–40000000 LU/min.

Description

AC1AC4, indicates the ramp time for the speed reference to decelerate from the rated speed to 0 rpm. It is recommended to set it to 0 when the AC4 and PLC are closed-looped.

H25.02 **EPOS max. acceleration**

Address:	0x2502	Effective mode:	Real-time
Min.:	1	Unit:	1000 LU/s/s
Max.:	2000000	Data Type:	UInt32
Default:	100	Change:	Real-time

Value Range:

1 LU/s/s–2000000 LU/s/s

Description

EPOS max. acceleration.

"Running program block" operation mode:

The acceleration override (H27.81 to H27.96) set by the program block is coupled with this parameter to make the acceleration effective.

"MDI" operation mode:

Acceleration override effective (H29.16, 0x4000 = 100%) is coupled with this parameter to make the acceleration effective.

"Jog" running mode:

No acceleration override effective. The axis is started with the maximum acceleration.

"Return to reference point" operation mode:

The homing acceleration/deceleration override (H25.27) is coupled to this parameter to make the acceleration effective.

H25.04 **EPOS max. deceleration**

Address:	0x2504	Effective mode:	Real-time
Min.:	1	Unit:	1000 LU/s/s
Max.:	2000000	Data Type:	UInt32
Default:	100	Change:	Real-time

Value Range:

1 LU/s/s–2000000 LU/s/s

Description

EPOS max. deceleration.

"Running program block" operation mode:

The deceleration override (H28.00 to H28.15) set by the program block is coupled with this parameter to make the deceleration effective.

"MDI" operation mode:

Acceleration override effective (H29.17, 0x4000 = 100%) is coupled with this parameter to make the deceleration effective.

"Jog" running mode:

No acceleration override effective. The axis is started with the minimum acceleration.

"Return to reference point" operation mode:

The homing acceleration/deceleration override (H25.27) is coupled to this parameter to make the deceleration effective.

H25.06 **EPOS ramp deceleration**

Address:	0x2506	Effective mode:	Real-time
Min.:	1	Unit:	1000 LU/s/s
Max.:	2000000	Data Type:	UInt32
Default:	100	Change:	Real-time

Value Range:
1 LU/s/s–2000000 LU/s/s
Description
During EPOS running, it triggers the negative task to take effect.

H25.10 **EPOS positioning reach threshold**

Address:	0x250A	Effective mode:	Real-time
Min.:	0	Unit:	LU
Max.:	2147483647	Data Type:	UInt32
Default:	7	Change:	Real-time

Value Range:
0LU to 2147483647LU
Description
Position reach threshold in EPOS relative or absolute positioning mode.

H25.12 **EPOS positioning reached window time**

Address:	0x250C	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 ms–2147483647 ms
Description
Indicates the positioning window time of the relative or absolute positioning mode.

H25.14 **EPOS-Jog1 speed**

Address:	0x250E	Effective mode:	Real-time
Min.:	-40000000	Unit:	1000 LU/min
Max.:	40000000	Data Type:	Int32
Default:	-300	Change:	Real-time

Value Range:
-40000000 Lu/min to 40000000 LU/min
Description
Jog1 speed setpoint of EEPOS mode 7 or modes 8.

H25.16 **EPOS-Jog2 speed**

Address:	0x2510	Effective mode:	Real-time
Min.:	-40000000	Unit:	1000 LU/min
Max.:	40000000	Data Type:	Int32
Default:	300	Change:	Real-time

Value Range:

-40000000 Lu/min to 40000000 LU/min

Description

Jog2 speed setpoint of EEPOS mode 7 or modes 8.

H25.18 EPOS-JOG1 position increment

Address:	0x2512	Effective mode:	Real-time
Min.:	0	Unit:	LU
Max.:	2147483647	Data Type:	UInt32
Default:	1000	Change:	Real-time

Value Range:

0LU to 2147483647LU

Description

Jog1 position increment setpoint of EEPOS mode 8.

H25.20 EPOS-JOG2 position increment

Address:	0x2514	Effective mode:	Real-time
Min.:	0	Unit:	LU
Max.:	2147483647	Data Type:	UInt32
Default:	1000	Change:	Real-time

Value Range:

0LU to 2147483647LU

Description

Jog2 position increment setpoint of EEPOS mode 8.

H25.22 Homing type

Address:	0x2516	Effective mode:	Real-time
Min.:	-2	Unit:	-
Max.:	35	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-2 to 35

Description

Homing trajectory selection.

H25.23 Homing high speed

Address:	0x2517	Effective mode:	Real-time
Min.:	0	Unit:	1000 LU/min
Max.:	40000000	Data Type:	UInt32
Default:	5000	Change:	Real-time

Value Range:

0 LU/min.–40000000 LU/min.

Description

Indicates the speed setpoint during high-speed running.

H25.25 Homing low speed

Address:	0x2519	Effective mode:	Real-time

Min.:	0	Unit:	1000 LU/min
Max.:	40000000	Data Type:	UInt32
Default:	300	Change:	Real-time

Value Range:
0 LU/min.–40000000 LU/min.
Description
Indicates the speed setpoint during low-speed running.

H25.27 Homing acceleration/deceleration override

Address:	0x251B	Effective mode:	Real-time
Min.:	0.01	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
0.01% to 100.00%
Description
Indicates the acceleration/deceleration override for homing.

H25.28 EPOS acceleration/deceleration determination sampling interval

Address:	0x251C	Effective mode:	Real-time
Min.:	0	Unit:	ms
Max.:	1500	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 ms–1500 ms
Description
Increasing the interval prevents the acceleration and deceleration flag in the status word from being abnormal, but also causes delay.

16.23 H27 Block Parameters

H27.00 Current block

Address:	0x2700	Effective mode:	-
Min.:	0	Unit:	-
Max.:	15	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 15
Description
Indicates the block number of the currently running block. It is displayed as 0 when no block is running.

H27.01 Block 0 task

Address:	0x2701	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16

Default:	1	Change:	Real-time

Value Range:

1: Positioning

2: Fixed stopper

3: Forward cycle

4: Reverse cycle

5: Waiting

6: Switching

7: Setting O

8: Resetting O

Description

Select the task type of the program block.

H27.02 **Block 1 task**

Address:	0x2702	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning

2: Fixed stopper

3: Forward cycle

4: Reverse cycle

5: Waiting

6: Switching

7: Setting O

8: Resetting O

Description

Select the task type of the program block.

H27.03 **Block 2 task**

Address:	0x2703	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning

2: Fixed stopper

3: Forward cycle

4: Reverse cycle

5: Waiting

6: Switching

7: Setting O

8: Resetting O

Description

Select the task type of the program block.

H27.04 **Block 3 task**

Address:	0x2704	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning

2: Fixed stopper

3: Forward cycle

4: Reverse cycle

5: Waiting

6: Switching

7: Setting O

8: Resetting O

Description

Select the task type of the program block.

H27.05 **Block 4 task**

Address:	0x2705	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning

2: Fixed stopper

3: Forward cycle

4: Reverse cycle

5: Waiting

6: Switching

7: Setting O

8: Resetting O

Description

Select the task type of the program block.

H27.06 **Block 5 task**

Address:	0x2706	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning
2: Fixed stopper
3: Forward cycle
4: Reverse cycle
5: Waiting
6: Switching
7: Setting O
8: Resetting O

Description

Select the task type of the program block.

H27.07 **Block 6 task**

Address:	0x2707	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning
2: Fixed stopper
3: Forward cycle
4: Reverse cycle
5: Waiting
6: Switching
7: Setting O
8: Resetting O

Description

Select the task type of the program block.

H27.08 **Block 7 task**

Address:	0x2708	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning
2: Fixed stopper
3: Forward cycle
4: Reverse cycle
5: Waiting
6: Switching
7: Setting O
8: Resetting O

Description

Select the task type of the program block.

H27.09 **Block 8 task**

Address:	0x2709	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning

2: Fixed stopper

3: Forward cycle

4: Reverse cycle

5: Waiting

6: Switching

7: Setting O

8: Resetting O

Description

Select the task type of the program block.

H27.10 **Block 9 task**

Address:	0x270A	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning

2: Fixed stopper

3: Forward cycle

4: Reverse cycle

5: Waiting

6: Switching

7: Setting O

8: Resetting O

Description

Select the task type of the program block.

H27.11 **Block 10 task**

Address:	0x270B	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning
2: Fixed stopper
3: Forward cycle
4: Reverse cycle
5: Waiting
6: Switching
7: Setting O
8: Resetting O

Description

Select the task type of the program block.

H27.12 **Block 11 task**

Address:	0x270C	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning
2: Fixed stopper
3: Forward cycle
4: Reverse cycle
5: Waiting
6: Switching
7: Setting O
8: Resetting O

Description

Select the task type of the program block.

H27.13 **Block 12 task**

Address:	0x270D	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning
2: Fixed stopper
3: Forward cycle
4: Reverse cycle
5: Waiting
6: Switching
7: Setting O
8: Resetting O

Description

Select the task type of the program block.

H27.14 **Block 13 task**

Address:	0x270E	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning

2: Fixed stopper

3: Forward cycle

4: Reverse cycle

5: Waiting

6: Switching

7: Setting O

8: Resetting O

Description

Select the task type of the program block.

H27.15 **Block 14 task**

Address:	0x270F	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning

2: Fixed stopper

3: Forward cycle

4: Reverse cycle

5: Waiting

6: Switching

7: Setting O

8: Resetting O

Description

Select the task type of the program block.

H27.16 **Block 15 task**

Address:	0x2710	Effective mode:	At stop
Min.:	1	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1: Positioning
2: Fixed stopper
3: Forward cycle
4: Reverse cycle
5: Waiting
6: Switching
7: Setting O
8: Resetting O

Description

Select the task type of the program block.

H27.17 **Position of block 0**

Address:	0x2711	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648LU to 2147483647LU

Description

Defines the position setting value of the program block positioning or stopper fixing task.

H27.19 **Position of block 1**

Address:	0x2713	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648LU to 2147483647LU

Description

Defines the position setting value of the program block positioning or stopper fixing task.

H27.21 **Position of block 2**

Address:	0x2715	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648LU to 2147483647LU

Description

Defines the position setting value of the program block positioning or stopper fixing task.

H27.23 **Position of block 3**

Address:	0x2717	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648LU to 2147483647LU

Description

Defines the position setting value of the program block positioning or stopper fixing task.

H27.25 **Position of block 4**

Address:	0x2719	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648LU to 2147483647LU

Description

Defines the position setting value of the program block positioning or stopper fixing task.

H27.27 **Position of block 5**

Address:	0x271B	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648LU to 2147483647LU

Description

Defines the position setting value of the program block positioning or stopper fixing task.

H27.29 **Position of block 6**

Address:	0x271D	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648LU to 2147483647LU

Description

Defines the position setting value of the program block positioning or stopper fixing task.

H27.31 **Position of block 7**

Address:	0x271F	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648LU to 2147483647LU

Description

Defines the position setting value of the program block positioning or stopper fixing task.

H27.33 **Position of block 8**

Address:	0x2721	Effective mode:	At stop

Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648LU to 2147483647LU
Description
Defines the position setting value of the program block positioning or stopper fixing task.

H27.35 **Position of block 9**

Address:	0x2723	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648LU to 2147483647LU
Description
Defines the position setting value of the program block positioning or stopper fixing task.

H27.37 **Position of block 10**

Address:	0x2725	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648LU to 2147483647LU
Description
Defines the position setting value of the program block positioning or stopper fixing task.

H27.39 **Position of block 11**

Address:	0x2727	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648LU to 2147483647LU
Description
Defines the position setting value of the program block positioning or stopper fixing task.

H27.41 **Position of block 12**

Address:	0x2729	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648LU to 2147483647LU
Description
Defines the position setting value of the program block positioning or stopper fixing task.

H27.43 **Position of block 13**

Address:	0x272B	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648LU to 2147483647LU
Description
Defines the position setting value of the program block positioning or stopper fixing task.

H27.45 **Position of block 14**

Address:	0x272D	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648LU to 2147483647LU
Description
Defines the position setting value of the program block positioning or stopper fixing task.

H27.47 **Position of block 15**

Address:	0x272F	Effective mode:	At stop
Min.:	-2147483648	Unit:	LU
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648LU to 2147483647LU
Description
Defines the position setting value of the program block positioning or stopper fixing task.

H27.49 **Block 0 speed**

Address:	0x2731	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:
0 Lu/min–4294967295 LU/min
Description
Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.51 **Block 1 speed**

Address:	0x2733	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:
0 Lu/min–4294967295 LU/min

Description
Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.53 **Block 2 speed**

Address:	0x2735	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:
0 Lu/min–4294967295 LU/min
Description
Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.55 **Block 3 speed**

Address:	0x2737	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:
0 Lu/min–4294967295 LU/min
Description
Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.57 **Block 4 speed**

Address:	0x2739	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:
0 Lu/min–4294967295 LU/min
Description
Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.59 **Block 5 speed**

Address:	0x273B	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:
0 Lu/min–4294967295 LU/min
Description
Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.61 **Block 6 speed**

Address:	0x273D	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min

Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:
0 Lu/min–4294967295 LU/min
Description
Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.63 **Block 7 speed**

Address:	0x273F	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:
0 Lu/min–4294967295 LU/min
Description
Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.65 **Block 8 speed**

Address:	0x2741	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:
0 Lu/min–4294967295 LU/min
Description
Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.67 **Block 9 speed**

Address:	0x2743	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:
0 Lu/min–4294967295 LU/min
Description
Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.69 **Block 10 speed**

Address:	0x2745	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:
0 Lu/min–4294967295 LU/min
Description
Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.71 **Block 11 speed**

Address:	0x2747	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:

0 Lu/min–4294967295 LU/min

Description

Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.73 **Block 12 speed**

Address:	0x2749	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:

0 Lu/min–4294967295 LU/min

Description

Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.75 **Block 13 speed**

Address:	0x274B	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:

0 Lu/min–4294967295 LU/min

Description

Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.77 **Block 14 speed**

Address:	0x274D	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:

0 Lu/min–4294967295 LU/min

Description

Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.79 **Block 15 speed**

Address:	0x274F	Effective mode:	At stop
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	600	Change:	Real-time

Value Range:

0 Lu/min–4294967295 LU/min

Description

Defines the speed setpoint of the program block positioning, looping, and fixed stopper tasks.

H27.81 **Block 0 acc. override**

Address:	0x2751	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:

1.00% to 100.00%

Description

Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.82 **Block 1 acc. override**

Address:	0x2752	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:

1.00% to 100.00%

Description

-

H27.83 **Block 2 acc. override**

Address:	0x2753	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:

1.00% to 100.00%

Description

Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.84 **Block 3 acc. override**

Address:	0x2754	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:

1.00% to 100.00%

Description

Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.85 **Block 4 acc. override**

Address:	0x2755	Effective mode:	At stop

Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.86 **Block 5 acc. override**

Address:	0x2756	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.87 **Block 6 acc. override**

Address:	0x2757	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.88 **Block 7 acc. override**

Address:	0x2758	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.89 **Block 8 acc. override**

Address:	0x2759	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.90 **Block 9 acc. override**

Address:	0x275A	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.91 **Block 10 acc. override**

Address:	0x275B	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.92 **Block 11 acc. override**

Address:	0x275C	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.93 **Block 12 acc. override**

Address:	0x275D	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.94 **Block 13 acc. override**

Address:	0x275E	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%

Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.95 **Block 14 acc. override**

Address:	0x275F	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H27.96 **Block 15 acc. override**

Address:	0x2760	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the acceleration ratio of the program block positioning, looping, and fixed stopper tasks.

16.24 H28 Block Parameters

H28.00 **Block 0 dec. override**

Address:	0x2800	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.01 **Block 1 dec. override**

Address:	0x2801	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.02 **Block 2 dec. override**

Address:	0x2802	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.03 **Block 3 dec. override**

Address:	0x2803	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.04 **Block 4 dec. override**

Address:	0x2804	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.05 **Block 5 dec. override**

Address:	0x2805	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.06 **Block 6 dec. override**

Address:	0x2806	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%

Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.07 **Block 7 dec. override**

Address:	0x2807	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.08 **Block 8 dec. override**

Address:	0x2808	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.09 **Block 9 dec. override**

Address:	0x2809	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.10 **Block 10 dec. override**

Address:	0x280A	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.11 **Block 11 dec. override**

Address:	0x280B	Effective mode:	At stop
Min.:	1.00	Unit:	%

Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.12 **Block 12 dec. override**

Address:	0x280C	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.13 **Block 13 dec. override**

Address:	0x280D	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.14 **Block 14 dec. override**

Address:	0x280E	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.15 **Block 15 dec. override**

Address:	0x280F	Effective mode:	At stop
Min.:	1.00	Unit:	%
Max.:	100.00	Data Type:	UInt16
Default:	100.00	Change:	Real-time

Value Range:
1.00% to 100.00%
Description
Defines the deceleration ratio of the program block positioning, looping, and fixed stopper tasks.

H28.16 **Task mode of block 0**

Address:	0x2810	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

Description

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

H28.17 **Task mode of block 1**

Address:	0x2811	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

Description

Bit0: Task identifier0: Task execution1: Task hidingbit4-7: Subsequent condition0: END1: CONTINUE_WITH_STOP2: CONTINUE_ON_THE_FLY3: CONTINUE_EXTERNAL4: CONTINUE_ EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_ALARMbit8-11: Positioning mode0: Absolute positioning
1: Relative positioning

H28.18 **Task mode of block 2**

Address:	0x2812	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

Description

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

H28.19 **Task mode of block 3**

Address:	0x2813	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

Description

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

H28.20 **Task mode of block 4**

Address:	0x2814	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

Description

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

H28.21 **Task mode of block 5**

Address:	0x2815	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

Description

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

H28.22 **Task mode of block 6**

Address:	0x2816	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

Description

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

H28.23 **Task mode of block 7**

Address:	0x2817	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

Description

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

H28.24 **Task mode of block 8**

Address:	0x2818	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

Description

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

H28.25 Task mode of block 9

Address:	0x2819	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

Description

Bit0: Task identifier0: Task execution1: Task hidingbit4-7: Subsequent condition0: END1: CONTINUE_WITH_STOP2: CONTINUE_ON_THE_FLY3: CONTINUE_EXTERNAL4: CONTINUE_ EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_ALARMbit8-11: Positioning mode0: Absolute positioning

1: Relative positioning

H28.26 Task mode of block 10

Address:	0x281A	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

Description

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

H28.27 **Task mode of block 11**

Address:	0x281B	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

Description

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

H28.28 **Task mode of block 12**

Address:	0x281C	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

Description

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

H28.29 **Task mode of block 13**

Address:	0x281D	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

Description

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

H28.30 **Task mode of block 14**

Address:	0x281E	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

Description

Bit0: Task identifier0: Task execution1: Task hidingbit4-7: Subsequent condition0: END1: CONTINUE_WITH_STOP2: CONTINUE_ON_THE_FLY3: CONTINUE_EXTERNAL4: CONTINUE_ EXTERNAL_WAIT 5: CONTINUE_EXTERNAL_ALARMbit8-11: Positioning mode0: Absolute positioning
1: Relative positioning

H28.31 **Task mode of block 15**

Address:	0x281F	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit0: Task identifier
0: Task execution
1: Task hiding
bit4-7: Subsequent condition
0: END
1: CONTINUE_WITH_STOP
2: CONTINUE_ON_THE_FLY
3: CONTINUE_EXTERNAL
4: CONTINUE_EXTERNAL_WAIT
5: CONTINUE_EXTERNAL_ALARM
bit8-11: Positioning mode
0: Absolute positioning
1: Relative positioning

Description

Bit0: Task identifier

0: Task execution

1: Task hiding

bit4-7: Subsequent condition

0: END

1: CONTINUE_WITH_STOP

2: CONTINUE_ON_THE_FLY

3: CONTINUE_EXTERNAL

4: CONTINUE_EXTERNAL_WAIT

5: CONTINUE_EXTERNAL_ALARM

bit8-11: Positioning mode

0: Absolute positioning

1: Relative positioning

H28.32 **Block 0 task parameter**

Address:	0x2820	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 to 2147483647

Description

Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.34 **Block 1 task parameter**

Address:	0x2822	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 to 2147483647

Description

Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.36 **Block 2 task parameter**

Address:	0x2824	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 to 2147483647

Description

Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.38 **Block 3 task parameter**

Address:	0x2826	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 to 2147483647

Description

Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.40 **Block 4 task parameter**

Address:	0x2828	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 to 2147483647

Description

Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.42 **Block 5 task parameter**

Address:	0x282A	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 to 2147483647

Description

Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.44 **Block 6 task parameter**

Address:	0x282C	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 to 2147483647

Description

Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.46 **Block 7 task parameter**

Address:	0x282E	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32

Default:	0	Change:	Real-time

Value Range:
0 to 2147483647
Description
Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.48 **Block 8 task parameter**

Address:	0x2830	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 2147483647
Description
Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.50 **Block 9 task parameter**

Address:	0x2832	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 2147483647
Description
Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.52 **Block 10 task parameter**

Address:	0x2834	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 2147483647
Description
Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.54 **Block 11 task parameter**

Address:	0x2836	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 2147483647
Description
Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.56 **Block 12 task parameter**

Address:	0x2838	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 2147483647

Description

Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.58 Block 13 task parameter

Address:	0x283A	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 to 2147483647

Description

Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.60 Block 14 task parameter

Address:	0x283C	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 to 2147483647

Description

Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.62 Block 15 task parameter

Address:	0x283E	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32

Default:	0	Change:	Real-time

Value Range:

0 to 2147483647

Description

Defines the torque limit setpoint (0.01 N·m) of the program block fixed stopper task.

Defines the waiting time setpoint (ms) of the program block wait task.

Defines the target segment number of the program block jump task.

Defines the operand bit (0 to 3) of the program block set O or reset O task.

Bit0 = 1: output signal 1, EPOS_ZSW2.bit10

Bit1 = 1: output signal 2, EPOS_ZSW2.bit11

H28.64 **Fixed stopper monitoring window**

Address:	0x2840	Effective mode:	At stop
Min.:	0	Unit:	LU
Max.:	4294967295	Data Type:	UInt32
Default:	100	Change:	Real-time

Value Range:

0LU to 4294967295LU

Description

If the motor rotating position exceeds this parameter value after the program block fixture task is reached, E550.9 is reported.

H28.66 **Max. following error of fixed stopper**

Address:	0x2842	Effective mode:	At stop
Min.:	0	Unit:	LU
Max.:	4294967295	Data Type:	UInt32
Default:	1000	Change:	Real-time

Value Range:

0LU to 4294967295LU

Description

Defines the threshold for determining the position deviation of the fixed block.

H28.68 **External trigger source**

Address:	0x2844	Effective mode:	At stop
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Triggered by STW1.bit13

1: Triggered by DI

Description

Used to trigger the external switchover signal of the program block.

16.25 H29 PN Telegram Value

H29.00 **Control word 1 (STW1)**

Address:	0x2900	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

Bit0: 1 = Pulse enable allowed; 0 = OFF1, ramp to stop, pulse cleared, ready to switch on

bit1: 1 = No OFF2 (pulse enable allowed); 0 = OFF2, coast to stop, pulse cleared immediately, switch-on inhibited

bit2: 1 = No OFF3 (pulse enable allowed); 0 = OFF3 quick stop, P1135 brake, pulse cleared, switch-on inhibited

bit3: 1 = Enable allowed; 0 = Operation inhibited (pulse cleared)

bit4: 1 = Ramp function generator available; 0 = Ramp function generator inhibited

bit5:1 = Ramp function generator continued; 0 = Ramp function generator output frozen

bit6:1 = Setpoint enabled; 0 = Setpoint inhibited (ramp function generator input being zero)

bit7: Rising edge-triggered, response fault

bit8: JOG1

bit9: JOG2

bit10: 1 = PLC controlled

bit11: Reserved

bit12: Reserved

bit13: Reserved

bit14: Reserved

bit15: Reserved

Description

Indicates the real-time value of the control word 1 (STW1).

H29.01 **Control word 2 (STW2)**

Address:	0x2901	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

0x0 to 0xFFFF

Description

Indicates the real-time value of the control word 2 (STW-2).

H29.02 **Speed setpoint A (VEL_NSOLL_A)**

Address:	0x2902	Effective mode:	-
Min.:	-32768	Unit:	-
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32768 to 32767

Description
The real-time value of speed setpoint A (VEL_NSOLL_A).

H29.04 **Speed setpoint B (VEL_NSOLL_B)**

Address:	0x2904	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
The real-time value of speed setpoint B (VEL_NSOLL_B).

H29.06 **Encoder control word (G1_STW)**

Address:	0x2906	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
bit0: bit7 = 0, searching for reference point 1; bit7 = 1, measure the pointer 1
bit1: bit7 = 0, searching for reference point 2; bit7 = 1, measure the pointer 2
bit2: bit7 = 0, searching for reference point 3; bit7 = 1, measure the pointer 3
bit3: bit7 = 0, searching for reference point 4; bit7 = 1, measuring pointer 4
bit4: bit4–bit6 000b = Not activated; 001b = Selected functions activated; 010b = Read value; 011b = Cancel
bit5: bit4–bit6 000b = Not activated; 001b = Selected functions activated; 010b = Read value; 011b = Cancel
bit6: bit4–bit6 000b = Not activated; 001b = Selected functions activated; 010b = Read value; 011b = Cancel
bit7: Mode selection; 1 = Real-time measurement; 0 = Searching for the reference point
bit8: Reserved
bit9: Reserved
bit10: Reserved
bit11: Zero setting mode; 0 = Absolute position; 1 = Relative position
bit12: Rising edge-triggered; request for setting the zero bit
bit13: Rising edge-triggered; request for cyclic transmission of absolute position in G1_XIST2
bit14: Parking encoder
bit15: Rising-edge triggered Response encoder fault
Description
Indicates the real-time value of the encoder control word (G1_STW).

H29.07 **Position deviation (XERR)**

Address:	0x2907	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Indicates the real-time value of the position deviation (XERR).

H29.09 **Position loop gain (KPC)**

Address:	0x2909	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFFFFFF
Description
Indicates the real-time value of the position loop gain (KPC).

H29.11 **Position control word 1 (POS_STW1)**

Address:	0x290B	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
Bit0: bit0–bit5 block selection supports up to 16 blocks
bit1: bit0–bit5 block selection supports up to 16 blocks
bit2: bit0–bit5 block selection supports up to 16 blocks
bit3: bit0–bit5 block selection supports up to 16 blocks
bit4: bit0–bit5 block selection supports up to 16 blocks
bit5: bit0–bit5 block selection supports up to 16 blocks
bit6: Reserved
bit7: Reserved
bit8: 1 = Absolute positioning 0 = Relative positioning
bit9: 1 = Forward
bit10: 1 = Reverse
bit11: Reserved
bit12: 1 = Continuous transmission 0 = MDI block modification activated by running the rising edge of the program segment (STW1.6)
bit13: Reserved
bit14: 1 = Setting signal selected 0 = Positioning signal selected
bit15: 1= MDI sub-mode 0 = Program segment sub-mode
Description
Indicates the real-time value of position control word 1 (POS_STW1).

H29.12 **MDI position setting (EPOS)**

Address:	0x290C	Effective mode:	-
Min.:	0	Unit:	LU
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0LU to 4294967295LU
Description
Indicates the real-time value of MDI position setting (EPOS).

H29.14 **MDI speed setting (EPOS)**

Address:	0x290E	Effective mode:	-
Min.:	0	Unit:	1000 LU/min
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0 Lu/min–4294967295 LU/min
Description
Indicates the real-time value of MDI speed reference (EPOS).

H29.16 **MDI acceleration override (EPOS)**

Address:	0x2910	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Indicates the real-time value of the MDI acceleration override (EPOS).

H29.17 **MDI deceleration override (EPOS)**

Address:	0x2911	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Indicates the real-time value of the MDI deceleration override (EPOS).

H29.18 **MDI mode (EPOS)**

Address:	0x2912	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

bit0: 1 = Absolute positioning 0 = Relative positioning
bit1: 1 = Forward
bit2: 1 = Reverse
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: Reserved
bit8: Reserved
bit9: Reserved
bit10: Reserved
bit11: Reserved
bit12: Reserved
bit13: Reserved
bit14: Reserved
bit15: Reserved

Description

Indicates the real-time value of the MDI mode (EPOS).

H29.19 **Position control word 2 (POS_STW2)**

Address:	0x2913	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

bit0: 1 = Tracking mode activated
bit1: 1 = Set reference point
bit2: 1 = Reference point stopper activated
bit3: Reserved
bit4: Reserved
bit5: 1 = JOG incremental positioning activated 0 = Speed activated
bit6: Reserved
bit7: Reserved
bit8: Reserved
bit9: 1 = Searching for the reference point in the reverse direction 0 = Start searching for the reference point in the forward direction
bit10: Reserved
bit11: Reserved
bit12: Reserved
bit13: Reserved
bit14: 1 = Software limit switch activated
bit15: 1 = Stopper activated

Description

Indicates the real-time value of position control word 2 (POS_STW2).

H29.20 **Position speed override (EPOS)**

Address:	0x2914	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
Indicates the real-time value of the position speed override (EPOS).

H29.21 **Customized receive word for telegram 111**

Address:	0x2915	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
The real-time value of the customized receive word for telegram 111.

H29.22 **Torque reduction (MOMRED)**

Address:	0x2916	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Indicates the real-time value of the torque reduction value (MOMRED).

H29.23 **Torque reference (AdditiveTorque)**

Address:	0x2917	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
The real-time value of the torque reference (AdditiveTorque).

H29.24 **Torque upper limit**

Address:	0x2918	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

The real-time value of the torque upper limit.

H29.25 **Torque lower limit**

Address:	0x2919	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

The real-time value of the torque lower limit.

H29.26 **Customized receive word for 850 additive telegram**

Address:	0x291A	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

The real-time value of the customized receive word for 850 additive telegram.

H29.27 **Message word (MELDW)**

Address:	0x291B	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Indicates the real-time value of the message word (MELDW).

H29.28 **Safety control word 1 (S_STW1)**

Address:	0x291C	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

Bit0: 1 = Cancel STO, 0 = Select STO
bit1 1: Cancel SS1, 0 = Select SS1
bit2: 1 = Cancel SS2, 0 = Select SS2
bit3 1: Cancel SOS, 0 = Select SOS
bit4 1: Cancel SLS, 0 = Select SLS
bit5: Reserved
bit6: Reserved
bit7: 1 -> 0: Respond to safety failure
bit8: Reserved
bit9: SLS limit value 0
bit10: SLS limit value 1
bit11: Reserved
bit12: 1 = Cancel SDI+, 0 = Select SDI+
bit13 1 = Cancel SDI-, 0 = Select SDI-
bit14: Reserved

bit15: 1= Cancel SSM, 0 = Select SSM

Description

Indicates the real-time value of safety control word 1 (S_STW1).

H29.29 **Safety control word 2 (S_STW2)**

Address:	0x291D	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:

bit0: 1 = Cancel STO, 0 = Select STO
bit1: 1 = Cancel SS1, 0 = Select SS1
bit2: 1 = Cancel SS2, 0 = Select SS2
bit3: 1 = Cancel SOS, 0 = Select SOS
bit4: 1 = Cancel SLS, 0 = Select SLS
bit5: Reserved
bit6: Reserved
bit7: 1-> 0 respond to safety failure
bit8: Reserved
bit9: SLS limit value 0
bit10: SLS limit value 1
bit11: Reserved
bit12: 1 = Cancel SDI+, 0 = Select SDI+
bit13: 1 = Cancel SDI-, 0 = Select SDI-
bit14: Reserved
bit15: 1 = Cancel SSM, 0 = Select SSM
bit16: Reserved
bit17: Reserved
bit18: 1 = Cancel SS1E, 0 = Select SS1E
bit19: Reserved
bit20: Reserved
bit21: Reserved
bit22: Reserved
bit23: Reserved
bit24: Reserved
bit25: Reserved
bit26: Reserved
bit27: Reserved
bit28: 1 = Cancel SS2E, 0 = Select SS2E
bit29: Reserved
bit30: Reserved
bit31: Reserved

Description

Indicates the real-time value of safety control word 2 (S_STW2).

H29.31 Variable SLS limit

Address:	0x291F	Effective mode:	-
Min.:	-32768	Unit:	-
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32768 to 32767

Description

Indicates the real-time value of the variable SLS limit.

H29.50 **Status word 1 (ZSW1)**

Address:	0x2932	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

bit0: 1 = Ready to switch on, control circuit switched on, initialization done

bit1: 1 = Ready to run, main circuit switched on

bit2: 1 = Run enable

bit3: 1 = Fault

bit4: 1 = Coast to stop deactivated (OFF2 deactivated) 0 = Cost to stop activated (OFF2 activated)

bit5: 1 = Quick stop deactivated (OFF2 deactivated) 0 = Quick stop activated (OFF2 activated)

bit6: 1 = Switch-on inhibited

bit7: 1 = Warning existed

bit8: Reserved

bit9: 1 = PLC control request

bit10: Reserved

bit11: Reserved

bit12: Reserved

bit13: Reserved

bit14: Reserved

bit15: Reserved

Description

Indicates the real-time value of status word 1 (ZSW1).

H29.51 **Status word 2 (ZSW2)**

Address:	0x2933	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

bit0: Reserved
bit1: Reserved
bit2: Reserved
bit3: Reserved
bit4: Reserved
bit5: Reserved
bit6: Reserved
bit7: Reserved
bit8: Reserved
bit9: Reserved
bit10: Reserved
bit11: Reserved
bit12: bit12–bit15 drive heartbeat count value, uploaded to PLC
bit13: bit12–bit15 drive heartbeat count value, uploaded to PLC
bit14: bit12–bit15 drive heartbeat count value, uploaded to PLC
bit15: bit12–bit15 drive heartbeat count value, uploaded to PLC

Description

Indicates the real-time value of status word 2 (ZSW2).

H29.52 Speed actual value A (VEL_NIST_A)

Address:	0x2934	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

The real-time value of speed actual value A (VEL_NIST_A).

H29.53 Speed actual value B (VEL_NIST_B)

Address:	0x2935	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0 to 4294967295

Description

The real-time value of speed actual value B (VEL_NIST_B).

H29.55 Encoder status word (G1_ZSW)

Address:	0x2937	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

bit0: 1 = Function 1 activated
bit1: 1 = Function 2 activated
bit2: 1 = Function 3 activated
bit3: 1 = Function 4 activated
bit4: 1 = Actual value 1 readable
bit5: 1 = Actual value 2 readable
bit6: 1 = Actual value 3 readable
bit7: 1 = Actual value 4 readable
bit8: Touch probe 1
bit9:Touch probe 2
bit10: Reserved
bit11: Response encoder fault
bit12: Set zero response
bit13: Cyclic transmission of the absolute position in G1_XIST2
bit14: Parking encoder activated
bit15: The encoder is faulty.

Description

Indicates the real-time value of the encoder status word (G1_ZSW).

H29.56 **Encoder 1 position actual value 1 (G1_XIST1)**

Address:	0x2938	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0 to 4294967295

Description

Indicates the real-time value of position actual value 1 of encoder 1 (G1_XIST1).

H29.58 **Encoder 1 position actual value 2 (G1_XIST2)**

Address:	0x293A	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0 to 4294967295

Description

Indicates the real-time value of position actual value 2 of encoder 1 (G1_XIST2).

H29.60 **Position status word 1 (POS_ZSW1)**

Address:	0x293C	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

Bit0: bit0–bit5 effective traversing block supports up to 16 blocks
bit1: bit0–bit5 effective traversing block supports up to 16 blocks
bit2 :bit0–bit5 effective traversing block supports up to 16 blocks
bit3 :bit0–bit5 effective traversing block supports up to 16 blocks
bit4: bit0–bit5 effective traversing block supports up to 16 blocks
bit5: bit0–bit5 effective traversing block supports up to 16 blocks
bit6: Reservedbit7: Reserved

bit8: 1 = Reverse stopper activated
bit9: 1 = Forward stopper activated
bit10: 1 = JOG activated
bit11: 1 = Proactive reference point approach activated
bit12: Reserved
bit13: 1 = Running block activated
bit14: 1 = Setting activated
bit15: 1 = MDI activated
0 = MDI deactivated

Description

Indicates the real-time value of the position status word 1 (POS_ZSW1).

H29.61 **Position status word 2 (POS_ZSW2)**

Address:	0x293D	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

bit0:1 = Tracking mode activated
bit1:1 = Speed limit activated
bit2:1 = Setpoint available
bit3: Reserved
bit4:1= Axis moving forwardly
bit5:1 = Axis moving reversely
bit6:1 = Negative software limit switch reached
bit7:1 = Positive software limit switch reached
bit8: 1 = Position actual value < = Limit switch position 1
bit9:1 = Position actual value < = Limit switch position 2
bit10:1 = Direct output 1 through running block setting
bit11:1 = Direct output 2 through running block setting
bit12:1 = Fixed stop point reached
bit13: 1 = Fixed stop point fastening torque reached
bit14: 1 = Running to the fixed stop point activated
bit15: 1 = RUN command activated

Description

Indicates the real-time value of the position status word 2 (POS_SW2).

H29.63 **Customized send word for telegram 111**

Address:	0x293F	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
The real-time value of the user-defined sending word of telegram 111.

H29.65 **Fault code (FaultCode)**

Address:	0x2941	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Indicates the real-time value of the fault code.

H29.66 **Warning code**

Address:	0x2942	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Indicates the real-time value of the warning code (WarnCode).

H29.67 **Actual torque**

Address:	0x2943	Effective mode:	-
Min.:	-32768	Unit:	-
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-32768 to 32767
Description
The real-time value of the actual torque.

H29.68 **User-defined send word for 850 additive telegram**

Address:	0x2944	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

The real-time value of the user-defined sending word of additive telegram 850.

H29.69 **XIST_A position feedback**

Address:	0x2945	Effective mode:	-
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the real-time value of the XIST_A position feedback.

H29.71 **Safety status word 1 (S_ZSW1)**

Address:	0x2947	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:

bit0: 1 = STO activated, 0 = STO not activated

bit1: 1 = SS1 not activated, 0 = SS1 not activated

bit2: 1 = SS2 not activated, 0 = SS2 not activated

bit3: 1 = SOS activated, 0 = SOS not activated

bit4: 1 = SLS activated, 0 = SLS not activated

bit5: Reserved

bit6: Reserved

bit7: 1 = Safety failure, 0 = Normal operation

bit8: Reserved

bit9: SLS limit value 0

bit10: SLS limit value 1

bit11: SOS selected

bit12: 1 = SDI+ activated, 0 = SDI+ not activated

bit13: 1 = SDI- activated, 0 = SDI- not activated

bit14: Reserved

bit15: 1 = speed smaller than or equal to SSM threshold, 0 = current speed exceeds the SSM threshold

Description

Indicates the real-time value of safety status word 1 (S_ZSW1).

H29.72 **Safety status word 2 (S_ZSW2)**

Address:	0x2948	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFFFFFF	Data Type:	UInt32
Default:	0x0	Change:	Unchangeable

Value Range:

Bit0: 1 = STO active, 0 = STO not active
bit1: 1 = SS1 active, 0 = SS1 not active
bit2: 1 = SS2 active, 0 = SS2 not active
bit3: 1 = SOS active, 0 = SOS not active
bit4: 1 = SLS active, 0 = SLS not active
bit5: Reserved
bit6: Reserved
bit7: 1 = safety failure, 0 = normal operation
bit8: Reserved
bit9: SLS limit value 0
bit10: SLS limit value 1
bit11: Reserved
bit12: 1 = SDI + active, 0 = SDI + not active
bit13: 1 = SDI- active, 0 = SDI- not active
bit14: Reserved
bit15: 1 = speed is less than or equal to SSM threshold, 0 = current speed is greater than SSM threshold
bit16: Reserved
bit17: reserved
bit18: 1 = SS1E active, 0 = SS1E not active
bit19: reserved
bit20: Reserved
bit21: Reserved
bit22: Reserved
bit23: Reserved
bit24: 1 = F-DI1 is 1 signal, 0 = F-DI1 is 0 signal
bit25: 1 = F-DI2 is 1 signal, 0 = F-DI2 is 0 signal
bit26: 1 = F-DI3 is 1 signal, 0 = F-DI3 is 0 signal
bit27: 1 = F-DI4 is 1 signal, 0 = F-DI4 is 0 signal
bit28: 1 = SS2E active, 0 = SS2E not active
bit29: 1 = SOS selected, 0 = SOS revoked
bit30: 1 = F-DI5 is 1 signal, 0 = F-DI5 is 0 signal
bit31: Reserved

Description

Indicates the real-time value of safety status word 2 (S_ZSW2).

H29.74 **Variable SLS limit state**

Address:	0x294A	Effective mode:	-
Min.:	-32768	Unit:	-
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32768 to 32767

Description

Indicates the real-time value of the variable SLS limit state.

H29.90 **Modulo axis modulus**

Address:	0x295A	Effective mode:	-
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:
0 to 2147483647
Description
Indicates the real-time effective value (user unit) of the modulo axis modulus.

16.26 H30 Related Variables Read through Communication

H30.00 **Servo state read via communication**

Address:	0x3000	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the current running state of the drive to be communicated to the software.

H30.01 **DO function status 1 read through communication**

Address:	0x3001	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Bit 0 corresponds to DO function 1.
Bit 1 corresponds to DO function 2.
Bit 2 corresponds to DO function 3.
…
By analogy

H30.02 **DO function status 2 read through communication**

Address:	0x3002	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Bit 0 corresponds to DO function 17.
Bit 1 corresponds to DO function 18.

Bit 2 corresponds to DO function 19.
…

By analogy

H30.16 1st encoder communication timeout count

Address:	0x3010	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
It indicates the total number of communication timeout errors of the first encoder after the latest power-on.

H30.17 1st encoder communication CRC error count

Address:	0x3011	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
It indicates the total number of communication CRC errors of the first encoder after the latest power-on.

H30.18 1st encoder communication frame stop bit error count

Address:	0x3012	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
It indicates the total number of communication frame stop bit errors of the encoder after the latest power-on.

H30.20 Bits 0 and 1 of drive SN code

Address:	0x3014	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
H30.20–H30.27 are servo 16-bit SN codes, which are displayed in the form of ASSIC codes.

H30.21 **Bits 2 and 3 of drive SN code**

Address:	0x3015	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
H30.20–H30.27 are servo 16-bit SN codes, which are displayed in the form of ASSIC codes.

H30.22 **Bits 4 and 5 of drive SN code**

Address:	0x3016	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
H30.20–H30.27 are servo 16-bit SN codes, which are displayed in the form of ASSIC codes.

H30.23 **Bits 6 and 7 of drive SN code**

Address:	0x3017	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
H30.20–H30.27 are servo 16-bit SN codes, which are displayed in the form of ASSIC codes.

H30.24 **Bits 8 and 9 of drive SN code**

Address:	0x3018	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
H30.20–H30.27 are servo 16-bit SN codes, which are displayed in the form of ASSIC codes.

H30.25 **Bits 10 and 11 of drive SN code**

Address:	0x3019	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF

Description
H30.20–H30.27 are servo 16-bit SN codes, which are displayed in the form of ASSIC codes.

H30.26 **Bits 12 and 13 of drive SN code**

Address:	0x301A	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
H30.20–H30.27 are servo 16-bit SN codes, which are displayed in the form of ASSIC codes.

H30.27 **Bits 14 and 15 of drive SN code**

Address:	0x301B	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
H30.20–H30.27 are servo 16-bit SN codes, which are displayed in the form of ASSIC codes.

16.27 H31 References Set Through Communication

H31.00 **VDI virtual level set through communication**

Address:	0x3100	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 65535
Description
When H17.90 is set to 1, the VDI state is defined by this parameter.
The VDI logic is determined by H17.91 (Default VDI virtual level value upon power-on) upon initial power-on. Then, H31.00 is determined by the VDI logic.
"bit(n) = 1" of H31.00 indicates the logic of VDI (n+1) is "1". "bit(n)=0" indicates the logic of VDI (n+1) is "0".

H31.01 **Frequency-division output frequency set through communication**

Address:	0x3101	Effective mode:	Real-time
Min.:	0	Unit:	Hz
Max.:	16000000	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 Hz–16000000 Hz

Description

When H05.38 is set to 4, H31.01 sets the frequency of the frequency division output port.

H31.04 DO status set through communication

Address:	0x3104	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 65535

Description

Sets DO output status.

H31.05 AO status set through communication

Address:	0x3105	Effective mode:	Real-time
Min.:	-10000	Unit:	mV
Max.:	10000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-10000 mV to 10000 mV

Description

Set H04.50 to 10 to define AO through H31.05 (in mV).

H31.09 Speed reference set through communication

Address:	0x3109	Effective mode:	Real-time
Min.:	-10000.000	Unit:	[mm/s]/[rpm]
Max.:	10000.000	Data Type:	Int32
Default:	0.000	Change:	Real-time

Value Range:

-10000.000[mm/s]/[rpm] to 10000.000[mm/s]/[rpm]

Description

Set H06.02 to 4 to define the speed reference in the speed control mode (unit: 0.001 [mm/s]/[rpm]).

H31.11 Torque reference set through communication

Address:	0x310B	Effective mode:	Real-time
Min.:	-100.000	Unit:	%
Max.:	100.000	Data Type:	Int32
Default:	0.000	Change:	Real-time

Value Range:

-100.000% to 100.000%

Description

Set H07.02 to 4 to define the torque reference in the torque control mode through this parameter (unit: 0.001%). The setpoint 100.000% corresponds to the rated torque of the motor.

16.28 H32 Direct Drive Parameters

H32.01 **Encoder interface switchover switch**

Address:	0x3201	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Default encoder interface

1: Switching encoder interface

Description

Encoder interface

0: Default encoder interface

1: Switching encoder interface

H32.02 **Angle auto-tuning upon power-on**

Address:	0x3202	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Angle auto-tuning starts after the drive switches to the rdy state and the time (in seconds) defined by H32.41 elapses.

0: Disabled

1: Enabled

H32.04 **Angle auto-tuning state**

Address:	0x3204	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

Bit1: A602.9

Description

Display an alarm or status bit when the incremental encoder is not angle auto-tuned.

Bit0: None

Bit1: A602.9

Only bit0 takes effect when both are set.

H32.05 **Pre-positioning retract selection**

Address:	0x3205	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16

Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Used to retract by a certain distance after auto-tuning through pre-positioning is done.

0: Disabled

1: Enabled

H32.06 **Position feedback**

Address:	0x3206	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

Used to align the position feedback to the position before angle auto-tuning for incremental encoders.

0: Disabled

1: Enabled

H32.07 **Incremental homing method**

Address:	0x3207	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Z Signal short circuit

1: Only first short circuit

Description

Set Z signal of the increment encoder during Z signal homing.

0: Z Signal short circuit

1: Only first short circuit

Note: The width of the Z signal is set based on H32.08.

H32.08 **Homing signal width**

Address:	0x3208	Effective mode:	Real-time
Min.:	100	Unit:	encoder unit
Max.:	65535	Data Type:	UInt16
Default:	800	Change:	At stop

Value Range:

100 to 65535

Description

The setpoint is active after the position is latched by Z signal.

H32.10 **Max. reference current in angle auto-tuning through inching**

Address:	0x320A	Effective mode:	Real-time
Min.:	10.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:
10.0% to 300.0%
Description
Defines the maximum reference current during auto-tuning.

H32.13 **Motor operation threshold (ROT/DDR) in angle auto-tuning through inching**

Address:	0x320D	Effective mode:	Real-time
Min.:	0.001	Unit:	deg
Max.:	20.000	Data Type:	UInt16
Default:	0.200	Change:	At stop

Value Range:
0.001deg to 20.000deg
Description
Sets motor operation threshold for position lock angle auto-tuning.
Usually no change is required. If you have special requirements for the operation range, you can adjust this parameter accordingly. The smaller the value, the smaller the operation range during auto-tuning, but the greater the auto-tuning error.

H32.14 **Motor standstill threshold (ROT/DDR) in angle auto-tuning through inching**

Address:	0x320E	Effective mode:	Real-time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:
0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]
Description
Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.20 **Max. reference current in angle auto-tuning through pre-positioning (closed-loop)**

Address:	0x3214	Effective mode:	Real-time
Min.:	10.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:
10.0% to 300.0%
Description
Defines the maximum reference current during auto-tuning.

H32.22 **Electrical angle reference in angle auto-tuning through pre-positioning (closed-loop)**

Address:	0x3216	Effective mode:	Real-time
Min.:	0.0	Unit:	deg

Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:
0.0deg to 360.0deg
Description
Defines the electrical angle during auto-tuning through pre-positioning.

H32.23 Electrical angle reference change range in angle auto-tuning through pre-positioning (closed-loop)

Address:	0x3217	Effective mode:	Real-time
Min.:	10.0	Unit:	deg
Max.:	170.0	Data Type:	UInt16
Default:	90.0	Change:	At stop

Value Range:
10.0deg to 170.0deg
Description
Defines the electrical angle change range during auto-tuning.

H32.24 Motor stop threshold (ROT/DDR) in angle auto-tuning through pre-positioning (closed-loop)

Address:	0x3218	Effective mode:	Real-time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:
0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]
Description
Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.26 Damping in angle auto-tuning through pre-positioning (closed-loop)

Address:	0x321A	Effective mode:	Real-time
Min.:	0.00	Unit:	[N/(m/s)]/[N·m/rpm]
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	At stop

Value Range:
0.00[N/(m/s)]/[N·m/rpm]–655.35[N/(m/s)]/[N·m/rpm]
Description
Sets the damping coefficient for motor auto-tuning. The appropriate coefficient ensures a smooth and impact-free operation.
(1) This coefficient is usually related to the load characteristics. Larger load requires a larger coefficient.
(2) When the coefficient is too small, the auto-tuning process may be prone to strong impact, which is normal. When it is too large, motor operation may be sluggish or even stops, which is also normal and a timeout alarm will be raised.

H32.30 Max. reference current in angle auto-tuning through position lock

Address:	0x321E	Effective mode:	Real-time
Min.:	10.0	Unit:	%

Max.:	300.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:
10.0% to 300.0%
Description
Defines the maximum reference current during auto-tuning.

H32.33 Motor operation threshold (ROT/DDR) in angle auto-tuning through position lock

Address:	0x3221	Effective mode:	Real-time
Min.:	0.001	Unit:	deg
Max.:	20.000	Data Type:	UInt16
Default:	0.200	Change:	At stop

Value Range:
0.001deg to 20.000deg
Description
Sets motor operation threshold for position lock angle auto-tuning.
Usually no change is required. If you have special requirements for the operation range, you can adjust this parameter accordingly. The smaller the value, the smaller the operation range during auto-tuning, but the greater the auto-tuning error.

H32.34 Motor standstill threshold (ROT/DDR) in angle auto-tuning through position lock

Address:	0x3222	Effective mode:	Real-time
Min.:	0.1	Unit:	[mm/s]/[rpm]
Max.:	100.0	Data Type:	UInt16
Default:	1.0	Change:	At stop

Value Range:
0.1[mm/s]/[rpm]–100.0[mm/s]/[rpm]
Description
Sets motor stop threshold for auto-tuning. Usually no change is required.

H32.37 Angle gain in angle auto-tuning through position lock

Address:	0x3225	Effective mode:	Real-time
Min.:	0	Unit:	deg/(p/s)
Max.:	10000	Data Type:	UInt16
Default:	1000	Change:	At stop

Value Range:
0deg/(p/s)–10000deg/(p/s)
Description
Defines the angle gain during auto-tuning. A proper setpoint improves the auto-tuning angle accuracy. The default value applies to most of applications.

H32.38 Inertia ratio in angle auto-tuning through position lock

Address:	0x3226	Effective mode:	Real-time
Min.:	0.00	Unit:	-
Max.:	120.00	Data Type:	UInt16
Default:	0.00	Change:	At stop

Value Range:

0.00 to 120.00

Description

Sets the inertia ratio gain for auto-tuning. A proper value can ensure smooth and jitter-free operation and reduce the operation range.

(1) This coefficient is usually related to the load characteristics. You can just set it to the actual inertia ratio.

(2) A small value may lead to long movement during auto-tuning, which is a normal phenomenon. A large value may lead to gain mismatch oscillation.

H32.39 Gain class in angle auto-tuning through position lock

Address:	0x3227	Effective mode:	Real-time
Min.:	4	Unit:	level
Max.:	31	Data Type:	UInt16
Default:	16	Change:	At stop

Value Range:

4level to 31level

Description

Defines the loop stiffness level gain for auto-tuning. A proper value can ensure smooth and jitter-free operation and reduce the operation range.

(1) A small value may lead to long movement during auto-tuning, which is a normal phenomenon. A large value may lead to gain mismatch oscillation.

H32.41 Angle auto-tuning delay after power-on

Address:	0x3229	Effective mode:	Real-time
Min.:	0	Unit:	s
Max.:	65535	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:

0s to 65535s

Description

Used to set automatic angle auto-tuning delay upon power-on.

H32.45 Black box channel 28 function

Address:	0x322D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Real-time target speed (607Ah)

1: Electric angle

Description

Select the black box channel 28 function.

0: Real-time target position

1: Electric angle

H32.50 32-bit range compatibility

Address:	0x3232	Effective mode:	Real-time

Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0 to 99
Description
32-bit range compatibility.

H32.70 Motor overload protection mode

Address:	0x3246	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: Internal motor overload curve
1: External motor overload curve
2: Current limit overload protection
3: Hide motor overload protection
Description
Set motor overload protection mode
0: Internal motor overload curve
1: External motor overload curve
2: Current limit overload protection
3: Hide motor overload protection

H32.73 Thermal threshold current of overload current limit

Address:	0x3249	Effective mode:	Upon the next power-on
Min.:	10.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	115.0	Change:	At stop

Value Range:
10.0% to 750.0%
Description
Thermal limit current is a percentage of motor rated current defaulted to 100%, above which the motor starts to heat continuously. The motor current will be finally maintained at this value.

H32.74 Peak current of overload current limit

Address:	0x324A	Effective mode:	Upon the next power-on
Min.:	100.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	300.0	Change:	At stop

Value Range:
100.0% to 750.0%
Description
Defines the ratio of the peak current that can be reached by the motor to the rated current of the motor.

H32.75 **Max. current duration of overload protection**

Address:	0x324B	Effective mode:	Real-time
Min.:	0.01	Unit:	s
Max.:	655.35	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:
0.01s to 655.35s
Description
Calculate the maximum heat that can be reached by the motor based on the maximum current continuous time, and take this value as the motor overload alarm threshold.

H32.76 **Current limit time constant of overload protection**

Address:	0x324C	Effective mode:	Real-time
Min.:	0.01	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	1.00	Change:	At stop

Value Range:
0.01 to 655.35
Description
It is related to the maximum current continuous time. The higher the setpoint, the longer the maximum current continuous time will be.

H32.77 **Current limit alarm threshold of overload protection**

Address:	0x324D	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:
0.0% to 750.0%
Description
If current limit protection is effective, and the limited current is lower than this value, the drive will raise an alarm.

H32.78 **Current limit fault threshold of overload protection**

Address:	0x324E	Effective mode:	Real-time
Min.:	0.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:
0.0% to 750.0%
Description
If current limit protection is effective, and the limited current is lower than this value, the drive will report an error.

H32.79 **Thermal threshold current of overload**

Address:	0x324F	Effective mode:	Upon the next power-on

Min.:	10.0	Unit:	%
Max.:	750.0	Data Type:	UInt16
Default:	115.0	Change:	At stop

Value Range:
10.0% to 750.0%
Description
Set thermal threshold current of overload.

H32.80 Thermal current interval of overload

Address:	0x3250	Effective mode:	Upon the next power-on
Min.:	0.1	Unit:	%
Max.:	204.8	Data Type:	UInt16
Default:	6.4	Change:	At stop

Value Range:
0.1% to 204.8%
Description
Set the thermal current interval of overload.

H32.81 Overload heat dissipation current interval

Address:	0x3251	Effective mode:	Upon the next power-on
Min.:	0.1	Unit:	%
Max.:	204.8	Data Type:	UInt16
Default:	6.4	Change:	At stop

Value Range:
0.1% to 204.8%
Description
Set the overload heat dissipation current interval.

H32.82 Length of overload heat dissipation curve

Address:	0x3252	Effective mode:	Upon the next power-on
Min.:	1	Unit:	-
Max.:	200	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1 to 200
Description
Set the length of overload heat dissipation curve.

H32.83 Length of overload heat dissipation curve

Address:	0x3253	Effective mode:	Upon the next power-on
Min.:	1	Unit:	-
Max.:	200	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1 to 200
Description
Set the length of overload heat dissipation curve.

16.29 H33 Compensation Parameter Group

H33.00 **Compensation data BUFFER0**

Address:	0x3300	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER0.

H33.01 **Compensation data BUFFER1**

Address:	0x3301	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER1.

H33.02 **Compensation data BUFFER2**

Address:	0x3302	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER2.

H33.03 **Compensation data BUFFER3**

Address:	0x3303	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER3.

H33.04 **Compensation data BUFFER4**

Address:	0x3304	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16

Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER4.

H33.05 Compensation data BUFFER5

Address:	0x3305	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER5.

H33.06 Compensation data BUFFER6

Address:	0x3306	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER6.

H33.07 Compensation data BUFFER7

Address:	0x3307	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER7.

H33.08 Compensation data BUFFER8

Address:	0x3308	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER8.

H33.09 **Compensation data BUFFER9**

Address:	0x3309	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER9.

H33.10 **Compensation data BUFFER10**

Address:	0x330A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER10.

H33.11 **Compensation data BUFFER11**

Address:	0x330B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER11.

H33.12 **Compensation data BUFFER12**

Address:	0x330C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER12.

H33.13 **Compensation data BUFFER13**

Address:	0x330D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535

Description
Set compensation data BUFFER13.

H33.14 **Compensation data BUFFER14**

Address:	0x330E	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER14.

H33.15 **Compensation data BUFFER15**

Address:	0x330F	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER15.

H33.16 **Compensation data BUFFER16**

Address:	0x3310	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER16.

H33.17 **Compensation data BUFFER17**

Address:	0x3311	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER17.

H33.18 **Compensation data BUFFER18**

Address:	0x3312	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.: 65535 Data Type: UInt16
Default: 0 Change: At stop
Value Range:
0 to 65535
Description
Set compensation data BUFFER18.

H33.19 Compensation data BUFFER19

Address: 0x3313 Effective mode: Real-time
Min.: 0 Unit: -
Max.: 65535 Data Type: UInt16
Default: 0 Change: At stop
Value Range:
0 to 65535
Description
Set compensation data BUFFER19.

H33.20 Compensation data BUFFER20

Address: 0x3314 Effective mode: Real-time
Min.: 0 Unit: -
Max.: 65535 Data Type: UInt16
Default: 0 Change: At stop
Value Range:
0 to 65535
Description
Set compensation data BUFFER20.

H33.21 Compensation data BUFFER21

Address: 0x3315 Effective mode: Real-time
Min.: 0 Unit: -
Max.: 65535 Data Type: UInt16
Default: 0 Change: At stop
Value Range:
0 to 65535
Description
Set compensation data BUFFER21.

H33.22 Compensation data BUFFER22

Address: 0x3316 Effective mode: Real-time
Min.: 0 Unit: -
Max.: 65535 Data Type: UInt16
Default: 0 Change: At stop
Value Range:
0 to 65535
Description
Set compensation data BUFFER22.

H33.23 **Compensation data BUFFER23**

Address:	0x3317	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER23.

H33.24 **Compensation data BUFFER24**

Address:	0x3318	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER24.

H33.25 **Compensation data BUFFER25**

Address:	0x3319	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER25.

H33.26 **Compensation data BUFFER26**

Address:	0x331A	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER26.

H33.27 **Compensation data BUFFER27**

Address:	0x331B	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535

Description
Set compensation data BUFFER27.

H33.28 **Compensation data BUFFER28**

Address:	0x331C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER28.

H33.29 **Compensation data BUFFER29**

Address:	0x331D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER29.

H33.30 **Compensation data BUFFER30**

Address:	0x331E	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER30.

H33.31 **Compensation data BUFFER31**

Address:	0x331F	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER31.

H33.32 **Compensation data BUFFER32**

Address:	0x3320	Effective mode:	Real-time
Min.:	0	Unit:	-

Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER32.

H33.33 Compensation data BUFFER33

Address:	0x3321	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER33.

H33.34 Compensation data BUFFER34

Address:	0x3322	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER34.

H33.35 Compensation data BUFFER35

Address:	0x3323	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER35.

H33.36 Compensation data BUFFER36

Address:	0x3324	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER36.

H33.37 **Compensation data BUFFER37**

Address:	0x3325	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER37.

H33.38 **Compensation data BUFFER38**

Address:	0x3326	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER38.

H33.39 **Compensation data BUFFER39**

Address:	0x3327	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Set compensation data BUFFER39.

H33.40 **Current Compensation BUFFER group number**

Address:	0x3328	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 65535
Description
Current Compensation BUFFER group number

H33.41 **Compensation data sum**

Address:	0x3329	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	32767	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 to 32767

Description

Set compensation data sum.

H33.44 **Data command**

Address:	0x332C	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0 to 1

Description

Data command.

H33.45 **Data storage position**

Address:	0x332D	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Servo RAM

1: Servo FLASH

2: Encoder FLASH

Description

Set data storage position

0: Servo RAM

1: Servo FLASH

2: Encoder FLASH

H33.46 **Data clear**

Address:	0x332E	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 to 3

Description

Data clear.

H33.47 **Software tool write status**

Address:	0x332F	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 to 2

Description
Display software write status: 0 - Idle; 1 - Writing BUFFER; 2 - Writing BUFFER completed

H33.48 Servo read status

Address:	0x3330	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Display servo read status: 0 - Idle; 1 - Reading BUFFER; 2 - Reading BUFFER completed

H33.49 Software tool read status

Address:	0x3331	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 2
Description
Display software read status: 0 - Idle; 1 - Reading BUFFER; 2 - Reading BUFFER completed

H33.50 Servo write status

Address:	0x3332	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Display servo write status: 0 - Idle; 1 - Writing BUFFER; 2 - Writing BUFFER completed

H33.51 Data transmission completed flag

Address:	0x3333	Effective mode:	Real-time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0 to 1
Description
Data transmission completed flag.

H33.52 Servo data transfer completed flag

Address:	0x3334	Effective mode:	-
Min.:	0	Unit:	-

Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Servo data transfer completed flag: 0: Uncompleted; 1: Completed

H33.81 **Motor cogging torque ripple compensation sum**

Address:	0x3351	Effective mode:	Real-time
Min.:	0	Unit:	count
Max.:	65535	Data Type:	UInt16
Default:	2000	Change:	At stop

Value Range:
0count to 65535count
Description
Motor cogging torque ripple compensation sum

16.30 H34 Servo Motor Parameters 2

H34.12 **Error type supported by EnDat2.2 encoder**

Address:	0x340C	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
bit0: Light source; bit1: Signal amplitude; bit2: Position; bit3: Overvoltage; bit4: Undervoltage; bit5: Overcurrent; bit6: Battery

H34.13 **Alarm types supported by EnDat2.2 encoders**

Address:	0x340D	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
bit0: Transmission rate too high, bit1: Overtemperature, bit2: Interior light source approaching limit position, bit3: Battery voltage low, bit4: Reference point not reached, bit5: Reserved, bit6: Approaching limit position, bit7: Probe not at position, bit8: Value change too small

H34.14 **Error value output by EnDat2.2 encoder**

Address:	0x340E	Effective mode:	-
Min.:	0x0	Unit:	-

Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
bit0: Light source; bit1: Signal amplitude; bit2: Position; bit3: Overvoltage; bit4: Undervoltage; bit5: Overcurrent; bit6: Battery

H34.15 **Alarm value output by EnDat2.2 encoder**

Address:	0x340F	Effective mode:	-
Min.:	0x0	Unit:	-
Max.:	0xFFFF	Data Type:	UInt16
Default:	0x0	Change:	Unchangeable

Value Range:
0x0 to 0xFFFF
Description
bit0: Transmission rate too high, bit1: Overtemperature, bit2: Interior light source approaching limit position, bit3: Battery voltage low, bit4: Reference point not reached, bit5: Reserved, bit6: Approaching limit position, bit7: Probe not at position, bit8: Value change too small

16.31 H3A Servo Version

H3A.00 **MCU software version - VR version**

Address:	0x3A00	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:
0.00 to 655.35
Description
Displays MCU software version - VR version, with 2 decimal places.

H3A.01 **MCU software version - C SPC version**

Address:	0x3A01	Effective mode:	-
Min.:	0.000	Unit:	-
Max.:	65.535	Data Type:	UInt16
Default:	0.000	Change:	Unchangeable

Value Range:
0.000 to 65.535
Description
Displays MCU software version - C SPC version, with 3 decimal places.

H3A.02 **MCU software version - non-standard version**

Address:	0x3A02	Effective mode:	-
Min.:	0	Unit:	-

Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the MCU software version number - non-standard version number.

H3A.03 **MCU software version - test, trial version**

Address:	0x3A03	Effective mode:	-
Min.:	0.000	Unit:	-
Max.:	65.535	Data Type:	UInt16
Default:	0.000	Change:	Unchangeable

Value Range:
0.000 to 65.535
Description
Displays MCU software version - test, trial version, with three decimal places.

H3A.04 **MCU software version - software version**

Address:	0x3A04	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the MCU software version - software version.

H3A.05 **FPGA software version - VR version**

Address:	0x3A05	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:
0.00 to 655.35
Description
Displays FPGA software version - VR version, with 2 decimal places.

H3A.06 **FPGA software version - C SPC version**

Address:	0x3A06	Effective mode:	-
Min.:	0.000	Unit:	-
Max.:	65.535	Data Type:	UInt16
Default:	0.000	Change:	Unchangeable

Value Range:
0.000 to 65.535
Description
Displays FPGA software version - C SPC version, with 3 decimal places.

H3A.07 **FPGA software version - non-standard version**

Address:	0x3A07	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the FPGA software version number - non-standard version number.

H3A.08 **FPGA software version - test, trial version**

Address:	0x3A08	Effective mode:	-
Min.:	0.000	Unit:	-
Max.:	65.535	Data Type:	UInt16
Default:	0.000	Change:	Unchangeable

Value Range:
0.000 to 65.535
Description
Displays FPGA software version - test, trial version, with three decimal places.

H3A.09 **FPGA software version - software version**

Address:	0x3A09	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the FPGA software version - software version.

H3A.10 **SAFE software version - VR version**

Address:	0x3A0A	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:
0.00 to 655.35
Description
Displays SAFE software version - VR version, with 2 decimal places.

H3A.11 **SAFE software version - C SPC version**

Address:	0x3A0B	Effective mode:	-
Min.:	0.000	Unit:	-
Max.:	65.535	Data Type:	UInt16
Default:	0.000	Change:	Unchangeable

Value Range:
0.000 to 65.535

Description
Displays SAFE software version - C SPC version, with 3 decimal places.

H3A.12 **SAFE software version - non-standard version**

Address:	0x3A0C	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the SAFE software version number - non-standard version number.

H3A.13 **SAFE software version - test, trial version**

Address:	0x3A0D	Effective mode:	-
Min.:	0.000	Unit:	-
Max.:	65.535	Data Type:	UInt16
Default:	0.000	Change:	Unchangeable

Value Range:
0.000 to 65.535
Description
Displays SAFE software version - test, trial version, with three decimal places.

H3A.14 **SAFE software version - software version**

Address:	0x3A0E	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Displays the SAFE software version - software version.

H3A.15 **Communication version - 200P**

Address:	0x3A0F	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0 to 6553.5
Description
Communication version - 200P

17 Troubleshooting

17.1 Fault Levels and Display

17.1.1 Fault and Alarm Levels

Faults and alarms of the servo drive are divided into three levels based on severity: No. 1 > No. 2 > No. 3, as shown below.

- No. 1 non-resettable fault
- No. 1 resettable fault
- No. 2 resettable fault
- No. 3 resettable alarm

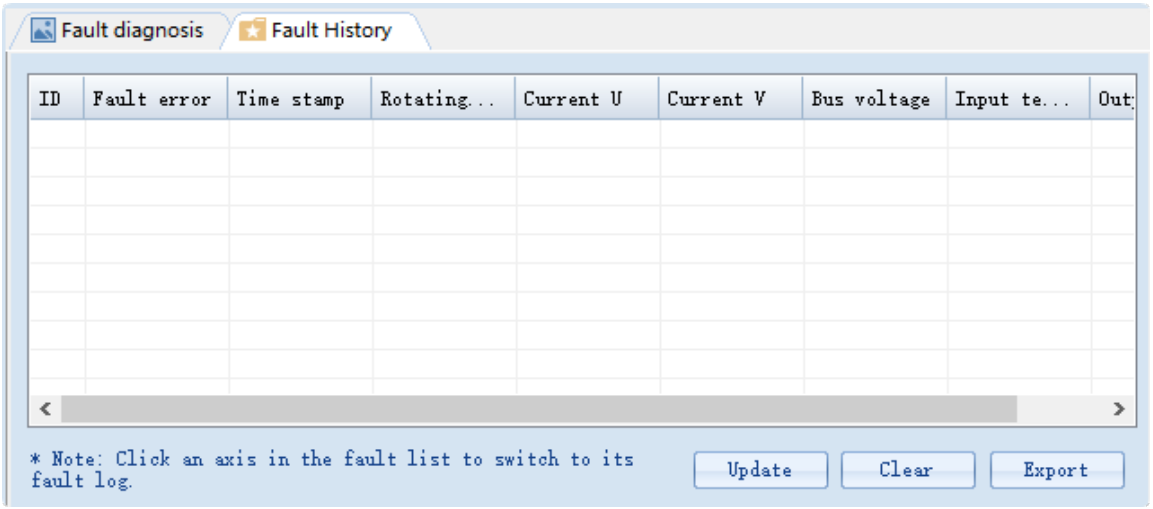
Note

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

Fault and alarm log

The servo drive can record the latest 20 faults and warnings and values of status parameters upon the fault/warning event. If repeated faults are present in the last 5 times, the repeated faults can be recorded many times after being cleared. If repeated alarms are present in the last 5 times, only one is recorded.

A fault/alarm will still be saved in the fault log after reset. To remove the fault/alarm from the fault log, set H02.31 to 2. See the following figure for details.



Read the value of H0b.34 through InoDriverShop to get the fault/alarm code. See examples in the following table.

H0b.34 (hex)	Description of H0b.34 (hex)
0101	0: Fault subcode 101: Fault code

17.2 Fault Reset

17.2.1 Fault Reset

Operating procedure:

- Set H0d.01 to 1 (reset the fault) to remove fault display from the keypad.
- To reset No. 1 and No. 2 faults, switch off the S-ON signal, and then set H0d.01 to 1.
- To reset a No.3 resettable alarm, set H0d.01 = 1.

Note

- Some faults and alarms can be reset only after the fault causes are rectified by modifying the setting. However, a reset operation does not necessarily activate the modifications to the setting.
- For modifications activated at next power-on (R, S, T/L1C, L2C), perform a power cycle.
- For modifications activated after stop, switch off the S-ON signal. The drive can operate normally only after modifications are activated.

17.3 Handling of Faults and Alarms

17.3.1 List of Fault Codes

No. 1 non-resettable faults:

Table 17–1 List of No. 1 non-resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable
E101	E101.0	Abnormal parameters in groups H02 and above	No.1	No
	E101.1	Parameter error in group H00/H01	No.1	No
	E101.2	Address error in read/write operation after the number of parameters changes	No.1	No
	E101.9	Parameter attribute initialization check error	No.1	No
E102	E102.0	FPGA communication establishment error	No.1	No
	E102.1	FPGA initialization start error	No.1	No
	E102.8	FPGA and MCU software version mismatch	No.1	No
E104	E104.1	MCU running timeout (MCU break down)	No.1	No
	E104.2	FPGA running timeout (FPGA break down)	No.1	No
	E104.4	MCU command update timeout	No.1	No

Fault Code	Fault subcode	Fault Name	Fault level	Resettable
E120	E120.0	Unknown encoder model	No.1	No
	E120.1	Unknown motor model	No.1	No
	E120.2	Unknown drive model	No.1	No
	E120.5	Motor and drive current mismatch	No.1	No
	E120.6	FPGA and motor model mismatch	No.1	No
	E120.7	Model check error	No.1	No
	E120.8	Junction temperature parameter check error	No.1	No
E136	E136.0	Encoder ROM motor parameter check error	No.1	No
	E136.1	Encoder ROM motor parameter read error	No.1	No
	E136.9	Dimension parameter Initialization error	No.1	No
E138	E138.1	Cogging ripple compensation data check failure	No.1	No
	E138.3	Overload compensation data check failure	No.1	No
E140	E140.1	MCU key calculation failed	No.1	No
	E140.4	Signature verification failed	No.1	No
E201	E201.0	Phase-P overcurrent	No.1	No
	E201.1	Phase-U overcurrent	No.1	No
	E201.2	Phase-V overcurrent	No.1	No
	E201.4	Phase-N overcurrent	No.1	No
E210	E210.0	Output short-circuited to ground	No.1	No
E234	E234.0	Runaway	No.1	No
E308	E308.0	Pulse encoder phase A wire breakage	No.1	No
	E308.1	Pulse encoder phase B wire breakage	No.1	No
	E308.2	Pulse encoder phase Z wire breakage	No.1	No
E720	E720.0	Wrong encoder interface	No.1	No
E740	E740.0	Absolute encoder communication timeout	No.1	No
	E740.2	Absolute encoder error	No.1	No
	E740.3	Absolute encoder single-turn calculation error	No.1	No
	E740.6	Encoder write error	No.1	No
	E740.9	Encoder data transmit delay too long	No.1	No
E765	E765.0	3rd party encoder over-temperature or overspeed	No.1	No
E770	E770.6	Fully closed-loop Inovance 2nd encoder initialization communication error	No.1	No
	E770.7	Fully closed-loop 2nd encoder communication error	No.1	No

Fault Code	Fault subcode	Fault Name	Fault level	Resettable
EA33	EA33.0	Encoder read/write check error	No.1	No
	EA33.1	Fully closed-loop Inovance 2nd encoder data read/write error	No.1	No
EE12	EE12.0	Parallel port detection error	No.1	No

No. 1 resettable faults:

Table 17–2 List of No. 1 resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable
E135	E135.0	Chip 3.3V signal diagnosis exception	No.1	Yes
E150	E150.0	STO safety state applied	No.1	Yes
	E150.1	STO input state abnormal	No.1	Yes
	E150.2	Buffer 5 V supply error	No.1	Yes
	E150.3	STO input circuit hardware diagnosis failure	No.1	Yes
	E150.4	PWM buffer hardware diagnosis failure	No.1	Yes
	E150.5	STO input signal interference	No.1	Yes
E208	E208.2	Encoder communication timeout	No.1	Yes
	E208.4	FPGA current loop operation timeout	No.1	Yes
E320	E320.0	Braking resistor overload	No.1	Yes
	E320.1	Discharge resistor surface temperature too high	No.1	Yes
E321	E321.0	Dynamic brake resistor overload	No.1	Yes
E400	E400.0	Main circuit overvoltage	No.1	Yes
E410	E410.0	Main circuit undervoltage	No.1	Yes
	E410.1	Main circuit de-energized	No.1	Yes
E500	E500.0	Motor overspeed	No.1	Yes
	E500.1	Speed feedback overflow	No.1	Yes
	E500.2	FPGA position feedback pulse overspeed	No.1	Yes
E602	E602.0	Angle auto-tuning failure	No.1	Yes
	E602.1	Angle auto-tuning overtravel	No.1	Yes
	E602.2	U/V/W phase sequence reversed	No.1	Yes
	E602.3	Large encoder jitter during angle auto-tuning	No.1	Yes
	E602.4	Auto-tuning failed. Auto-tuning timeout.	No.1	Yes
	E602.5	Angle auto-tuning failed. Z signal not found.	No.1	Yes
	E602.6	Angle auto-tuning does not converge	No.1	Yes
E605	E605.0	Speed too fast upon S-ON	No.1	Yes

Fault Code	Fault subcode	Fault Name	Fault level	Resettable
E612	E612.0	Rotor locked during phase sequence auto-tuning	No.1	Yes
	E612.1	Overtravel occurred during phase sequence auto-tuning	No.1	Yes
	E612.3	Large encoder jitter during phase sequence auto-tuning	No.1	Yes
	E612.4	Phase sequence auto-tuning failed. Auto-tuning timeout.	No.1	Yes
E620	E620.0	Motor overload	No.1	Yes
	E620.1	Overload current limit mode, motor overloaded	No.1	Yes
E621	E621.0	Overload current limiting torque attained	No.1	Yes
E630	E630.0	Motor stall over-temperature protection	No.1	Yes
E631	E631.1	24 V power supply or brake not connected	No.1	Yes
	E631.2	P-MOS open circuit	No.1	Yes
	E631.3	N-MOS disconnection	No.1	Yes
E640	E640.0	High IGBT junction overtemperature	No.1	Yes
	E640.1	Flywheel diode overtemperature	No.1	Yes
E650	E650.0	Heatsink overtemperature	No.1	Yes
E660	E660.0	Motor overtemperature	No.1	Yes
E770	E770.0	Fully-closed loop input phase A wire breakage	No.1	Yes
	E770.1	Fully-closed loop input phase B wire breakage	No.1	Yes
	E770.2	Fully-closed loop input phase Z wire breakage	No.1	Yes
	E770.3	Fully closed-loop external loop encoder communication timeout.	No.1	Yes
	E770.8	Full closed-loop encoder data transmit delay is too large	No.1	Yes
E939	E939.0	Motor power cables disconnected	No.1	Yes
EB00	EB00.0	Excessive position deviation	No.1	Yes

No. 2 resettable faults

Table 17–3 List of No. 2 resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable
E122	E122.0	Multi-turn absolute encoder setting error	No.2	Yes
	E122.1	DI function allocation error	No.2	Yes
	E122.2	DO function allocation error	No.2	Yes
	E122.3	Upper limit in the rotation mode too high	No.2	Yes
	E122.4	VDI function allocation error	No.2	Yes
	E122.5	DI and VDI assigned with the same function	No.2	Yes
	E122.6	Absolute function setting fault of 2nd encoder	No.2	Yes
	E122.7	Fully closed-loop parameter setting error	No.2	Yes
	E122.9	Modulo axis or rotation mode not allowed	No.2	Yes
E123	E123.0	Drive control mode is selected improperly	No.2	Yes
E420	E420.0	Main circuit phase loss	No.2	Yes
E550	E550.0	Initial operation block number not exist	No.2	Yes
	E550.1	Relative/absolute attribute of positioning or fixed stopper commands set improperly	No.2	Yes
	E550.3	Task switch condition is set improperly	No.2	Yes
	E550.7	Task type is selected improperly	No.2	Yes
	E550.8	Fixed stopper point not found	No.2	Yes
	E550.9	Fixed stopper beyond the window	No.2	Yes
E551	E551.1	Program block stop exception	No.2	Yes
	E551.3	Jump block not exist	No.2	Yes
	E551.4	Continuous position reference not supported in relative positioning	No.2	Yes
E661	E661.0	STune failure	No.2	Yes
E662	E662.0	ETune failure	No.2	Yes
E664	E664.0	Resonance too strong	No.2	Yes
E731	E731.0	Encoder multi-turn data lost	No.2	Yes
	E731.1	Inovance second encoder multi-turn data lost	No.2	Yes
E733	E733.0	Encoder multi-turn counting error	No.2	Yes
	E733.1	Inovance 2nd encoder multi-turn counting error	No.2	Yes
E735	E735.0	Encoder multi-turn counting overflow	No.2	Yes
E760	E760.0	Encoder over-temperature	No.2	Yes
E950	E950.0	Forward overtravel	No.2	Yes
E952	E952.0	Reverse overtravel	No.2	Yes
EB00	EB00.1	Position deviation overflow	No.2	Yes

Fault Code	Fault subcode	Fault Name	Fault level	Resettable
EB02	EB02.0	Position deviation too large in fully closed-loop mode	No.2	Yes
	EB02.1	Fully closed-loop position deviation overflow	No.2	Yes
EB03	EB03.0	Electronic gear ratio setpoint beyond the limit - H05.02	No.2	Yes
	EB03.1	Electronic gear ratio beyond the limit - 1st group of electronic gear ratio	No.2	Yes
	EB03.2	Electronic gear ratio beyond the limit - 2nd group of electronic gear ratio	No.2	Yes
EE01	EE01.0	PN system parameter error	No.2	Yes
EE03	EE03.0	Communication timeout	No.2	Yes
	EE03.1	Communication abnormal	No.2	Yes
EE08	EE08.0	PLC sync loss	No.2	Yes
	EE08.1	PLC stopped	No.2	Yes
	EE08.7	Heartbeat error	No.2	Yes
	EE08.8	No network connection during synchronous communication	No.2	Yes
	EE08.9	LAN cable disconnected	No.2	Yes
EE09	EE09.0	Software position limit setting error	No.2	Yes
	EE09.1	Home setting error	No.2	Yes
EE11	EE11.1	EEPROM bus read failure	No.2	Yes
	EE11.2	EEPROM update failure	No.2	Yes
EE13	EE13.0	PN synchronization cycle setting error	No.2	Yes
EE15	EE15.0	Excessive deviation of the PN synchronization signal	No.2	Yes
EE18	EE18.0	PN device name missing	No.2	Yes
EE19	EE19.0	Incorrect time sequence of telegram 105 in IRT	No.2	Yes
	EE19.1	PN mode and fully closed-loop match error	No.2	Yes
	EE19.2	Sync mode does not match the telegram	No.2	Yes
	EE19.3	Small I/O period in RT mode	No.2	Yes
	EE19.4	Unsupported PNU979 parameter	No.2	Yes
	EE19.5	AC4 mode use error	No.2	Yes
	EE19.6	AC4 mode does not support DI limit and soft limit.	No.2	Yes

17.3.2 List of Alarm Codes

Table 17–4 List of alarm codes

Warning code	Alarm subcode	Name	Fault level	Resettable
A108	A108.0	Storage parameter write error	No.3	Yes
	A108.1	Storage parameter read error	No.3	Yes
	A108.2	Invalid check on data written in EEPROM	No.3	Yes
	A108.3	Invalid check on data read in EEPROM	No.3	Yes
	A108.4	Single data is stored too many times	No.3	Yes
A110	A110.0	Frequency-division pulse output setting error	No.3	Yes
A116	A116.0	SLS overspeed warning	No.3	Yes
	A116.1	SDI out of tolerance warning	No.3	Yes
A120	A120.3	The motor and drive do not match in the power	No.3	Yes
A121	A121.0	Invalid S-ON command	No.3	Yes
A510	A510.0	Frequency division pulse output overspeed	No.3	Yes
A550	A550.2	External switchover wait warning	No.3	Yes
	A550.6	Reached the fixed stop point but not the tightening torque	No.3	Yes
A600	A600.0	Inertia auto-tuning failure	No.3	Yes
A601	A601.0	Homing alarm	No.3	Yes
	A601.1	Homing switch error	No.3	Yes
	A601.2	Homing mode setting error	No.3	Yes
A602	A602.9	Angle auto-tuning not done for incremental encoder motor	No.3	Yes
A609	A609.0	Data save timeout	No.3	Yes
	A609.1	Data save overflow	No.3	Yes
	A609.2	Failed to save data	No.3	Yes
	A609.3	Failed to erase data	No.3	Yes
A621	A621.1	Overload current limiting torque attained	No.3	Yes
A631	A631.4	P-MOS disconnection	No.3	Yes
	A631.5	N-MOS disconnection	No.3	Yes
A730	A730.0	Encoder battery alarm	No.3	Yes
	A730.1	Inovance 2nd encoder battery voltage low	No.3	Yes
A831	A831.1	AI1 zero offset too large	No.3	Yes
	A831.2	AI2 zero offset too large	No.3	Yes
A834	A834.1	AI1 overvoltage	No.3	Yes
	A834.2	AI2 overvoltage	No.3	Yes
A900	A900.0	DI emergency braking	No.3	Yes

Warning code	Alarm subcode	Name	Fault level	Resettable
A902	A902.0	DI/VDI setting invalid	No.3	Yes
	A902.1	DO/VDO setting invalid	No.3	Yes
	A902.2	Torque reach setting invalid	No.3	Yes
A909	A909.0	Motor overload	No.3	Yes
A910	A910.0	Control circuit overvoltage	No.3	Yes
A920	A920.0	Braking resistor overload	No.3	Yes
A921	A921.0	Dynamic brake resistor overload alarm	No.3	Yes
A922	A922.0	Resistance of the external braking resistor too small	No.3	Yes
A924	A924.0	Regenerative transistor over-temperature	No.3	Yes
A940	A940.0	Change of controlled motor is detected. It is recommended to restore factory settings before use	No.3	Yes
A941	A941.0	Modified parameters activated at next power-on	No.3	No
A942	A942.0	Parameter storage too frequent	No.3	Yes
A950	A950.0	Positive limit switch alarm	No.3	Yes
	A950.1	Target position is larger than forward soft limit threshold	No.3	Yes
A952	A952.0	Negative limit switch alarm	No.3	Yes
	A952.1	Target position is smaller than reverse soft limit threshold	No.3	Yes
A971	A971.0	Undervoltage alarm for voltage drop protection	No.3	Yes
A980	A980.0	Frequency division output overflow	No.3	Yes
AA41	AA41.0	Torque fluctuation compensation failure	No.3	Yes
AE19	AE19.7	Unsupported overtravel stop mode	No.3	Yes

17.3.3 Description of Fault Codes

17.3.3.1 Solutions to Faults

- E101.0: Abnormal parameters in groups H02 and above
  Cause:

  The total number of parameters changes, which generally occurs after software update. Values of parameters in groups H02 and above exceed the limit, which generally occurs after software update.

Cause	Troubleshooting	Solution
1. The voltage of the control circuit power supply drops instantaneously.	1. Check whether the control circuit (L1C, L2C) is in the process of power-off or instantaneous power failure occurs. 2. Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range: 220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: -10% to +10% (198 V to 264 V) 380 V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	1. Restore default settings (H02.31 = 1), and write parameters again. 2. Enlarge the power capacity or replace with a power supply of higher capacity, restore default settings (H02.31 = 1) and write parameters again.
2. Instantaneous power failure occurs when saving parameters.	Check whether instantaneous power failure occurs when saving parameters.	Power on the system again, restore system parameters to default settings (H02.31 = 1), and write parameters again.
3. The number of write operations within a certain period of time exceeds the limit.	1. Check whether instantaneous power failure occurs during parameter storage. 2. Check whether parameters are updated frequently through the host controller.	1. If the servo drive is faulty, replace the servo drive. 2. Change the way of writing and write parameters again. 3. Power on the system again, restore system parameters to default settings (H02.31 = 1), and write parameters again.
4. The software is updated.	Check whether parameter values in group H02 and above exceed the upper/lower limit due to software update.	Reset the servo drive model and servo motor model, and restore system parameters to default settings (H02.31 = 1).
5. The servo drive is faulty.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the servo drive is faulty.	Replace the servo drive.

- E101.1: parameter error in group H00/H01

  Cause:

  The total number of parameters changes, which generally occurs after software update. Values of parameters in groups H00 or H01 exceed the limit, which generally occurs after software update.

Cause	Troubleshooting	Solution
The servo drive detects whether parameter values in groups H00 and H01 exceed the upper/lower limit during initialization upon power-on. If yes, the keypad displays E101.1. Motor parameters in group H00 are read from the encoder. Servo drive parameters in group H01 are mapped based on the servo drive model defined by H01.10.	Read H0b.90 and H0b.91 and obtain the abnormal parameter group number. Check groups H00 and H01 to find the parameter whose value exceeds the limit. Confirm whether this parameter range is abnormal.	Replace the motor or drive.

- E101.2: Address error in read/write operation after the number of parameters changes

  Cause:

  Address error in read/write operation after the number of parameters changes.

Cause	Troubleshooting	Solution
The total number of parameters changes after software update, leading to address error in read/ write operation.	Read H0b.90 and H0b.91 and obtain the abnormal parameter group number.	1. Rectify the wrong value. 2. Restore default settings.

- E101.9: Parameter attribute initialization check error

  Cause:

  Parameter attribute initialization check error.

Cause	Troubleshooting	Solution
Parameter attribute initialization error	Check that H0A.99 = AA5C.	If the problems persists, replace the drive.

- E102.0: FPGA communication establishment error

  Cause:

  The communication between MCU and FPGA cannot be established.

Cause	Troubleshooting	Solution
The communication between MCU and FPGA cannot be established.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.

- E102.1: FPGA initialization start error

  Cause:

  FPGA failed.

Cause	Troubleshooting	Solution
FPGA cannot start.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.

- E102.8: FPGA and MCU software version mismatch

  Cause:

  The FPGA and MCU software versions do not match or the 200P and MCU software do not match.

Cause	Troubleshooting	Solution
The software versions of MCU, FPGA and 200P are inconsistent.	1. Check whether the MCU version in H01.00 is 124x.x. 2. Check whether the FPGA version in H01.01 is 124x.x. 3. Check whether the 200P version in H02.33 is 124x.x.	Contact Inovance for technical support. Update the FPGA, MCU or 200P software.

- E104.1: MCU running timeout (MCU break down)

  Cause:

  The access to MCU times out.

Cause	Troubleshooting	Solution
1. FPGA failure.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.
2. FPGA and HOST communication handshaking error.		
3. Access timeout occurs between HOST and the coprocessor.		

- E104.2: FPGA running timeout (FPGA break down)
  Cause:

  The MCU torque interrupt scheduling time is abnormal. This fault is reported only during commissioning.

Cause	Troubleshooting	Solution
1.FPGA failure.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.
2. FPGA and MCU communication handshaking error.		

- E104.4: MCU command update timeout
  Cause:

  Take the moment when interrupt starts as the starting time, if the time when commands are written to MCU is larger than the time when position and speed regulators are started by FPGA, an alarm will be reported.

Cause	Troubleshooting	Solution
The system reports that the encoder communication time is set improperly or the command calculation time is too long.	The fault persists after the servo drive is powered off and on repeatedly.	1 Hide the unnecessary functions. 2 Replace the servo drive.

- E120.0: Unknown encoder model
  Cause:

  The servo drive detects the encoder model during initialization upon power-on. If the encoder model does not comply with the requirement, E120.0 occurs.

Cause	Troubleshooting	Solution
1. The product (motor or servo drive) code does not exist.	Read the nameplates of the servo drive and motor to check whether SV680F-INT series servo drive and 26-bit servo motor are used. Meanwhile, check whether H00.00 (motor code) is set to 14102. Check the servo drive code (H01.02) to see whether this servo drive code exists.	If the motor code is unknown, set H00.00 to 14102 when the SV680F-INT series servo drive and 23-bit servo motor are used. If the drive code is unknown, check it against the nameplate of the drive. If the drive model is incorrect, contact our technicians.
2. The power rating of the motor does not match that of the servo drive.	Check whether the servo drive code (H01.02) matches the serial-type motor code (H00.05).	Replace the unmatched products.

- E120.1: Unknown motor model
  Cause:

  The servo drive detects the motor model defined by H00.00 during initialization upon power-on. If the motor model does not exist, E120.1 occurs.

Cause	Troubleshooting	Solution
The motor model defined by H00.00 is abnormal	Check whether the value of H00.00 matches the used motor.	Rectify the value of H00.00.

- E120.2: Unknown drive model

  Cause:

  The servo drive detects the servo drive model defined by H01.10 during initialization upon power-on. If the servo drive model does not exist, E120.2 occurs.

Cause	Troubleshooting	Solution
H01.10 is set incorrectly.	Check the value of H01.10.	Replace the servo drive.

- E120.5: Motor and drive current mismatch

  Cause:

  The rated output of the servo drive is far higher than the rated current of the motor. You must use a servo drive of lower rated output or a motor with higher rated current.

Cause	Troubleshooting	Solution
The internal scaling value is abnormal.	Check whether the servo drive model is correct. If the set current sampling coefficient is too large, calculation overflow will occur.	Replace the servo drive.

- E120.6: FPGA and motor model mismatch

  Cause:

  - The motor model is set improperly, causing mismatch and malfunction of the servo drive.
  - The motor model is set properly, but the motor encoder is not supported by the servo drive.

Cause	Troubleshooting	Solution
FPGA software version does not match the setting of H00.00.	Check whether the FPGA software version (H01.01) supports the motor model set by H00.00.	Update the FPGA software to support the motor model or replace the motor.

- E120.7: Model check error

  Cause:

  The servo drive model parameter cannot be identified.

Cause	Troubleshooting	Solution
Model parameter CRC check failed.	Check that the model parameter is present.	Write the model parameter again.

- E120.8: Junction temperature parameter check error

  Cause:

  The junction temperature parameter is identified incorrectly.

Cause	Troubleshooting	Solution
Junction temperature parameter CRC check failed.	Check that the junction temperature parameter is present.	Rewrite the junction temperature parameter.

- E122.0: Multi-turn absolute encoder setting error

  Cause:

  The motor does not match the absolute position mode or the motor code is set improperly.

Cause	Troubleshooting	Solution
The motor does not match in the absolute position mode or the motor SN is set improperly.	1 Check the motor nameplate to see whether the motor is configured with a multi-turn absolute encoder. 2 Check whether H00.00 (motor code) is set properly.	Reset H00.00 (motor code) according to the motor nameplate or use a suitable motor.

- E122.1: Different DIs assigned with the same function

  Cause:

  The same function is assigned to different DIs.

  The DI function No. exceeds the maximum number allowed for DI functions.

Cause	Troubleshooting	Solution
1. The same function is assigned to different DIs.	Check whether parameters in groups H03 (H03.02, H03.04... H03.20) and H17 (H17.00, H17.02... H17.30) are assigned with the same non-zero DI function No.	Assign different DI function numbers to parameters in groups H03 or H17, and then restart the control circuit to activate the assignment, or switch off the S-ON signal and send a "RESET" signal to activate the assignment.
2. The DI function No. exceeds the maximum setting number allowed for DI functions.	Check whether the MCU program is updated.	Restore system parameters to default values (H02.31 = 1) and restart the servo drive.

- E122.2: Different DOs assigned with the same function

  Cause:

  The DO function No. exceeds the maximum number allowed for DO functions.

Cause	Troubleshooting	Solution
The DO function No. exceeds the maximum number allowed for DO functions.	Check whether DO function numbers defined by H04.00 and H04.02 are abnormal.	Set the correct DO function No.

- E122.3: Upper limit in the rotation mode invalid

  Cause:

  The upper limit (reference range) of the mechanical single-turn position exceeds 2^{31} in the absolute position rotation mode.

Cause	Troubleshooting	Solution
The upper limit (reference range) of the mechanical single-turn position exceeds 2^{31} in the absolute position rotation mode.	Check the setting of the mechanical gear ratio, the upper limit of mechanical single-turn position and the electronic gear ratio when the servo drive runs in the absolute rotation mode (H02.01 = 2).	Reset the mechanical gear ratio, the upper limit of mechanical single-turn position and the electronic gear ratio to ensure the upper limit of the mechanical single-turn position (reference range) does not exceed 2^{31}.

- E122.4: Different VDIs assigned with the same function

  Cause:

  The same function is assigned to different VDIs. The VDI function No. exceeds the maximum number allowed for VDI functions.

Cause	Troubleshooting	Solution
1. The same function is assigned to different VDIs.	Check whether parameters in groups H03 (H03.02, H03.04... H03.20) and H17 (H17.00, H17.02... H17.30) are assigned with the same non-zero DI function No.	Assign different DI function numbers to parameters in groups H03 or H17, and then restart the control circuit to activate the assignment, or switch off the S-ON signal and send a "RESET" signal to activate the assignment.
2. The VDI function No. exceeds the maximum number allowed for VDI functions.	Check whether the MCU program is updated.	Restore system parameters to default values (H02.31 = 1) and restart the servo drive.

- E122.5: DI and VDI assigned with the same function

  Cause:

  The same function is assigned to different VDIs. The VDI function No. exceeds the maximum number allowed for VDI functions.

Cause	Troubleshooting	Solution
Two or more DIs and VDIs are assigned with the same function No.	Check whether DI function numbers set in groups H03 and H17 are repetitive.	Change any repetitive number.

- E122.6: Absolute function setting fault of the 2nd encoder

  Cause:

  The motor does not match the absolute mode.

Cause	Troubleshooting	Solution
The motor does not match the absolute mode.	Check the motor nameplate to see whether the motor is configured with a multi-turn absolute encoder.	Set H0F.02 to 0.

- E122.7: Fully closed-loop parameter setting error

  Cause:

  In fully closed-loop applications, the inner loop is set to rotation mode.

Cause	Troubleshooting	Solution
When H0F.00 is not 0, set H02.01 to 2 (absolute position rotation mode).	Check the value of H02.01 if fully closed-loop is used.	Set the value of H02.01 to 2 if fully closed-loop is used.

- E122.9: Modulo axis or rotation mode not allowed

  Cause:

  When the host controller is in AC1/AC4 mode, the local modulo axis and rotation mode are not allowed to turn on.

Cause	Troubleshooting	Solution
When the host controller is in AC1/AC4 mode, the modulo axis function and rotation mode are planned and calculated by the host controller, and it is forbidden to turn on the modulo axis and rotation mode locally.	Check whether the local modulo axis and rotation mode match the host controller control mode.	Modify the host controller control mode or modify the enabled state of the local modulo axis and rotation mode.

- E123.0: Drive control mode is selected improperly

  Cause:

H02.00 (control mode selection) is set incorrectly.

Cause	Troubleshooting	Solution
H02.00 is configured improperly.	Check whether H02.00 is set to 8, 9, 10.	Set H02.00 to 11-PN communication mode.

- E135.0: Chip 3.3V signal diagnosis error

  Cause:

  The two chips diagnose whether the supply voltage of each other is within the allowed range of 3.0 V to 3.6 V.

Cause	Troubleshooting	Solution
The chip voltage is out of the range of 3.0 V to 3.6 V.	Perform a power cycle to check if the fault is eliminated.	Replace the servo drive.

- E136.0: Encoder ROM motor parameter check error

  Cause:

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

Cause	Troubleshooting	Solution
1. The servo Servo drive model does not match the motor model.	View the servo drive and servo motor nameplates to check whether the SV680F-INT series servo drive and servo motor are used.	Replace the servo drive and motor.
2. A parameter check error occurs or no parameter is saved in the ROM of the serial incremental encoder.	1 Check whether the encoder cable provided by Inovance is used. For cable specifications, see "Matching Cables". The cable must be connected securely without scratching, breaking or poor contact on both ends. 2 Measure signals PS+, PS-, +5V and GND on both ends of the encoder cable and observe whether signals at both ends are consistent. For signal pin assignment, see the section related to wiring.	1 Use the encoder cable provided by Inovance. Ensure motor terminals are connected securely and servo drive screws are tightened properly. Use a new encoder cable if necessary. 2 Route encoder cables and power cables (RST, UVW) through different routes.
3. The servo drive is faulty.	The fault persists after the servo drive is restarted.	Replace the servo drive.

- E136.1: Encoder ROM motor parameter read error

  Cause:

  The encoder cable is not connected properly.

  A communication error occurs on the encoder due to interference.

Cause	Troubleshooting	Solution
The encoder cable connections are incorrect or loosened.	Check encoder wiring. Check for strong vibration, which loosens the encoder cable and even damages the encoder.	1 Connect the encoder cables according to the correct wiring diagram. 2 Re-connect encoder cables and ensure encoder terminals are connected securely.
The servo drive is faulty.	The fault persists after the servo drive is restarted.	Replace the servo drive.
Encoder communication is interfered with.	Check whether E136.1 occurs occasionally.	Install a magnetic ring. Route the power cable and communication cable separately.

- E136.9: Dimension parameter Initialization error

  Cause:

  Encoder read-write error causes 32-bit dimensional compatibility initialization error.

Cause	Troubleshooting	Solution
Encoder read-write error causes 32-bit dimensional compatibility initialization error.	Check whether H32.50 is set to enable compatibility.	1 If the encoder communication error still occurs after you disable compatibility, takes measures accordingly. 2 If power-on is normal after you disable compatibility. turn on the alarm and contact the technical support personnel of Inovance.

- E138.1: Cogging ripple compensation data check failure

  Cause:

  Check failed because cogging ripple compensation data is lost.

Cause	Troubleshooting	Solution
1. Check failed because cogging ripple compensation data is lost.	Read data through InoDriverShop.	1 Compensate again and power off to restart. 2 If the alarm remains, contact the manufacturer.
2. FLASH hardware failure.		

- E138.3: Overload compensation data check failure

  Cause:

  Check failed because overload compensation data is lost.

Cause	Troubleshooting	Solution
1. Check failed because overload compensation data is lost.	Read data through InoDriverShop.	1 Compensate again and power off to restart. 2 If the alarm remains, contact the manufacturer.
2. FLASH hardware failure.		

- E140.1: MCU key calculation failed

  Cause:

  The version of the encryption chip is incorrect.

Cause	Troubleshooting	Solution
Communication failure between MCU and the encryption chip	Check whether the error persists after restart.	Ask the manufacturer to flash the encryption software.

- E140.4: Signature verification failed

  Cause:

  Signature verification of the encryption chip failed.

Cause	Troubleshooting	Solution
Encryption software is not flashed.	Check whether the error persists after restart.	Ask the manufacturer to flash the encryption software.

- E150.0: STO safety state applied

  Cause:

  The STO input protection applies (safety state).

Cause	Troubleshooting	Solution
STO is triggered because either or both of two 24 V inputs are disconnected.	1. Check whether the STO function is activated.	It does not affect normal operation. After the STO terminal is back to normal, clear the fault using the fault reset function.
	2. Check whether the STO power supply is normal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
	3. The fault persists after preceding causes are rectified.	Replace the servo drive.

- E150.1: STO input state abnormal

  Cause:

  The single-channel input of STO is ineffective.

Cause	Troubleshooting	Solution
1. STO input power supply is abnormal.	Check whether the STO power supply is normal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
2. STO input resistor is abnormal.	After STO is triggered, only one STO signal is sent to MCU after the 24 V power supply is cut off due to input resistor drift.	Replace the servo drive.
3. STO is ineffective.	The fault persists after preceding causes are rectified.	Replace the servo drive.

- E150.2: Buffer 5 V voltage detection error

  Cause:

  The MCU monitors the 5 V power supply of the PWM Buffer to detect whether overvoltage or undervoltage occurs. If the voltage is abnormal, E150.2 occurs.

Cause	Troubleshooting	Solution
The 5 V voltage supplied to the STO Buffer is abnormal due to undervoltage or overvoltage.	Check whether the fault can be removed by a restart. If not, the 5V voltage supplied to the Buffer is abnormal.	Replace the servo drive.

- E150.3: STO input circuit hardware diagnosis failure
  Cause:

  The photocoupler of the front hardware circuit for STO input is inspected. If the photocoupler is short-circuited, the servo will display E150.3.

Cause	Troubleshooting	Solution
Direct connection occurs on the upstream optocoupler of STO1 or STO2.	The fault persists and the keypad displays E150.3 after restart.	Replace the servo drive.

- E150.4: PWM buffer hardware diagnosis failure
  Cause:

  An error occurs on the PWM Buffer integrated circuit during initialization detection upon power-on (the PWM signal cannot be blocked).

Cause	Troubleshooting	Solution
STO Buffer power-on test error.	The fault persists and the keypad displays E150.4 after restart.	Replace the servo drive.

- E150.5: STO input signal interference
  Cause:

  The STO input signal is interfered with, but the interference does not meet the noise filtering conditions set in H0A.73.

Cause	Troubleshooting	Solution
Poor contact of the STO terminal or unstable external 24V input voltage may lead to STO misoperation or malfunction.	Check whether the 24V input voltage of the STO terminal is unstable and disconnected repeatedly.	Replace the 24V power supply.

- E201.0: Phase-P overcurrent
  Cause:

  An excessively high current flows through the positive pole of the DC-AC circuit.

Cause	Troubleshooting	Solution
1. Gains are set improperly and the motor oscillates.	Check whether vibration or sharp noise occurs during start and operation of the motor, or view "Current feedback" in the software tool.	1 The motor parameters are set improperly, modify the motor parameters. 2 The current loop parameters are set improperly, re-adjust the current loop parameters. 3 Improper speed loop parameters cause vibration. 4 Servo drive operates improperly. Replace it.
2. The encoder cable is wired incorrectly, aging, corroded, or connected loosely.	Check whether the encoder cable provided by Inovance is used. Check whether the cable is aging, corroded, or connected loosely. 1. Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.17 (Electrical angle) changes as motor shaft rotates.	Re-solder, tighten or replace the encoder cable.

Cause	Troubleshooting	Solution
3. The servo drive is faulty.	1 Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.17 (Electrical angle) changes as motor shaft rotates. 2 Disconnect the motor cable but the fault persists after the servo drive is powered off and on again. 3 Check whether resistance of the external braking resistor is too small or the braking resistor is short-circuited (between terminals P ⊕ , C).	1 Use an external braking resistor of matching resistance. Perform wiring again. 2 Replace the servo drive.
4. Overcurrent occurs on the braking resistor.	Check whether resistance of the external braking resistor is too small or the braking resistor is short-circuited (between terminals P, C).	Use an external braking resistor of matching resistance. Perform wiring again.

- E201.1: Phase-U overcurrent

  Cause:

  A current higher than the threshold is collected in the phase-U current.

Cause	Troubleshooting	Solution
1. 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 loose.	Tighten the cables that are loose or disconnected.
2. Motor cables are grounded.	After confirming the drive power cables and motor cables are connected properly, measure whether the insulation resistance between the drive U/V/W side and the PE cable is at MΩ level.	Replace the motor in case of poor insulation.
3. Motor UVW cables are short-circuited.	Disconnect motor cables and check whether short circuit occurs among motor U/V/W cables and whether burrs exist in the wiring.	Connect the motor cables correctly.
4. The motor is damaged due to over-temperature.	Disconnect the motor cables and measure whether the resistance among U, V, and W phases of motor cables is balanced.	Replace the motor if the resistance is unbalanced.

- E201.2: Phase-V overcurrent

  Cause:

  A current higher than the threshold is collected in the phase-V current.

Cause	Troubleshooting	Solution
1. 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 loose.	Tighten the cables that are loose or disconnected.
2. Motor cables are grounded.	After confirming the drive power cables and motor cables are connected properly, measure whether the insulation resistance between the drive U/V/W side and the PE cable is at MΩ level.	Replace the motor in case of poor insulation.
3. Motor UVW cables are short-circuited.	Disconnect motor cables and check whether short circuit occurs among motor U/V/W cables and whether burrs exist in the wiring.	Connect the motor cables correctly.
4. The motor is damaged due to over-temperature.	Disconnect the motor cables and measure whether the resistance among U, V, and W phases of motor cables is balanced.	Replace the motor if the resistance is unbalanced.

- E201.4: Phase-N overcurrent

  Cause:

  An excessively high current flows through the negative pole of the DC-AC circuit.

Cause	Troubleshooting	Solution
1. Gains are set improperly and the motor oscillates.	Check whether vibration or sharp noise occurs during start and operation of the motor, or view "Current feedback" in the software tool.	Adjust the gains.
2. The encoder cable is wired incorrectly, aging, corroded, or connected loosely.	Check whether the encoder cable provided by Inovance is used and whether the cable is aging, corroded, or connected loosely.	Re-solder, tighten or replace the encoder cable.
3. Overcurrent occurs on the braking resistor.	Check whether resistance of the external braking resistor is too small or the braking resistor is short-circuited (between terminals P ⊕ , C).	Use a braking resistor of matching resistance. Perform wiring again.
4. Overcurrent is caused by the superposition of the braking current and phase current.	Check if the drive accelerates abruptly during braking. Check if the voltage feedback exceeds the release threshold through the Inovance drive commissioning platform, and if the torque command increases abruptly.	Increase the acceleration/ deceleration time.
5. The servo drive is faulty.	Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.17 (Electrical angle) changes as motor shaft rotates. Disconnect the motor cable but the fault persists after the servo drive is powered off and on again.	Replace the servo drive.

- E208.2: Encoder communication timeout

Cause:

The FPGA detected a communication timeout with the encoder.

Cause	Troubleshooting	Solution
The servo drive fails to receive the data fed back by the encoder in three consecutive cycles.	Check whether the encoder cable is wired improperly, loosened, lengthened or interfered with. Check bit12 of H0b.30.	1. Check whether the motor model is correct. 2. Check whether the encoder cable is proper. 3. Check whether the encoder version (H00-04) is set properly. 4. The servo drive operates improperly. Replace it.

- E208.4: FPGA current loop operation timeout

  Cause:

  The operating time of the current loop exceeds the interval threshold.

Cause	Troubleshooting	Solution
FPGA operation timeout.	Internal fault code H0b.45 = 4208: Current loop operation timeout	Disable some unnecessary functions, such as notch and speed observer, to reduce the operating load of the current loop.

- E210.0: Output short-circuited to ground

  Cause:

  An abnormal motor phase current or bus voltage is detected during power-on self-testing.

  - The DC bus voltage exceeds the discharge threshold.
  - The phase U current of size C/D/E models is greater than 1/4 of H01.07.
  - Overcurrent occurs on phase-P and phase-N of servo drives in size A and B.

Cause	Troubleshooting	Solution
1. The servo drive power cables (U/V/W) are short-circuited to ground.	Disconnect the motor cables and measure whether the servo drive power cables (U/V/W) are short-circuited to ground (PE).	Connect the cables again or replace the servo drive power cables.
2. The motor is short-circuited to ground.	After confirming the servo drive power cables and motor cables are connected properly, measure whether the insulation resistance between the servo drive U/V/W side and the PE cable is at MΩ level.	Replace the motor.
3. The servo drive is faulty.	Disconnect the power cables from the servo drive, but the fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.
4. The motor speed is too high during phase-to-ground detection.	Check whether the motor is in the generating status during power-on.	Reduce the motor speed.

- E234.0: Runaway

  Cause:

  The torque reference direction is opposite to the speed feedback direction in the torque control mode.

The speed feedback direction is in reverse to the speed reference direction in the position or speed control mode.

Cause	Troubleshooting	Solution
1. The UVW cables are connected incorrectly.	Check whether the servo drive power cables are connected in the correct sequence at both ends.	Connect the UVW cables according to the correct sequence.
2. The interference signal causes an error in the initial phase detection of the motor rotor upon power-on.	The UVW phase sequence is correct. But E234.0 occurs when the servo drive is enabled.	Power off and on the servo drive again.
3. The encoder model is wrong or the wiring is incorrect.	View the servo drive and servo motor nameplates to check whether the devices used are Inovance SV680F-INT series servo drive and 23-bit servo motor.	Replace with a mutually-matching servo drive and servo motor. For use of of SV680F-INT series servo drive and 26-bit servo motor, set H00.00 to 14102. Check the motor model, encoder type, and encoder cable connection again.
4. The encoder cable is wired incorrectly, aging, corroded, or connected loosely.	Check whether the encoder cable provided by Inovance is used and whether the cable is aging, corroded, or connected loosely. Switch off the S-ON signal and rotate the motor shaft manually. Check whether the value of H0b.10 (Electrical angle) changes as motor shaft rotates.	Re-solder, tighten or replace the encoder cable.
5. The gravity load in vertical axis applications is too heavy.	Check whether the load of the vertical shaft is too large. Adjust brake parameters H02.09...H02.12 and check whether the fault is cleared.	Reduce the load of the vertical axis, increase the stiffness level, or hide this fault without affecting the safety performance and normal use.
6. Improper parameter settings lead to excessive vibration.	The stiffness level is set to an excessively high value, leading to excessive vibration.	Set a proper stiffness level to avoid excessive vibration.

- E308.0: Pulse encoder phase A wire breakage

  Cause:

  Pulse encoder phase A wire breakage.

Cause	Troubleshooting	Solution
1. Phase A of the encoder is wired improperly.	Check encoder wiring.	Reconnect the encoder and power off and restart.
2. The motor is set to a model with a pulse encoder.	Check whether the motor code H00.00 is set correctly and matches the connected encoder.	Check whether the motor code H00.00 is set correctly and matches the connected encoder.

- E308.1: Pulse encoder phase B wire breakage

  Cause:

  Pulse encoder phase B wire breakage.

Cause	Troubleshooting	Solution
Phase B of the encoder is wired improperly.	Check encoder wiring.	Reconnect the encoder and power off and restart.

- E308.2: Pulse encoder phase Z wire breakage

  Cause:

Pulse encoder phase Z wire breakage.

Cause	Troubleshooting	Solution
1. Phase Z of the encoder is wired improperly.	Check the wiring.	Connect the encoder again.
2. The connected encoder does not have phase Z.	Check the encoder manual.	Re-install the motor and select an AB two-phase encoder on the encoder configuration page.

- E320.0: Braking resistor overload

  Cause:

  The braking resistor is overloaded.

Cause	Troubleshooting	Solution
The accumulative heat of the braking resistor exceeds the maximum thermal capacity of the braking resistor.	Check whether the value of H0b.67 exceeds 100%.	Check if large discharge current is present due to high bus voltage. Ensure that the motor cannot be driven reversely. Replace the servo drive.

Caution

In applications where the motor drives a vertical axis or is driven by the load, set H0A.12 to 0 to disable runaway fault detection.

- E320.1: External braking resistor surface temperature too high

  Cause:

  The accumulative heat of the built-in braking resistor is too great.

Cause	Troubleshooting	Solution
The accumulative heat of the built-in braking resistor is too great.	Cut off the power and check the braking resistor for over-temperature.	Check if large discharge current is present due to high bus voltage. Ensure that the motor cannot be driven reversely. Replace the servo drive.

- E321.0: Dynamic brake resistor overload

  Cause:

  The dynamic braking resistor is overloaded.

Cause	Troubleshooting	Solution
1. The accumulative heat of exceed braking resistor exceeds the maximum thermal capacity of the resistor. 2. The resolution setting of the third party encoder (if any) is too small.	1. Check whether the value of H0b.98 exceeds 100%. 2. For an ABZ encoder, check H00.31. For a BiSS-C/Endat2.2 encoder, check H00.39. For an SSI encoder, check H00.39 and H00.43.	1. Ensure that the motor cannot be driven reversely in the dynamic braking state. 2. For an ABZ encoder, set H00.31 correctly. For a BiSS-C/Endat2.2 encoder, set H00.39 correctly. For an SSI encoder, set H00.39 and H00.43 correctly.

- E400.0: Main circuit overvoltage

  Cause:

The DC bus voltage between P ⊕ and N ⊖ exceeds the overvoltage threshold.

220 V servo drive: Normal value 310 V Overvoltage threshold 420 V.

380 V servo drive: Normal value 540 V Overvoltage threshold 760 V.

Cause	Troubleshooting	Solution
1. The voltage input to the main circuit is too high.	Check the power input specifications of the servo drive and measure whether the voltage input to main circuit cables (R S T) on the drive side is within the following range: 220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V) 380 V servo drive: Value range: 380 V–440 V Allowable deviation: –10% to +10% (342 V to 484 V)	Replace or adjust the power supply according to the specified range.
2. The power supply is unstable or affected by lightning.	Check whether the power supply is unstable, affected by lightning, or complies with the preceding range.	Connect a surge protection device (SPD) and switch on the power supplies of the control circuit and the main circuit. If the fault persists, replace the servo drive.
3. The braking resistor fails.	If the built-in braking resistor is used (H02.25 = 0), check whether terminals P ⊕ and D are jumpered. If yes, measure the resistance between terminals C and D to ensure that the resistor works normally. If an external braking resistor is used (H02.25 = 1 or 2), measure the resistance of the external braking resistor connected between terminals P⊕ and C. For details, See table "Specifications of the braking resistor" in SV680F-INT Series Servo Drive Commissioning Guide.	If the resistance is "∞" (infinite), the braking resistor is disconnected internally. If you use a built-in braking resistor with insufficient discharge capability, use an external braking resistor (H02.25 = 1 or 2) instead and remove the jumper between terminals P ⊕ and D. The resistance of the external braking resistor can be equal to or smaller than the built-in one and the power must not be smaller than the built-in one. If you use an external braking resistor which is damaged or has insufficient power, replace it with a new one with larger power and connect the new one between terminals P ⊕ and C. Set H02.26 (Power of external braking resistor) and H02.27 (Resistance of external braking resistor) to values consistent with the specifications of the external braking resistor used.

Cause	Troubleshooting	Solution
4. The resistance of the external braking resistor is too large, resulting in insufficient energy absorption during braking.	Measure the resistance of the external braking resistor connected between terminals P ⊕ and C. Compare the measured value with the recommended value.	Connect a new external braking resistor with recommended resistance between terminals P ⊕ and C. Set H02.26 (Power of external braking resistor) and H02.27 (Resistance of external braking resistor) to values consistent with the specifications of the external braking resistor used.
5. The motor is in abrupt acceleration/deceleration status and the maximum braking energy exceeds the energy absorption value.	Confirm the acceleration/ deceleration time during running and measure the DC bus voltage between P ⊕ and N to check whether the voltage exceeds the fault threshold during deceleration.	After confirming the input voltage of the main circuit is within the specified range, increase the acceleration/deceleration time if the operating conditions allow.
6. The bus voltage sampling value deviates greatly from the measured value.	Check whether H0b.26 (Bus voltage) is within the following range: 220 V servo drive: H0b.26 ＞ 420 V 380 V servo drive: H0b.26 ＞ 760 V Measure whether the DC bus voltage N between P ⊕ and N ⊖ is normal and less than the value of H0b.26.	Contact Inovance for technical support.
7. The servo drive is faulty.	The fault persists after the main circuit is powered off and on repeatedly.	Replace the servo drive.

- E410.0: Main circuit undervoltage

  Cause:

  The DC bus voltage between P ⊕ and N ⊖ is lower than the undervoltage threshold.

  220 V servo drive: Normal value: 310 V Undervoltage threshold: 200 V (180 V for S5R5 models)

  380 V servo drive: Normal value 540 V Overvoltage threshold 380 V.

Cause	Troubleshooting	Solution
1. The power supply of the main circuit is unstable or power failure occurs.	Check the power input specifications of the servo drive and measure whether the input voltage at the power supply side of the main circuit cables and R/S/T on the drive side is within the following range: 220 V servo drive: Value range: 220 V–240 V Allowable deviation: –10% to +10% (198 V to 264 V) Measure the voltages of all the three phases.	Increase the capacity of the power supply.
2. Instantaneous power failure occurs.		
3. The voltage of the power supply drops during operation.	Monitor the power supply voltage and check whether the main circuit power supply is applied to other devices, resulting in insufficient power capacity and voltage drop.	
4. A three-phase servo drive is connected to a single-phase power supply, leading to phase loss.	Check whether the main circuit is wired correctly and whether phase loss detection (H0A.00) is hidden.	Replace the cables and wire the power cables correctly Three-phase: RST.
5. The servo drive is faulty.	Check whether H0b.26 (Bus voltage) is within the following range: 220 V servo drive: H0b.26 < 200 V 380 V servo drive: H0b.26 < 380 V The fault persists after the main circuit is powered off and on repeatedly.	Replace the servo drive.
6. When the external 24V power is enabled, disconnect the control power.	When the control power and main circuit power are both connected to the enabled external 24V, disconnect the control power (check whether H0b.57 is less than 100 V).	Restore control power supply.

- E410.1: Main circuit de-energized

  Cause:

  Phase loss occurs on the three-phase servo drive.

Cause	Troubleshooting	Solution
The power supply is disconnected during operation..	Check the power input specifications of the servo drive and measure whether the input voltage at the power supply side of the main circuit cables and R/S/T on the drive side is within the following range: 220 V servo drive: Value range: 220 V–240 V Allowable deviation: –10% to +10% (198 V to 264 V) 380 V servo drive: Effective value: 380 to 440 V Allowable deviation: –10% to +10% (342 V to 484 V) Measure the voltages of all the three phases.	Increase the capacity of the power supply.
	Monitor the power supply voltage and check whether the main circuit power supply is applied to other devices, resulting in insufficient power capacity and voltage drop.	
	Check whether H0b.26 (Bus voltage) is within the following range: 200 V servo drive: H0b.26 < 200 V. 400 V servo drive: H0b.26＜ 400 V. The fault persists after the main circuit is powered off and on repeatedly.	Replace the servo drive.
	Check the wiring of the main circuit.	Replace the cables and wire the power cables correctly Three-phase: RST /L1 L2 L3.

- E420.0: Main circuit phase loss
  Cause:

  Drive three-phase input phase abnormal.

Cause	Troubleshooting	Solution
1. The three-phase input cables are connected improperly.	Check whether RST cables on the drive side and non-drive side are in good condition and connected properly.	Replace the cables and connect the main circuit cables properly.
2. A single-phase power supply is used for a three-phase servo drive. 3. The three-phase power supply is unbalanced or the voltages of the three phases are too low.	Check the specifications of the power supply and measure whether the voltage input to the main circuit is within the following range: 220 V servo drive: Value range: 220 V–240 V Allowable deviation: –10% to +10% (198 V to 264 V) 380 V servo drive: Effective value: 380 to 440 V Allowable deviation: –10% to +10% (342 V to 484 V) Measure the voltages of all the three phases.	Servo drives of 0.75 kW (H01.10 = 5) can be supplied by single-phase power supplies. If the input voltage complies with the specifications, set H0A.00 (power input phase loss protection) to 2 (inhibit phase loss faults and alarms). If input voltage is outside the specified range, replace or adjust the power supply.

- E500.0: motor overspeed

  Cause:

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

Cause	Troubleshooting	Solution
1. The UVW phase sequence of the motor is incorrect.	Check whether the servo drive power cables are connected in the correct sequence at both ends.	Connect the UVW cables according to the correct sequence.
2. H0A.08 is set improperly.	Check whether the overspeed threshold is lower than the maximum speed. Overspeed threshold = 1.2 x Maximum motor speed (H0A.08 = 0) Overspeed threshold = H0A.08 (H0A.08 ≠ 0, and H0A.08 < 1.2 x Maximum motor speed)	Re-set the overspeed threshold according to the mechanical requirements.
3. The input reference exceeds the overspeed threshold.	Check whether the motor speed corresponding to the input reference exceeds the overspeed threshold. Check the speed setpoint and speed threshold.	Decrease the speed or increase the overspeed threshold (H0A.08).
4. The motor speed overshoots.	Check whether the speed feedback exceeds the overspeed threshold by using Inovance servo commissioning software.	Adjust the gain or mechanical running conditions.
5. The servo drive is faulty.	The fault persists after the servo drive is powered off and on again.	Replace the servo drive.

Cause	Troubleshooting	Solution
6. Encoder data error.	Check whether there is interference, whether encoder type selection is incorrect, or whether encoder parameter settings are incorrect.	• Take interference shielding measures, such as magnetic rings and shielding cables. • Check whether the encoder type is selected correctly. If not, replace the encoder type correctly. • Set the encoder parameters properly according to encoder manual.
7. The selected motor type is incorrect.	Check whether the type of the motor is set improperly. For example, the linear motor is set to a rotary motor or the rotary motor is set to a linear motor.	Replace the actual motor with the correct type or change the value of H00.00 to the correct motor type.

- E500.1: Speed feedback overflow

  Cause:

  The FPGA speed measurement overflows.

Cause	Troubleshooting	Solution
1. FPGA internal speed overflows.	Check whether the servo drive power cables are connected in the correct sequence at both ends.	Connect the UVW cables according to the correct sequence.
2. The motor speed overshoots.	Check whether the speed feedback exceeds the overspeed threshold by using Inovance servo commissioning software. Overspeed threshold: 16384 RPM for a rotary motor	Adjust the gain or mechanical running conditions.
3. Encoder data error.	Check whether there is interference, whether encoder type selection is incorrect, or whether encoder parameter settings are incorrect.	• Take interference shielding measures, such as magnetic rings and shielding cables. • Check whether the encoder type is selected correctly. If not, replace the encoder type correctly. • Set the encoder parameters properly according to encoder manual.
4. The selected motor type is incorrect.	Check whether the type of the motor is set improperly. For example, the linear motor is set to a rotary motor or the rotary motor is set to a linear motor.	Replace the actual motor with the correct type or change the value of H00.00 to the correct motor type.

- E500.2: FPGA position feedback pulse overspeed

  Cause:

  The MCU has detected that the position feedback increment from the FPGA is too large.

Cause	Troubleshooting	Solution
1. The MCU has detected that the position feedback increment from the FPGA is too large.	Check whether the value of H0b.17 changes abruptly.	Modify the value of H0A.70 (Overspeed threshold), which is 0 by default. Use the maximum speed of the motor as the threshold for large feedback increment.
2. Encoder data error.	Check whether there is interference, whether encoder type selection is incorrect, or whether encoder parameter settings are incorrect.	• Take interference shielding measures, such as magnetic rings and shielding cables. • Check whether the encoder type is selected correctly. If not, replace the encoder type correctly. • Set the encoder parameters properly according to encoder manual.
3. The selected motor type is incorrect.	Check whether the type of the motor is set improperly. For example, the linear motor is set to a rotary motor or the rotary motor is set to a linear motor.	Replace the actual motor with the correct type or change the value of H00.00 to the correct motor type.

- E550.0: initial operation block number not exist

  Cause:

  The block number designated by PLC through POS_STW1.0–POS_STW1.5 is outside the range of 0 to 15 or is within this range but the attribute is set to "Invisible".

Cause	Troubleshooting	Solution
The block number designated by PLC through POS_STW1.0–POS_ STW1.5 is outside the range of 0 to 15 or is within this range but the attribute is set to "Invisible".	Check the block number selected and the attribute of this block number.	Rectify the operation block number of the initial segment or change the attribute to "Visible".

- E550.1: relative/absolute attribute of positioning or fixed stopper commands set improperly

  Cause:

  The relative/absolute attribute of the positioning or fixed stopper commands are set improperly.

Cause	Troubleshooting	Solution
The relative/absolute attribute of the positioning or fixed stopper commands are set improperly.	Check whether bit8–bit11 of the task mode (H28.16–H28.31) of current operation block is 0 or 1.	Set bit8–bit11 of the corresponding task mode of the positioning or fixed stopper to 0 to 1 (absolute or relative).

- E550.3: Task switch condition is set improperly.

  Cause:

  Task switch condition is set improperly.

Cause	Troubleshooting	Solution
Task switch condition is set improperly.	Check whether bit4–bit7 of the task mode (H28.16–H28.31) of current operation block is 0–5.	Set task mode bit4-bit7 properly.

- E550.7: Task type is selected improperly

  Cause:

The unsupported task type is selected.

Cause	Troubleshooting	Solution
The selected task type is not supported.	Check the task type selected by the corresponding block.	Set to a task type within the scope of support.

- E550.8: fixed stopper point not found

  Cause:

  The fixed stopper is not found within the range of the displacement reference.

Cause	Troubleshooting	Solution
The fixed stopper is not found within the range of the displacement reference.	Check whether the stopper is within the range of the operation reference.	Set the displacement reference (H27.17–H27.47) properly.

- E550.9: fixed stopper beyond the window

  Cause:

  The position feedback fluctuation exceeds the monitoring window (H28.64) after the fixed stopper is found.

Cause	Troubleshooting	Solution
The position feedback fluctuation exceeds the monitoring window (H28.64) after the fixed stopper is found.	Check whether H28.64 is set properly.	Set a proper monitoring window value.

- E551.1: program block stop exception

  Cause:

  The switchover condition for the last block is not "stop".

Cause	Troubleshooting	Solution
The switchover condition for the last block is not "stop".	Check whether bit4–7 of the task mode (H18.16–28.31) of the last block in operation is 0.	Setting switchover condition for the last block to "stop".

- E551.3: jump block not exist

  Cause:

  The block number designated by the jump task does not exist.

Cause	Troubleshooting	Solution
The block number designated by the jump task does not exist.	Check whether the setting range of corresponding task parameters (H28.32–H28.62) of the jump block is 0–15.	Set task parameters for the jump block properly.

- E551.4: Continuous position reference not supported in relative positioning

  Cause:

  Continuous position reference not supported in relative positioning

Cause	Troubleshooting	Solution
Continuous position reference enabled in relative positioning of telegram 111.	Check whether ConfigEPos_X8 (bit12 of POS_STW1) is 1.	Set bit12 of POS-STW1 to 0.

- E602.0: Angle auto-tuning failure

  Cause:

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

Cause	Troubleshooting	Solution
1. Locked-rotor occurred in mechanical equipment.	Stop the motor and push it to check whether locked-rotor occurred.	If yes, eliminate the problem and perform angle auto-tuning (phase sequence auto-tuning) again.
2. The data fed back by the encoder is abnormal.	Push the motor and observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement?	If you determine that the feedback data of the encoder is abnormal, replace the encoder and perform angle auto-tuning (phase sequence auto-tuning) again.
3. U, V and W power cables are incorrectly connected or disconnected.	Check the wiring. Use a multimeter to check wire breakage.	If any improper connection is found, reconnect the cables perform angle auto-tuning (phase sequence auto-tuning) again.
4. The drive/motor is faulty.	If none of the above solves the problem, contact the manufacturer.	If none of the above solves the problem, contact the manufacturer.

- E602.1: Angle auto-tuning overtravel

  Cause:

  Angle auto-tuning overtravel.

Cause	Troubleshooting	Solution
The moving distance during angle auto-tuning is too large. 1. The setting of auto-tuning parameters does not match the load characteristics, and large impact occurred during auto-tuning, resulting in an overtravel alarm. 2. The data fed back by the encoder is abnormal. A false alarm is raised.	• Check whether the displacement is really too large, and whether overtravel is caused by the setting of auto-tuning parameters. • Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is the feedback operation continuous? Is the observed displacement consistent with the actual displacement?	• If the movement during auto-tuning is too large, the overtravel can be avoided by manually reducing the current rising slope (H32.21 closed-loop pre-positioning method) (H32.31 position locking method) or the maximum auto-tuning current (H32.20 closed-loop pre-positioning method) (H32.30 position locking method). • If the encoder feedback data is abnormal, replace the encoder, and then identify the angle/ phase sequence again.

- E602.2: U/V/W phase sequence reversed

  Cause:

  A wrong U/V/W phase sequence is detected during angle auto-tuning.

Cause	Troubleshooting	Solution
The system indicates the UVW wiring is wrong to avoid the motor from losing control.	Check U/V/W wiring through phase sequence auto-tuning.	• After phase sequence is corrected, perform angle auto-tuning again. • Exchange cables of any two phases and perform angle auto-tuning again.

- E602.3: Large encoder jitter during angle auto-tuning
  Cause:

  Large encoder jitter during angle auto-tuning

Cause	Troubleshooting	Solution
Encoder feedback data has large jitter.	Check whether the encoder jitters abnormally at standstill.	• Check the wiring of the encoder. • Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. • Manually increase H32.14/ H32.16 (inching angle auto-tuning) and H32.34/H32.36 (position locking angle auto-tuning).

- E602.4: Auto-tuning failed. Auto-tuning timeout.
  Cause:

  Auto-tuning failed. Auto-tuning timeout.

Cause	Troubleshooting	Solution
If the angle auto-tuning process is not completed in 30 seconds, a timeout alarm is raised. 1. Due to external disturbance (such as vibration of other parts on the bench), the completion condition of angle auto-tuning cannot be met. 2. The feedback data of the encoder is subjected to poor characteristics, interference or anomaly, and the completion condition of angle auto-tuning cannot be met.	• Check for vibrating parts on the bench. • Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement? Is there abnormal jitter during standby?	• Check whether the encoder cable shield is connected properly. If the encoder data is abnormal, replace the encoder, and then auto-tune the angle/ phase sequence again. • Adjust the angle auto-tuning parameters properly and reduce the completion conditions of angle auto-tuning. For example, you can increase the operation/ standstill evaluation threshold of angle auto-tuning as appropriate.

- E602.5: Angle auto-tuning failed. Z signal not found.
  Cause:

  Angle auto-tuning failed. Z signal not found.

Cause	Troubleshooting	Solution
1. The encoder configuration is incorrect. The connected motor encoder has no Z signal.	Check whether the encoder has a Z signal.	Check the wiring of the encoder. Ensure the shielded cables are effectively connected. Check the polarity configuration of Z signal. If the encoder data is abnormal, replace the encoder and then identify the angle again.
2. The Z signal polarity is set incorrectly.	Check if the polarity of the Z signal is configured correctly. Check bit 13 of H00.26.	
3. The data fed back by the encoder is abnormal. No Z signal is present.	Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement?	

- E602.6: Angle auto-tuning does not converge

  Cause:

  Angle auto-tuning does not converge.

Cause	Troubleshooting	Solution
1. External disturbance (such as vibration of other parts on the bench) is present. 2. Parameters are set incorrectly.	Check for vibrating parts on the bench. Check whether the angle gain is set too large.	• Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. • For the position lock method, you can reduce the angle gain (H32.37) manually. • For the jog method, you can manually reduce the operation evaluation threshold (H32.13/ H32.15) or increase the standstill evaluation threshold (H32.14/H32.16).

- E605.0: Motor speed too high upon S-ON

  Cause:

  The motor speed exceeds the rated speed when the servo drive in size A/B is switched on.

Cause	Troubleshooting	Solution
The motor speed exceeds the rated speed when the servo drive is switched on.	Check if the drive is enabled when the motor has been driven.	Switch on the drive when the motor is standstill.

- E612.0: Rotor locked during phase sequence auto-tuning

  Cause:

  Locked-rotor occurred during phase sequence auto-tuning.

Cause	Troubleshooting	Solution
1. Locked-rotor occurred in mechanical equipment.	Stop the motor and push it to check whether locked-rotor occurred.	If yes, eliminate the problem and perform angle auto-tuning (phase sequence auto-tuning) again.
2. The data fed back by the encoder is abnormal.	Push the motor and observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement?	If you determine that the feedback data of the encoder is abnormal, replace the encoder and perform angle auto-tuning (phase sequence auto-tuning) again.
3. U, V and W power cables are incorrectly connected or disconnected.	Check the wiring. Use a multimeter to check wire breakage.	If any improper connection is found, reconnect the cables perform angle auto-tuning (phase sequence auto-tuning) again.
4. The drive/motor is faulty.	If none of the above solves the problem, contact the manufacturer.	If none of the above solves the problem, contact the manufacturer.

- E612.1: Overtravel occurred during phase sequence auto-tuning

  Cause:

  Overtravel occurred during phase sequence auto-tuning.

Cause	Troubleshooting	Solution
1. The setting of auto-tuning parameters does not match the load characteristics, and large impact occurred during auto-tuning, resulting in an overtravel alarm.	Check whether the displacement is really too large, and whether overtravel is caused by the setting of auto-tuning parameters.	If the movement during auto-tuning is too large, you can manually reduce the current rising slope (H32.21).
2. The data fed back by the encoder is abnormal. A false alarm is raised.	Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is the feedback operation continuous? Is the observed displacement consistent with the actual displacement?	If the encoder feedback data is abnormal, replace the encoder, and then identify the angle/phase sequence again.

- E612.3: Large encoder jitter during phase sequence auto-tuning

  Cause:

  Large encoder jitter during phase sequence auto-tuning.

Cause	Troubleshooting	Solution
Encoder feedback data has large jitter.	Check whether the encoder jitters abnormally at standstill.	Check the wiring of the encoder. Check for external electromagnetic interference. Install a magnetic ring and use shielded cables as necessary. Manually increase H32.24/H32.25.

- E612.4: Phase sequence auto-tuning failed. Auto-tuning timeout.

Cause:

Phase sequence auto-tuning failed. Auto-tuning timeout.

Cause	Troubleshooting	Solution
1. If the phase sequence auto-tuning process is not completed in 30 seconds, a timeout alarm is raised. 2. Due to external disturbance (such as vibration of other parts on the bench), the completion condition of angle auto-tuning cannot be met. 3. The feedback data of the encoder is subjected to poor characteristics, interference or anomaly, and the completion condition of angle auto-tuning cannot be met.	Check for vibrating parts on the bench. Observe the encoder with the oscilloscope in InoDriverShop. You can determine whether the encoder feedback is abnormal by the following criteria: Is there feedback? Is the feedback data continuous? Is the observed displacement consistent with the actual displacement? Is there abnormal jitter during standby?	Check whether the encoder cable shield is connected properly. If the encoder data is abnormal, replace the encoder, and then auto-tune the phase sequence again. Adjust the phase sequence auto-tuning parameters properly and reduce the completion conditions of the auto-tuning. For example, you can increase the operation/standstill evaluation threshold as appropriate.

- E620.0: Motor overload

  Cause:

  The accumulative heat of the motor reaches the fault threshold.

Cause	Troubleshooting	Solution
1. The motor and encoder cables are connected improperly.	Check the wiring between the servo drive, servo motor and the encoder according to the correct “wiring diagram”.	Connect cables according to the correct wiring diagram. It is recommended to use the cables provided by Inovance. When customized cables are used, prepare and connect the customized cables according to the wiring instructions.
2. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque.	Check the overload characteristics of the servo drive or servo motor. Check whether the average load rate (H0b.12) of the servo drive keeps exceeding 100.0%.	Use a servo drive of higher capacity and a matching servo motor. Reduce the load and increase the acceleration/deceleration time.
3. The acceleration/deceleration is too frequent or the load inertia is too large.	Calculate the mechanical inertia ratio or perform inertia auto-tuning. View the value of H08.00 (Load moment of inertia ratio). Confirm the individual operation cycle when the servo motor operates cyclically.	Increase the acceleration/deceleration time during single-cycle running.
4. Gains are improper or the stiffness level is too high.	Check whether the motor vibrates and generates unusual noise during operation.	Readjust the gain.

Cause	Troubleshooting	Solution
5. The servo drive model or motor model is set improperly.	Check the motor model (H00.00) and drive model (H01.10) stored in the bus encoder.	Check the servo drive nameplate and set the servo drive model (H01.10) and motor model properly according to section "Servo Drive Model and Nameplate" in SV680F-INT Series Servo Drive Hardware Guide.
6. The motor stalls due to mechanical factors, resulting in overload during operation.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter) • References in the speed control mode: H0b.01 (Speed reference) • References in the torque control mode: H0b.02 (Internal torque reference) Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
7. The servo drive is faulty.	The fault persists after the servo drive is powered off and on again.	Replace the servo drive.

Note

When this fault occurs, stop the drive for at least 30s before further operations.

- E620.1: Overload current limit mode, motor overloaded

  Cause:

  Overload current limit mode, motor overloaded.

Cause	Troubleshooting	Solution
1. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque.	• Confirm the overload characteristics of the servo drive or motor. • Check whether the average load rate (H0b.12) keeps exceeding 100.0%.	• Replace with a servo drive of higher capacity and a matching servo motor. • Reduce the load and increase the acceleration/deceleration time.
2. The acceleration/deceleration is too frequent or the load inertia is too large.		
3. The motor and encoder cables are connected improperly.		
4. Gains are improper or the stiffness level is too high.		
5. The motor stalls due to mechanical factors, resulting in overload during operation.		
6. The servo drive is faulty.		

- E621.0: Overload current limiting torque attained

  Cause:

Overload current limiting torque is attained.

Cause	Troubleshooting	Solution
1. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque.	Confirm the overload characteristics of the servo drive or motor. Check whether the average load rate (H0b.12) keeps exceeding 100.0%. Detect whether the value of H32.78 is set too high.	• Replace with a servo drive of higher capacity and a matching servo motor. • Reduce the load and increase the acceleration/deceleration time.
2. The acceleration/deceleration is too frequent or the load inertia is too large.		
3. The motor and encoder cables are connected improperly.		
4. Gains are improper or the stiffness level is too high.		
5. The motor stalls due to mechanical factors, resulting in overload during operation.		
6. The servo drive is faulty.		

- E630.0: motor rotor locked over-temperature

  Cause:

  The actual motor speed is lower than 10rpm but the torque reference reaches the limit, and such status lasts for the time defined by H0A.32.

Cause	Troubleshooting	Solution
1. U/V/W output phase loss, wire breakage or incorrect phase sequence occurs on the servo drive.	Perform motor trial run without load and check cable connections and the phase sequence.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The motor parameters (especially the number of pole pairs) are set improperly, or motor angle auto-tuning is not performed, or motor power is greater than drive power.	View parameters in group H00 to check whether the number of pole pairs are set properly. Perform angle auto-tuning on the motor several times and check whether the value of H00.28 is consistent during angle auto-tuning. Check whether the motor and drive match in the power.	Modify motor parameter values or replace the drive.

Cause	Troubleshooting	Solution
3. The communication commands are being disturbed.	Check whether jitter occurs on the commands sent from the host controller and whether EtherCAT communication is being disturbed.	Check whether the communication line between the host controller and the servo drive is being disturbed.
4. The motor is stalled due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter) • References in the speed control mode: H0b.01 (Speed reference) • References in the torque control mode: H0b.02 (Internal torque reference) Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode. Check the current feedback (torque reference) waveform.	Check whether any mechanical part gets stuck or eccentric.

Note

When this fault occurs, stop the drive for at least 30s before further operations.

- E631.1: 24 V or brake not connected

  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
The brake or the 24 power supply is not connected when the internal brake feature is used.	Check whether 24 V power supply or the brake is not connected when H02.16 is set to 1.	If you use the internal brake, connect the brake cable and 24 power supply.
2. DO or VDO configuration 9: Brake function, and the function is not enabled by H04.24.	2. DO or VDO configuration 9: Brake function, and H04.24 = 0.	If you use a DO brake, set H0E-10 to 1.

- E631.2: P-MOS open circuit

  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, P-MOS open circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	Replace the servo drive. Turn off the brake switch H02.16.

- E631.3: N-MOS open circuit

  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, N-MOS open circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	Replace the servo drive. Turn off the brake switch H02.16.

- E640.0: IGBT over-temperature

  Cause:

  The IGBT temperature reaches the fault threshold defined by H0A.18.

Cause	Troubleshooting	Solution
1. The ambient temperature is too high.	Measure the ambient temperature and view the fault records (set H0b.33 and view H0b.34) to check whether an overload fault/alarm is reported (E620.0, E630.0, E650.0, A909.0, A920.0, A922.0).	Improve the cooling conditions of the servo drive to lower down the ambient temperature. Change the fault reset method. After overload occurs, wait for 30s before reset. Increase the capacities of the servo drive and servo motor. Increase the acceleration/deceleration time and reduce the load.
2. The servo drive is restarted repeatedly to reset the overload fault.		
3. The fan is damaged.	Check whether the fan works properly during operation.	Replace the servo drive.
4. The servo drive is installed in a wrong direction and the clearance between servo drives is improper.	Check whether the servo drive is installed properly.	Install the servo drive according to the installation requirements.
5. The servo drive is faulty.	The fault persists even though the servo drive is restarted five minutes after power-off.	Replace the servo drive.

Note

When this fault occurs, stop the drive for at least 30s before further operations.

- E640.1: Flywheel diode overtemperature

  Cause:

  The temperature of the flywheel diode reaches the fault threshold defined by H0A.18.

Cause	Troubleshooting	Solution
1. The ambient temperature is too high. 2. The servo drive is restarted repeatedly to reset the overload fault.	Measure the ambient temperature and view the fault records (set H0b.33 and view H0b.34) to check whether an overload fault/alarm is reported (E620.0, E630.0, E650.0, A909.0, A920.0, A922.0).	Improve the cooling conditions of the servo drive to lower down the ambient temperature. Change the fault reset method. After overload occurs, wait for 30s before reset. Increase the capacities of the servo drive and servo motor. Increase the acceleration/deceleration time and reduce the load.
3. The fan is damaged.	Check whether the fan works properly during operation.	Replace the servo drive.

Cause	Troubleshooting	Solution
4. The servo drive is installed in a wrong direction and the clearance between servo drives is improper.	Check whether the servo drive is installed properly.	Install the servo drive according to the installation requirements.
5. The servo drive is faulty.	The fault persists even though the servo drive is restarted five minutes after power-off.	Replace the servo drive.

Note

When this fault occurs, stop the drive for at least 30s before further operations.

- E650.0: Heatsink overtemperature

  Cause:

  The temperature of the servo drive power module is higher than the overtemperature threshold.

Cause	Troubleshooting	Solution
1. The ambient temperature is too high. 2. The servo drive is restarted repeatedly to reset the overload fault.	Measure the ambient temperature. View the fault log. (set H0b.33 and view H0b.34). Check whether an overload fault or alarm (E620.0, E630.0, E650.5, A909.0, A920.0, A922.0) occurs.	Improve the cooling conditions of the servo drive to lower down the ambient temperature. Change the fault reset method. After overload occurs, wait for 30s before reset. Increase the capacities of the servo drive and servo motor. Increase the acceleration/deceleration time and reduce the load.
3. The fan is damaged.	Check whether the fan works properly during operation.	Replace the servo drive.
4. The servo drive is installed in a wrong direction and the clearance between servo drives is improper.	Check whether the servo drive is installed properly.	Install the servo drive according to the installation requirements.
5. The servo drive is faulty.	The fault persists even though the servo drive is restarted five minutes after power-off.	Replace the servo drive.

Note

When this fault occurs, stop the drive for at least 30s before further operations.

- E660.0: Motor overtemperature

  Cause:

  - The temperature of the air-cooled motor is too high.
  - PTC was turned on by mistake through H00.26.

Cause	Troubleshooting	Solution
• The temperature of the air-cooled motor is too high. • PTC was turned on by mistake through H00.26.	Measure whether the temperature of the air-cooled motor is too high. Check whether PTC is enabled on the drive, but the motor has no PTC hardware. Or check whether PTC is connected properly. For an Inovance motor, the temperature threshold is 130°C. For a third-party motor, measure the PTC resistance and determine the motor temperature based on the resistance specifications.	• Cool the motor down. • Check whether PTC is enabled on the drive, but the motor has no PTC hardware. • Check whether PTC is connected properly.

- E661.0: STune failure

  Cause:

  During STune operation, the gain drops to the lower limit. Position loop gain < 5 Speed loop gain < 5 Model loop gain < 10.

Cause	Troubleshooting	Solution
During ETune operation, the gain drops to the lower limit: Position loop gain < 5 Speed loop gain < 5 Model loop gain < 10.	Check if vibration resonance is properly suppressed in the system. The torque vibration amplitude exceeds the setpoint of H09.11.	Set the notch manually. Modify the electronic gear ratio to improve the command resolution, or increase the command filter time constant or in the parameter configuration interface. Check whether the current of the machine fluctuates periodically. Set H09.58 to 1 to clear resonance suppression parameters, and perform STune again.

- E662.0: ETune failure

  Cause:

  Check whether resonance that occurred during ETune operation cannot be suppressed.

Cause	Troubleshooting	Solution
Check whether resonance that occurred during ETune operation cannot be suppressed.	Check whether there is abnormal noise or torque fluctuation during operation.	Set the notch manually when vibration cannot be suppressed automatically. Modify the electronic gear ratio to improve the command resolution, increase the command filter time constant or in the parameter configuration interface. Increase the value of H09.11 as appropriate. Check whether the current of the machine fluctuates periodically. Check whether the positioning threshold is too low. Increase the reference acceleration/ deceleration time.

- E664.0: Resonance too strong
  Cause:

  Resonance occurs on the servo system and the torque fluctuation amplitude is higher than the value of H09.54.

Cause	Troubleshooting	Solution
Resonance occurs on the servo system and the torque fluctuation amplitude is higher than the value of H09.54.	Check whether there is abnormal noise or torque fluctuation during operation.	Check whether the inertia ratio or loop gain parameters are set properly. Check whether resonance parameters are set properly. Increase the value of H09.54 or set H09.54 to 0 to disable this function.

- E720.0: Wrong encoder interface
  Cause:

  The drive does not support the selected encoder interface.

Cause	Troubleshooting	Solution
The drive does not support the selected encoder interface.	Check whether H32.01 and H0F.06 are set properly. If the gantry function is turned on, check whether the gantry function conflicts with the master encoder or full closed-loop encoder setting.	Check whether the signal cable required by the current encoder interface scheme exceeds the upper limit of a single interface. Modify H32.01 and H0F.01.

- E731.0: Encoder multi-turn data lost
  Cause:

  Encoder multi-turn data is lost.

Cause	Troubleshooting	Solution
1. The battery of the first encoder is not connected during power-off.	Check whether the battery is connected during power-off.	Set H0d.20 to 1 to clear the fault.
2. The battery voltage of the first encoder is lower than 2.9 V.	Measure the battery voltage.	Use a new battery with the matching voltage.
3. The first encoder is interfered with by a strong magnetic field.	Check whether the encoder is in a strong magnetic field.	Remove the magnetic field and set H0d.20 to 1 to clear the error.
4. The encoder cable is removed when energized.	Check whether the encoder communication cable is removed with the drive powered on.	Do not remove the encoder cable when the drive is powered on. Set H0d.20 = 1 to clear the fault.

- E731.1: Inovance second encoder multi-turn data lost
  Cause:

  Inovance 2nd encoder multi-turn data is lost.

Cause	Troubleshooting	Solution
1. The battery of the Inovance second encoder is not connected during power-off.	Check whether the battery is connected during power-off.	Set H0d.20 to 3 to clear the fault.
2. The Inovance second encoder battery voltage is lower than 2.9 V.	Measure the battery voltage.	Use a new battery with the matching voltage.
3. The Inovance second encoder is interfered with by a strong magnetic field.	Check whether the encoder is in a strong magnetic field.	Remove the magnetic field and set H0d.20 to 3 to clear the error.

- E733.0: Encoder multi-turn counting error
  Cause:

  An encoder multi-turn counting error occurs.

Cause	Troubleshooting	Solution
The encoder is faulty.	Set H0d.20 to 2 to clear the fault, but E733.0 persists after restart.	Replace the motor.

- E733.1: Inovance 2nd encoder multi-turn counting error.
  Cause:

  Inovance second encoder multi-turn counting error

Cause	Troubleshooting	Solution
Inovance 2nd encoder error	Set H0d.20 to 3 to clear the fault, but E733.1 persists after restart.	Replace the motor.

- E735.0: Encoder multi-turn counting overflow
  Cause:

  A multi-turn counting overflow occurs on the absolute encoder.

Cause	Troubleshooting	Solution
The number of forward revolutions exceeds 32767 or the number of reverse revolutions exceeds 32768.	Check whether the value of H0b.70 (Number of absolute encoder revolutions) is 32767 or 32768 when the servo drive works in the absolute linear mode (H02.01 = 1).	Set H0d.20 to 2 to power on again. Perform homing if necessary.

- E740.0: Absolute encoder communication timeout
  Cause:

  Communication timeout occurs on the absolute encoder.

Cause	Troubleshooting	Solution
The communication between the servo drive and the encoder times out.	Check the wiring of the encoder and power on the servo drive again.	Check whether the encoder version (H00.04) is set properly. Check whether the servo drive software version (H01.00). Check the encoder wiring. Replace the servo motor.

- E740.2: Absolute encoder error
  Cause:

  A communication error occurs on the RX side of the encoder.

Cause	Troubleshooting	Solution
An error occurs on the communication between the servo drive and the encoder.	Check whether the value of H0b.28 is not 0.	Check whether H00-00 (motor SN) is set properly. Check whether encoder cables are connected properly. Check whether the servo drive and motor are grounded properly. You can wind a magnetic ring on the encoder cable to reduce interference.

- E740.3: Absolute encoder single-turn calculation error

  Cause:

  Internal fault of the encoder.

Cause	Troubleshooting	Solution
Internal fault of the encoder.	Check whether bit7 of H0b.28 is set to 1.	Check whether the encoder version (H00-04) is proper. Check whether encoder cables are in proper condition. Replace the motor.

- E740.6: Encoder data write error

  Cause:

  The attempt to write the encoder data fails.

Cause	Troubleshooting	Solution
1. An error occurs during writing the position offset after angle/ phase sequence auto-tuning.	Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	Use a new encoder cable. If the fault persists after the encoder cable is replaced, the encoder may be faulty. In this case, replace the servo motor.
2. The auto-tuning parameters failed to be written after resistance and inductance auto-tuning.		
3. The current loop gain fails to write after the current loop auto-tuning.		

- E740.9: Encoder data transmit delay is too long

  Cause:

  The encoder data transmit delay is set to exceed one current loop period.

Cause	Troubleshooting	Solution
1. The value of H01.59 is set too large.	Power off and restart the drive.	Decrease the value of H01.59.
2. Too many encoder data bits.		Use an encoder with fewer data bits.

- E760.0: Encoder overtemperature

  Cause:

  The temperature of the absolute encoder is too high.

Cause	Troubleshooting	Solution
The temperature of the absolute encoder is too high.	Measure the encoder temperature or the motor temperature, which must not exceed 120°C. Note that you are measuring the temperature of the housing, which is is 20°C to 40°C lower than the internal temperature.	Switch off the S-ON signal to wait for the encoder to cool down.

- E765.0: 3rd party encoder over-temperature or overspeed

Cause	Troubleshooting	Solution
Motor overtemperature	Check if the ambient temperature or the average load rate is too high. Check the motor for overspeed.	Switch off the S-ON signal to wait for the encoder to cool down.

- E770.0: Fully-closed input phase A wire breakage

  Cause:

  Fully-closed phase A input differential voltage wire breakage.

Cause	Troubleshooting	Solution
Fully-closed phase A input differential voltage wire breakage.	Measure the phase A differential voltage to check if it is below 2.5 V.	Adjust the fully-closed loop phase A input voltage.

- E770.1: Fully-closed input phase B wire breakage

  Cause:

  Fully-closed phase B input differential voltage wire breakage.

Cause	Troubleshooting	Solution
Fully-closed phase B input differential voltage wire breakage.	Measure the phase B differential voltage to check if it is below 2.5 V.	Adjust the fully-closed loop phase B input voltage.

- E770.2: Fully-closed input phase Z wire breakage

  Cause:

  Fully-closed phase Z input differential voltage wire breakage.

Cause	Troubleshooting	Solution
Fully-closed phase Z input differential voltage wire breakage	Measure the phase Z differential voltage to check if it is below 2.5 V.	Adjust the fully-closed loop phase Z input voltage.

- E770.3: fully closed-loop external loop encoder communication timeout

  Cause:

  Fully closed-loop external loop encoder communication timeout.

Cause	Troubleshooting	Solution
Fully closed-loop external loop encoder communication timeout.	Check the wiring.	Check the wiring.

- E770.6: Fully closed-loop Inovance 2nd encoder initialization communication error

  Cause:

  The Inovance second encoder failed to initialize.

Cause	Troubleshooting	Solution
1. The encoder cable connections are incorrect or loosened.	Check encoder wiring. Check for strong vibration, which loosens the encoder cable and even damages the encoder.	Connect the encoder cables according to the correct wiring diagram. Re-connect encoder cables and ensure encoder terminals are connected securely.
2. The servo drive is faulty.	The fault persists after the servo drive is restarted.	Replace the servo drive.

- E770.7: Fully closed-loop 2nd encoder communication error

  Cause:

  Second encoder communication failed.

Cause	Troubleshooting	Solution
1. The encoder is wired improperly. 2. The encoder cable is connected loosely. 3. The encoder Z signal suffers from interference. 4. The encoder is faulty. 5. Check whether H0F.29–H0F.33 are set correctly.	Check encoder wiring. Check for strong vibration, which loosens the encoder cable and even damages the encoder. Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. Check whether ambient devices are generating interference and whether multiple interference sources are present in the cabinet. Make servo drive stay in "Rdy" status and rotate motor shaft counterclockwise (CCW) manually and observer whether H0b.17 (electrical angle) increases/ decreases smoothly. Turning one circle corresponds to five 0–360° (for Z series motors). For X series motors, turning one circle corresponds to four 0–360°. If H0b.17 changes abnormally during motor rotating, the encoder is faulty. If no alarm is reported during motor shaft rotating but an alarm is reported during servo drive running, interference may exist. Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change. Check the encoder manual to see if H0F.29–H0F.33 are set to the correct values.	Connect the cables again according to the correct wiring diagram. Connect the cables again and ensure encoder terminals are connected securely. It is recommended to use the cables provided by Inovance. If a customized cable is used, check whether this cable is a shielded twisted pair cable that complies with the specifications. Route the motor cables and encoder cables through different routes. Ensure the servo motor and servo drive are grounded properly. Check whether the connectors at both ends of the encoder are in good contact and whether any pin retracts. Use a new encoder cable. If the fault persists after encoder cables are replaced, the encoder may be faulty. In this case, replace the servo motor. Check the encoder manual to see if H0F.29–H0F.33 are set to the correct values.

- E770.8: Full closed-loop encoder data transmit delay is too large

  Cause:

  The encoder data transmit delay is set to exceed one current loop period.

Cause	Troubleshooting	Solution
1. The value of H01.59 is set too large.	Power off and restart the drive.	Decrease the value of H01.59.
2. Too many encoder data bits.		Use an encoder with fewer data bits.

- E939.0: Motor power cable disconnected

  Cause:

  At least one phase of the motor is disconnected.

Cause	Troubleshooting	Solution
1. One or two phases of the motor power cable are disconnected. 2. The actual current loop gain is set improperly.	Check the wiring of U/V/W power cables. The power cable is not disconnected. The current feedback and torque reference follow are abnormal. Perform inductive resistance auto-tuning and current loop auto-tuning again.	Check whether the power cables are disconnected or in poor contact. Re-connect the power cables. Replace the servo motor. Perform inductive resistance auto-tuning and current loop auto-tuning again.

- E950.0: Forward overtravel

  Cause:

  The logic of the DI allocated with FunIN.14: P-OT (positive limit switch) is valid.

Cause	Troubleshooting	Solution
1. The logic of the DI assigned with FunIN.14 (P-OT function 14, positive limit switch) is effective.	Check whether a certain DI in group H03 is assigned with FunIN.14. Check whether the logic of DI corresponding to the bit of H0b.03 (Monitored DI status) is effective.	Check the running mode. On the prerequisite of safety, send a reverse command or rotate the motor to deactivate the logic of the DI terminal allocated with DI function 14.
2. The servo position feedback reaches the positive software position limit.	Check whether the position feedback (H0b.17) is close to the value of H0A.41. Check whether the software position limit is set in H0A.40.	Ensure the servo drive references are proper, allowing the load travel range to be within the software position limit.

- E952.0: Reverse overtravel

  Cause:

  The logic of the DI allocated with FunIN.15: N-OT (negative limit switch) is valid.

Cause	Troubleshooting	Solution
1. The logic of the DI assigned with FunIN.15 is effective.	Check whether a certain DI in group H03 is assigned with FunIN.15. Check whether the logic of DI corresponding to the bit of H0b.03 (Monitored DI status) is effective.	Check the operation mode. On the prerequisite of ensuring safety, send a forward run command or rotate the motor to deactivate the logic of DI assigned with FunIN.15.
2. The servo position feedback reaches the negative software position limit.	Check whether the position feedback (H0b.17) is close to the value of H0A.43. Check whether the software position limit is set in H0A.40.	Ensure the servo drive references are proper, allowing the load travel range to be within the software position limit.

- EA33.0: Encoder read/write check error

  Cause:

  Internal parameters of the encoder are abnormal.

Cause	Troubleshooting	Solution
1. The serial incremental encoder cable is disconnected or loose.	Check the wiring.	Check whether the encoder cables are connected incorrectly, disconnected, or in poor contact. If the motor cables and encoder cables are bundled together, separate them.
2) An error occurs when reading/ writing the RS485 encoder parameters.	If the fault persists after the servo drive is powered off and on repeatedly, the encoder is faulty.	Replace the servo motor.

- EA33.1: Fully closed-loop Inovance 2nd encoder data read/write error

  Cause:

  Internal parameters of the encoder are abnormal.

Cause	Troubleshooting	Solution
1. The serial incremental encoder cable is disconnected or loose.	Check the wiring.	Check whether the encoder cables are connected incorrectly, disconnected, or in poor contact. If the motor cables and encoder cables are bundled together, separate them.
2) An error occurs when reading/ writing the RS485 encoder parameters.	If the fault persists after the servo drive is powered off and on repeatedly, the encoder is faulty.	Replace the servo motor.

- EB00.0: Position deviation too large

  Cause:

  The position deviation in the position control mode is larger than the setpoint of H0A.10 (Threshold of excessive position deviation).

Cause	Troubleshooting	Solution
1. U/V/W output phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The servo drive U/V/W cables or the encoder cable is disconnected.	Check the wiring.	Connect the cables again. The servo drive power cables must be connected in the correct order at both ends. If necessary, replace all cables and ensure a reliable connection.

Cause	Troubleshooting	Solution
3. The motor stalls due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter) • References in the speed control mode: H0b.01 (Speed reference) • References in the torque control mode: H0b.02 (Internal torque reference) Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
4. The gain values are too low.	Check the position loop gain and speed loop gain of the servo drive. 1st gain set: H08.00...H08.02 2nd gain set: H08.03...H08.05	Adjust the gain values manually or perform gain auto-tuning.
5. The position reference increment is too large.	Position control mode: Check gear ratio H05.07, H05.09. Check target position and acceleration/deceleration ramp time or position increment.	Decrease acceleration or increase acceleration time or decrease position reference increment.
6. The value of H0A.10 is insufficient for the operating conditions.	Check the value of H0A.10.	Increase the setpoint of H0A.10.
7. The servo drive/motor is faulty.	Monitor the operation waveform through the oscilloscope function in the software tool: position references, position feedback, speed references, and torque references.	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB00.1: Position deviation overflow

  Cause:

  The position deviation is too large.

Cause	Troubleshooting	Solution
1. U/V/W output phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The servo drive U/V/W cables or the encoder cable is disconnected.	Check the wiring.	Connect the cables again. The servo drive power cables must be connected in the correct order at both ends. If necessary, replace all cables and ensure a reliable connection.

Cause	Troubleshooting	Solution
3. The motor stalls due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter). • References in the speed control mode: H0b.01 (Speed reference). • References in the torque control mode: H0b.02 (Internal torque reference). Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
4. The gain values are too low.	Check the position loop gain and speed loop gain of the servo drive. • 1st gain set: H08.00...H08.02 • 2nd gain set: H08.03...H08.05	Adjust the gain values manually or perform gain auto-tuning.
5. The position reference increment is too large.	Position control mode: Check gear ratio H05.07, H05.09. Check target position and acceleration/deceleration ramp time or position increment.	Decrease acceleration or increase acceleration time or decrease position reference increment.
6. The value of H0A.10 is insufficient for the operating conditions.	Check the value of H0A.10.	Increase the setpoint of H0A.10.
7. The servo drive/motor is faulty.	Monitor the operation waveform through the oscilloscope function in the software tool: position references, position feedback, speed references, and torque references.	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB02.0: Position deviation exceeding threshold in fully closed-loop

  Cause:

  The absolute value of position deviation in fully closed-loop mode exceeds the value of H0F.08 (Excessive position deviation threshold in fully closed-loop mode).

Cause	Troubleshooting	Solution
1. U/V/W output phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The servo drive U/V/W cables or the encoder cable is disconnected.	Check the wiring.	Connect the cables again. The servo drive power cables must be connected in the correct order at both ends. If necessary, replace all cables and ensure a reliable connection.

Cause	Troubleshooting	Solution
3. The motor stalls due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter). • References in the speed control mode: H0b.01 (Speed reference). • References in the torque control mode: H0b.02 (Internal torque reference). Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
4. The gain values are too low.	Check the position loop gain and speed loop gain of the servo drive. • 1st gain set: H08.00...H08.02 • 2nd gain set: H08.03...H08.05	Adjust the gain values manually or use gain auto-tuning.
5. The input pulse frequency is high.	When the position reference source is pulse reference, check whether the input pulse frequency is too high or whether the acceleration/ deceleration time is set to 0 or an excessively low value.	Reduce the position reference frequency or the electronic gear ratio. When the host controller is used to output position pulses, you can set the acceleration time in the host controller. If the acceleration/ deceleration time cannot be set in the host controller, increase the values of H05.04 and H05.06.
6. The value of H0F.08 is insufficient for the operating conditions.	Check the value of H0F.08.	Increase the setpoint of H0F.08.
7. The servo drive/motor is faulty.	Monitor the operation waveform through the oscilloscope function in the software tool: position references, position feedback, speed references, and torque references.	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB02.1: Fully closed-loop position deviation overflow

  Cause:

  The absolute value of the fully closed-loop position deviation is greater than 2^{31}.

Cause	Troubleshooting	Solution
1. UVW phase loss or incorrect phase sequence occurs on the servo drive.	Perform a no-load trial run on the motor and check the wiring.	Re-connect the cables according to the wiring diagram or replace the cables.
2. The servo drive UVW cables or the encoder cables are disconnected.	Check the wiring.	Connect the cables again. The drive power cables must be connected in the correct order at both ends. If necessary, replace all cables and ensure a reliable connection.

Cause	Troubleshooting	Solution
3. The motor stalls due to mechanical factors.	Check the reference and motor speed (H0b.00) through the software tool or keypad. • References in the position control mode: H0b.13 (Input position reference counter). • References in the speed control mode: H0b.01 (Speed reference). • References in the torque control mode: H0b.02 (Internal torque reference). Check whether the reference value is not 0 but the motor speed is 0 rpm in the corresponding mode.	Rectify the mechanical-related problem.
4. The gain values are too low.	Check the position loop gain and speed loop gain of the servo drive. • 1st gain set: H08.00...H08.02 • 2nd gain set: H08.03...H08.05	Adjust the gain values manually or perform gain auto-tuning.
5. The position reference increment is too large.	Position control mode: Check gear ratio H05.07, H05.09. Check target position and acceleration/deceleration ramp time or position increment.	Decrease acceleration or increase acceleration time or decrease position reference increment.
6. The value of H0F.08 is insufficient for the operating conditions.	Check the value of H0F.08.	Increase the setpoint of H0F.08.
7. The servo drive/motor is faulty.	Monitor the operating waveform using the oscilloscope function of Inovance commissioning software and check whether the operating waveform includes the following information: position reference, position feedback, speed reference, torque reference	If the position reference is not 0 but the position feedback is always 0, replace the servo drive or motor.

- EB03.0: Electronic gear ratio beyond the limit - H05.02

  Cause:

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

Cause	Troubleshooting	Solution
The electronic gear ratio converted by converted exceeds the maximum gear ratio or is less than the minimum gear ratio.	Check if the electronic gear ratio is within the range of 0.001–4000 × Encoder resolution/10000.	Change the value of H05.02.

- EB03.1: Electronic gear ratio beyond the limit - Electronic gear ratio 1

  Cause:

  The electronic gear ratio exceeds the limit: [0.001, 4000 × Encoder resolution/10000].

Cause	Troubleshooting	Solution
Electronic gear ratio 1 exceeds the maximum gear ratio or is less than the minimum gear ratio.	Check if electronic gear ratio 1 is within the range of 0.001–4000 × Encoder resolution/10000.	Change the values of H05.07/ H05.09.

- EB03.2: Electronic gear ratio beyond the limit - Electronic gear ratio 2

  Cause:

  Electronic gear ratio 2 exceeds the limit: [0.001, 4000 × Encoder resolution/10000].

Cause	Troubleshooting	Solution
Electronic gear ratio 2 exceeds the maximum gear ratio or is less than the minimum gear ratio.	Check if electronic gear ratio 2 is within the range of 0.001–4000 × Encoder resolution/10000.	Change the values of H05.11/ H05.13.

- EE01.0: PN system parameter error

  Cause:

  H24.04 fault number is greater than the PN fault buffer length.

Cause	Troubleshooting	Solution
H24.04 fault number is greater than the PN fault buffer length 63.	Check the value of H24.04.	Adjust the value of H24.04.

- EE03.0: communication timeout

  Cause:

  Communication frame is present between the host controller and the drive, but the drive is in the waiting state for communication.

Cause	Troubleshooting	Solution
Communication frame is present between the host controller and the drive, but the drive is in the waiting state for communication.	Check whether the PLC is in the normal operation state. Check whether the STP is used as the communication cable. Check whether the servo drive is well grounded. Check whether the communication cable is connected. If you use IRT mode, verify that the topology of the host controller is consistent with the actual connection. The PLC has too many axes, causing watchdog timeout.	Switch the PLC to normal operation state. Use the STP cable. Connect the cable according to the wiring instructions. Confirm that the host controller topology view connection is consistent with the actual situation. Increase the watchdog time.

- EE03.1: communication abnormal

  Cause:

  200P heartbeat check failure

Cause	Troubleshooting	Solution
The communication chip is faulty.	Check whether the PLC is in the normal operation state. Check whether the STP is used as the communication cable. Check whether the servo drive is well grounded. Check whether the communication cable is connected. If you use IRT mode, verify that the topology of the host controller is consistent with the actual connection. The PLC has too many axes, causing watchdog timeout.	Switch the PLC to normal operation state. Use the STP cable. Connect the cable according to the wiring instructions. Confirm that the host controller topology view connection is consistent with the actual situation. Increase the watchdog time.

- EE08.0: PLC synchronization lost

  Cause:

  When the network is in the OP state, the synchronization signal SYNC is turned off.

Cause	Troubleshooting	Solution
The bit10 of PLC control word changes after the servo drive is enabled in host controller control mode.	Check whether STW1.bit10 (Encoder feedback mode) is set to 0 (Internal/External encoder feedback switchover at electronic gear ratio switchover).	If STW1.bit10 is 0, set bit10 to 1.

- EE08.1: PLC stopped

  Cause:

  The servo drive is in the enabled state, and the network state is switched from OP to another state.

Cause	Troubleshooting	Solution
The PLC stops during synchronous communication.	Check whether the PLC is in the normal operation state. Check whether the STP is used as the communication cable. Check whether the servo drive is well grounded. Check whether the communication cable is connected.	Switch the PLC to normal operation state. Use the STP cable. Connect the cable according to the wiring instructions.

- EE08.7: Abnormal heartbeat

  Cause:

  During synchronous communication, the upper controller sends an abnormal heartbeat.

Cause	Troubleshooting	Solution
The heartbeat is abnormal during synchronous communication.	Check whether the STP is used as the communication cable. Check whether the servo drive is well grounded. Check the value of H29.01.	• Use the STP cable. • Connect the cable according to the wiring instructions.

- EE08.8: No network connection during synchronous communication

Cause:

The network is not connected during synchronous communication.

Cause	Troubleshooting	Solution
The network is not connected during synchronous communication.	Check whether the STP is used as the communication cable. Check whether the servo drive is well grounded. Check whether the communication cable is connected.	• Use the STP cable. • Connect the cable according to the wiring instructions.

- EE08.9: LAN cable disconnected

  Cause:

  The LAN cable is disconnected during synchronous communication.

Cause	Troubleshooting	Solution
The LAN cable is disconnected during synchronous communication.	Check whether the STP is used as the communication cable. Check whether the servo drive is well grounded. Check whether the communication cable is connected.	• Use the STP cable. • Connect the cable according to the wiring instructions.

- EE09.0: Software position limit setting error

  Cause:

  The lower limit of the software limit is equal to or larger than the upper limit.

Cause	Troubleshooting	Solution
The lower limit of the software limit is equal to or larger than the upper limit.	Check the values of H0A.41 and H0A.43.	Reset the values of H0A.43 and H0A.41 and ensure the former is smaller than the latter.

- EE09.1: Home setting error

  Cause:

  The home offset exceeds the upper/lower limit.

Cause	Troubleshooting	Solution
1. When soft limit is enabled, the home offset is outside the soft limits H0A.41 and H0A.43. 2. When the soft limit is not enabled, the home offset is outside the upper and lower limits of the rotation mode.	H0A.01 is non-0 and the home offset is outside the soft limit value. H0A.01 is 0 and the home offset is outside the mechanical single-turn upper/lower limit when the encoder works in the rotation mode.	Set the home offset to a value within the software position limit.

- EE11.1: EEPROM read failure

  Cause:

  Failed to communicate with the plug-in EEPROM.

Cause	Troubleshooting	Solution
Failed to read data in EEPROM.	This fault persists after the servo drive is powered off and on several times.	Replace the servo drive.

- EE11.2: EEPROM update failure
  Cause:

  The communication is normal but the message in the EEPROM is wrong or lost.

Cause	Troubleshooting	Solution
Failed to update data in EEPROM.	This fault persists after the servo drive is powered off and on several times.	Replace the servo drive.

- EE12.0: Parallel port detection error
  Cause:

  Peripheral initialization failed during power-on initialization.

Cause	Troubleshooting	Solution
1. The internal chip is faulty.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.

- EE13.0: PN synchronization cycle setting error
  Cause:

  The synchronization period is not an integer multiple of 125 μs or 250 μs after the network switches to the OP mode.

Cause	Troubleshooting	Solution
The synchronization cycle is not a integral multiple of 125 μs or 250 μs.	Check the setting of the synchronization period in the controller.	Modify the synchronization cycle to an integral multiple of 125 μs or 250 μs.

- EE15.0: Excessive deviation of the PN synchronization signal
  Cause:

  The synchronization cycle error exceeds the threshold.

Cause	Troubleshooting	Solution
The internal chip is faulty.	The fault persists after the servo drive is powered off and on repeatedly.	Replace the servo drive.

Note

You can clear the fault or restart the power supply 30s after overload occurs.

- EE18.0: PN device name missing
  Cause:

  Device name is missing in PN device flash.

Cause	Troubleshooting	Solution
The communication is faulty, leading to device name loss.	Check whether the device name is present through the software tool network.	Re-assign a device name.

- EE19.0: Incorrect time sequence of telegram 105 in IRT
  Cause:

  Telegram 105 timing configuration error in IRT. Telegram 105 operating conditions are not met.

Cause	Troubleshooting	Solution
When telegram 105 is used under IRT, the transmit clock and H01.61 reference scheduling frequency do not meet the restriction conditions.	Check that the timing configuration for Telegram 105 meet the following conditions: 1. Transmit clock > = 0.25 ms; 2. The transmit clock is an integer multiple of the reference scheduling period (1/H01.61);	Check the timing configuration under IRT and adjust the IRT configuration to ensure that normal operation conditions are met.

- EE19.1: PN mode and fully closed-loop match error
  Cause:

  AC1/AC4 does not support full closed loop.

Cause	Troubleshooting	Solution
The full closed loop function is turned on under AC1/AC4.	Under AC1/AC4, check if H0F.00 is non-0.	When running AC1/AC4, set H0F.00 to 0.

- EE19.2: Sync mode does not match the telegram
  Cause:

  Telegram 105 is configured but the RT mode is used or a telegram other than telegram 105 is configured but the IRT mode is used.

Cause	Troubleshooting	Solution
Telegram 105 supports only the IRT mode, and other telegrams support only the RT mode.	Check the communication telegram configured by the upper controller, as well as the isochronous synchronization mode settings and synchronization domain settings.	Modify the configuration of the upper controller. When using telegram 105, select the isochronous synchronization mode. When not, unselect the isochronous synchronization mode and remove all isochronous synchronization related settings in the synchronization domain settings.

- EE19.3: Small I/O period in RT mode
  Cause:

  In RT mode, the host controller configures the servo IO period to be less than 1ms.

Cause	Troubleshooting	Solution
In RT mode, the host controller configures the servo IO period to be less than 1ms.	Check the servo IO period configured by the host controller.	Modify the servo IO period configured by the host controller, which must be greater than or equal to 1 ms.

- EE19.4: Unsupported PNU979 parameter
  Cause:

  The configuration of the motor used does not match the PNU979 parameter configuration specifications.

Cause	Troubleshooting	Solution
The number of encoder pulses per revolution of the motor used does not meet specifications.	If it is the Inovance encoder, check whether the number of bits of the encoder is supported by H00.00; If it is an encoder of Endat2.2 or SSI or BiSS-C protocol, check the single-turn resolution H00.39 and the total resolution H00.43, and calculate the multi-turn resolution H00.43–H00.39: the single-turn resolution must be greater than or equal to 8 and less than 32, the total resolution must be greater than or equal to the single-turn resolution, and the multi-turn resolution must not exceed 23 bits; If it is a rotary pulse encoder, check whether the number of encoder pulses per revolution exceeds 8388608 and is not 2 to the nth power.	If it is an Inovance encoder, use a motor whose number of encoder bits is supported by H00.00. If it is an encoder of Endat2.2 or SSI or BiSS-C protocol, re-set the single turn resolution and total resolution of the encoder according to the rules in the confirmation method; If it is a rotary pulse encoder and the number of encoder pulses per revolution exceeds 8388608, set it to 2 to the nth power.

- EE19.5: AC4 mode use error
  Cause:

  AC4 mode does not support homing and non-zero ramp generation time.

Cause	Troubleshooting	Solution
AC4 mode does not support homing and non-zero ramp generation time.	In AC4 mode 1. Check whether H05.30 is a non-0 value 2. Check whether H24.50 and H24.52 are non-0 values.	1. H05.30 is set to 0; 2. H24.50 and H24.52 are set to 0.

- EE19.6: AC4 mode does not support DI limit and soft limit.
  Cause:

  DI limit and soft limit are prohibited in AC4 mode.

Cause	Troubleshooting	Solution
DI limit and soft limit are prohibited in AC4 mode.	1. It is forbidden to use the DI limit function. Check whether the limit function is assigned to the DI. 2. It is forbidden to use the soft limit function. Check whether H0A.01 is non-0.	Turn off local DI limit and software limit (H0A.01 = 0), and use PLC process object for limit.

17.3.3.2 Internal Fault

When any one of the following fault occurs, contact Inovance for technical support.

- E111.0: Internal parameter error
- E602.0: Angle auto-tuning failure
- E220.0: Phase sequence incorrect
- EA40.0: Parameter auto-tuning failure

17.3.4 Description of Alarm Codes

- A108.0: Parameter write error

  Cause:

  Parameter values cannot be written to EEPROM.

Cause	Troubleshooting	Solution
An error occurs during parameter-writing.	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- A108.1: Parameter read error

  Cause:

  Parameter values cannot be read from EEPROM.

Cause	Troubleshooting	Solution
The parameter-read operation is abnormal, and the system indicates an EEPROM read failure.	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- A108.2: EEPROM write check error

  Cause:

  The check on the data written in EEPROM failed.

Cause	Troubleshooting	Solution
A check error occurs after parameter writing.	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- A108.3: EEPROM read check error

  Cause:

  The check on the data read in EEPROM failed.

Cause	Troubleshooting	Solution
An error occurs during parameter-reading.	Modify a certain parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- A108.4: Single data stored too many times

  Cause:

  Single data is stored too frequently.

Cause	Troubleshooting	Solution
That may damage EEPROM over time.	Check H0b.90 and H0b.91. H0b.90 shows the parameter in question or object dictionaries (in hexadecimal). If H0b.91=15, H0b.90 shows internal variables of software. 2. Check "Func Test 1" through the oscilloscope channel. Be sure to display it in hexadecimal. This channel displays the address that EEPROM is storing. 3. Check the storage count through the oscilloscope channel "Func Test 2".	1. If the alarm is caused by manually modifying a certain parameter or object dictionary, there will be no frequent storage of a certain data during operation, and you can reset the fault. Check the abnormal parameter through H0b. 90 or oscilloscope channel, and find out the cause. For example, if the host controller program frequently writes parameters through SDO, you can modify the program to stop it or set H0E.01 to 0 (Do not access EEPROM when writing parameters or object dictionaries).

- A110.0: Frequency-division pulse output setting error

  Cause:

  The frequency-division output setpoint (H05.17) exceeds the encoder resolution.

Cause	Troubleshooting	Solution
1. The number of frequency divisions (quadrupled) exceeds the motor revolutions. 2. The resolution setting of the third party encoder (if any) is too small.	1. Check the setpoint of H05.17. 2. For an ABZ encoder, check H00.31. For a BiSS-C/Endat2.2 encoder, check H00.39. For an SSI encoder, check H00.39 and H00.43.	1. Adjust the value of H05.17 on the basis of the motor revolutions. 2. For an ABZ encoder, set H00.31 correctly. For a BiSS-C/Endat2.2 encoder, set H00.39 correctly. For an SSI encoder, set H00.39 and H00.43 correctly.

- A120.3: The motor and drive do not match in the power

  Cause:

  the motor and drive do not match in the rated power.

Cause	Troubleshooting	Solution
The rated current/voltage of the motor is higher than that of the drive.	Check whether the rated motor current/voltage is larger than that of the drive.	Replace the motor or drive.

- A121.0: Invalid S-ON command

  Cause:

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

Cause	Troubleshooting	Solution
The external S-ON signal is active when servo drive is enabled internally.	Check whether auxiliary functions (H0d.02, H0d.03, and H0d.12) are used and DI function 1 (FunIN.1: S-ON, S-ON signal) is active.	Deactivate the DI assigned with FunIN.1 (both hardware DI and virtual DI).

- A510.0: Frequency division pulse output overspeed

  Cause:

  The output pulse frequency exceeds the frequency upper limit allowed by the hardware (4 MHz) when pulse output is used (H05.38 = 0 or 1 or 2).

Cause	Troubleshooting	Solution
The MCU detects excessive pulse increment fed back by FPGA.	When 1.H05.38 is set to 0 (encoder frequency-division output) or 2 (2nd encoder frequency-division output), check whether the output pulse frequency corresponding to the motor speed upon fault exceeds the limit. Output pulse frequency (Hz) = Motor speed (rpm)/60 x H05.17. The input pulse frequency exceeds 2 MHz or interference exists in the pulse input pins when 2.H05.38 is set to 1 (Reference pulse synchronous output). Low speed pulse input pins: open-collector input terminals: PULLHI, PULSE+, PULSE-, SIGN+, SIGN-; maximum pulse frequency: 200 kpps. High-speed pulse input pins: differential input terminals: HPULSE+, HPULSE-, HSIGN+, HSIGN-; maximum pulse frequency: 8 Mpps.	1. Decrease the value of H05.17 (encoder frequency-division pulses) to allow the output pulse frequency, within the speed range required by the machine, to drop below the frequency upper limit allowed by the hardware. 2. Decrease the input pulse frequency to a value within the frequency upper limit allowed by hardware. In this case, if you do not modify the electronic gear ratio, the motor speed will decrease. If the input pulse frequency is high but is still within the frequency upper limit allowed by the hardware, take anti-interference measures (use STP cable for pulse input and set pin filter parameter H0A.24 or H0A.30). This is to prevent false alarms caused by interference pulses superimposed to actual pulse references.

- A550.2: External switchover wait warning

  Cause:

  If the external warning must be kept to allow current block to continue operating, the keypad displays the warning when current block is done operating.

Cause	Troubleshooting	Solution
If the external warning must be kept to allow current block to continue operating, the keypad displays the warning when current block is done operating.	Check bit4–bit7 of the task mode (H28.16–H28.31) of current operation block.	The warning will be cleared automatically when the next block is triggered by the external signal.

- A550.6: Reached the fixed stop point but not the tightening torque

  Cause:

  The position deviation condition of the fixed stopper is met before the torque limit condition.

Cause	Troubleshooting	Solution
The actual torque is smaller than the task parameter set by the fixed stopper when the position deviation ⩾ H28.66.	Use the continuous oscilloscope function in the commissioning software to check No. 8 channel: post-model position follow-up deviation – Reference unit and No. 15 channel: current feedback. Determine whether Post-model position follow-up deviation – Reference unit ⩾ H28.66 and Current feedback < Actual effective torque limit value. Note: If multiple sources of torque limits are in effect, select the strictest.	Increase the setpoint of H28.66.

- A600.0: Inertia auto-tuning failure
  Cause:

  Vibration cannot be suppressed. You can set notch parameters (H09.12...H09.23) manually to suppress vibration.

  The auto-tuned values fluctuate dramatically. Increase the maximum operating speed, reduce the acceleration/deceleration time, and shorten the stroke of the lead screw during ETune operation.

  Mechanical couplings of the load are loose or eccentric. Rectify the mechanical faults.

  An alarm occurs during auto-tuning and causes interruption. Rectify the fault causes and perform inertia auto-tuning again.

  The vibration cannot be suppressed if the load carries large inertia. In this case, increase the acceleration/deceleration time to ensure the motor current is unsaturated.

  The position following-up is too poor. That is, the maximum speed of the motor is less than the speed setpoint of the inertia auto-tuning. Ensure that the speed setpoint is less than the maximum speed of the motor.

Cause	Troubleshooting	Solution
1. Continuous vibration occurs during auto-tuning. 2. The auto-tuned values fluctuate dramatically. 3. Mechanical couplings of the load are loose or the mechanism is eccentric. 4. A warning occurs during auto-tuning, interrupting the operation. 5. The vibration cannot be suppressed if the load carries large inertia. In this case, increase the acceleration/deceleration time to ensure the motor current is unsaturated. 6. The position following-up is too poor. That is, the maximum speed of the motor is less than the speed setpoint of the inertia auto-tuning.	Perform internal inspection to check whether the torque jitters upon stop (not FFT. Check whether three times more than the last auto-tuned value for variation less than 5 times; 0.5 times more than last auto-tuned value for variation above 5 times.	1. Rectify the fault and perform auto-tuning again. Rectify the fault causes and perform inertia auto-tuning again. 2. For vibration that cannot be suppressed, enable vibration suppression. 3. Ensure mechanical couplings are connected securely. 4. Increase the maximum operating speed, reduce the acceleration/deceleration time, and shorten the stroke of the lead screw during ETune operation. 5. Ensure that the speed setpoint is less than the maximum speed of the motor.

- A601.0: Homing alarm

  Cause:

  Homing time exceeds the setpoint.

Cause	Troubleshooting	Solution
1. The home switch is faulty.	There is only high-speed searching but no low-speed searching during homing. After high-speed searching, low-speed searching in the reverse direction applies.	If a hardware DI is used, check whether the corresponding DI function is allocated to a certain DI in group 2003h and check the wiring of this DI. Change the DI logic manually and observe the value of H0B.03 (monitored DI status) to monitor whether the servo drive receives corresponding DI level changes. If the home signal is Z signal but it cannot be found, check the condition of the Z signal.
2. The homing time limit is too short.	Check whether the value of H05.35 and H05.66 (time limit for homing) is too small.	Increase the value of H05.35 and H05.66.
3. The speed in high-speed searching for the home switch signal is too low.	Check the distance between the start position of homing and the home switch. Then check whether the setpoint of H25.23 (Speed in high-speed searching for the home switch signal) is too low, resulting in a long homing process.	Increase the value of H25.23.

- A601.1: Homing switch error

  Cause:

  The homing switch is set improperly.

Cause	Troubleshooting	Solution
The home switch is set improperly.	Check whether the limit signals at both sides are activated. Check whether the limit signal and the deceleration point signal/home signal are both activated. Check whether the positive and negative position limits are activated successively.	Set the position of the physical switch properly.

- A601.2: Homing mode setting error

  Cause:

  The homing method value is too large.

Cause	Troubleshooting	Solution
The homing method value is too large.	Check if the homing method value exceeds the existent homing mode (check H25.22).	Change the value of H25.22.

- A602.9: Angle auto-tuning not done for incremental encoder motor

  Cause:

  Angle auto-tuning is not performed for the incremental encoder motor.

Cause	Troubleshooting	Solution
Angle auto-tuning is not performed for the incremental encoder, and corresponding alarm is enabled.	Check whether bit1 of H32.04 is set.	1. The alarm is automatically reset after the angle auto-tuning is completed. 2. If you do not need this alarm, reset bit1 of H32.04.

- A609.0: Data save timeout

  Cause:

  Wire breakage occurred when the software was downloading data.

Cause	Troubleshooting	Solution
Wire breakage occurred when the software was downloading data.	Check that the drive is connected to the software.	Download the data again.

- A609.1: Data save overflow

  Cause:

  Wire breakage occurred when the software was downloading data.

Cause	Troubleshooting	Solution
Wire breakage occurred when the software was downloading data.	Check that the drive is connected to the software.	Download the data again.

- A609.2: Failed to save data

  Cause:

  Failed to save data.

Cause	Troubleshooting	Solution
The FLASH memory chip or the interface between MCU and FLASH failed.	Power on multiple times and download data again.	If the problems persists, replace the drive.

- A609.3: Failed to erase data

  Cause:

  Failed to erase data.

Cause	Troubleshooting	Solution
The FLASH memory chip or the interface between MCU and FLASH failed.	Power on multiple times and download data again.	If the problems persists, replace the drive.

- A621.1: Overload current limiting torque attained

  Cause:

  Overload current limiting torque attained.

Cause	Troubleshooting	Solution
1. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque. 2. The acceleration/deceleration is too frequent or the load inertia is too large. 3. The motor and encoder cables are connected incorrectly or in poor contact. 4. The gain adjustment is improper or the stiffness is too high. 5. The motor is stalled due to mechanical factors, resulting in overload during operation. 6. The servo drive is faulty.	1. Confirm the overload characteristics of the servo drive or servo motor. Check whether the average load rate (H0b.12) of the servo drive keeps exceeding 100.0%. 2. Detect whether the value of H32.77 is set too high.	1. Replace with a servo drive of higher capacity and a matching servo motor, or reduce the load and increase the acceleration/deceleration time.

- A631.4: P-MOS short circuit

  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, the P-MOS short circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	1. Replace the servo drive. 2. Turn off the brake switch H02.16.

- A631.5: N-MOS short circuit

  Cause:

  The brake circuit is faulty.

Cause	Troubleshooting	Solution
When braking is used, the N-MOS short circuit occurred on the brake circuit.	Ensure the brake cable is connected, check if the fault persists after the servo drive is powered off and on again.	1. Replace the servo drive. 2. Turn off the brake switch H02.16.

- A730.0: Encoder battery alarm

  Cause:

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

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

Note

E731.0 and E733.0 can trigger A730.0. See E731.0 and E733.0 for other solutions.

- A730.1: Inovance 2nd encoder battery voltage low

  Cause:

  Inovance 2nd encoder battery voltage is lower than 3.0 V.

Cause	Troubleshooting	Solution
Inovance 2nd encoder battery voltage is too low.	Measure the battery voltage.	Use a new battery with the matching voltage.

- A831.1: AI1 zero offset too large

  Cause:

  The zero drift of AI1 exceeds 500 mV.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI1 input filter time.
2. The servo drive is faulty.	Disconnect AI1 and measure whether the actual terminal voltage exceeds 0.5 V.	If not, replace the servo drive.

- A831.2: AI2 zero offset too large

  Cause:

  The zero drift of AI2 exceeds 500 mV.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI2 input filter time.
2. The servo drive is faulty.	Disconnect AI2 and measure whether the actual terminal voltage exceeds 0.5 V.	If not, replace the servo drive.

- A834.1: AI1 overvoltage

  Cause:

  AI1 input voltage is greater than 11.5 V.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI1 input filter time.
2. The input voltage is too high.	Measure whether the actual terminal voltage exceeds 11.5 V.	Adjust the input voltage to a value lower than 11.5 V.

- A834.2: AI2 overvoltage

Cause:

AI2 input voltage is greater than 11.5 V.

Cause	Troubleshooting	Solution
1. The wiring is incorrect or interference exists.	Check the wiring according to the correct wiring diagram.	Use shielded twisted pairs and shorten the circuit length. Increase AI2 input filter time.
2. The input voltage is too high.	Measure whether the actual terminal voltage exceeds 11.5 V.	Adjust the input voltage to a value lower than 11.5 V.

- A900.0: DI emergency braking

  Cause:

  The logic of the DI terminal (including the hardware DI and virtual DI) allocated with DI function 34 (FunIN.34) is effective.

Cause	Troubleshooting	Solution
The DI function 34 (EmergencyStop) is triggered.	Check whether the logic of the DI allocated with DI function 34 (FunIN.34: Emergency stop) is valid.	Check the operation mode and clear the active DI braking signal without affecting the safety performance.

- A902.0: Invalid DI/VDI setting

  Cause:

  DI function parameters are set to invalid values.

Cause	Troubleshooting	Solution
DI or VDI function selections are invalid.	Check whether DI function configure parameters in H03 and H17 are set to invalid values.	Set DI/VDI function parameters to valid values.

- A902.1: Invalid DO/VDO setting

  Cause:

  DO/VDO function parameters are set to invalid values.

Cause	Troubleshooting	Solution
DO or VDO function selections are invalid.	Check whether DI function configure parameters in H04 and H17 are set to invalid values.	Set DO/VDO function parameters to valid values.

- A902.2: Invalid setting for torque reach

  Cause:

  The DO parameters set for torque reach in the torque control mode are invalid.

Cause	Troubleshooting	Solution
The DO parameters set for torque reach in the torque control mode are invalid.	Check whether the value of H07.22 is lower than or equal to the value of H07.23 (unit: 0.1%).	Set H07.22 to a value higher than that of H07.23.

- A909.0: Motor overload alarm

  Cause:

  The accumulative heat of the motor reaches 90% of the fault threshold.

Cause	Troubleshooting	Solution
1. The motor cables and encoder cable are connected improperly or in poor contact.	Check the wiring among the servo drive, servo motor and the encoder according to the correct wiring diagram.	Connect cables according to the correct wiring diagram. It is recommended to use the cables provided by Inovance. When customized cables are used, prepare and connect the customized cables according to the wiring instructions.
2. The load is so heavy that the effective torque outputted by the motor keeps exceeding the rated torque.	Confirm the overload characteristics of the servo drive or motor. Check whether the average load rate (H0b.12) keeps exceeding 100.0%.	Use a servo drive of higher capacity and a matching servo motor. Reduce the load and increase the acceleration/deceleration time.
3. Acceleration/Deceleration is too frequent or the load inertia is too large.	Check the mechanical inertia ratio or perform inertia auto-tuning. View the value of H08.15 (load moment of inertia ratio). Confirm the individual operation cycle when the servo motor operates cyclically.	Increase the acceleration/ deceleration time.
4. Gains are improper or the stiffness level is too high.	Check whether the motor vibrates and generates unusual noise during operation.	Readjust the gain.
5. The servo drive model or motor model is set improperly.	View the model of the motor equipped with a serial-type encoder in H00.05 and the servo drive model in H01.10.	Read the servo drive nameplate and set the servo drive model (H01.10) and motor model properly.
6. The motor is stalled due to mechanical factors, resulting in overload during operation.	Check the running reference and motor speed (H0b.00) through Inovance servo commissioning software or keypad: • References in the position control mode: H0b.13 (Input position reference counter) • References in the speed control mode: H0b.01 (Speed reference) • References in the torque control mode: H0b.02 (Internal torque reference) Check whether the reference value is not 0 or is very large but the motor speed is 0 RPM in the corresponding mode.	Rectify the mechanical-related problem.
7. The servo drive is faulty.	Power off and on the servo drive.	Replace the servo drive.

- A910.0: Control circuit overvoltage

Cause	Troubleshooting	Solution
Overvoltage occurred on the control circuit of the drive.	Measure whether the input voltage in the control circuit cable is within the following range: 220 V servo drive: Value range: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V) 380 V servo drive: Value range: 380 V to 440 V Allowable deviation: –10% to +10% (342 V to 484 V) Check whether control circuit cables are connected properly and whether the voltage of control circuit cables (L1C, L2C) is within the specified range.	Re-connect or replace the cables.

- A920.0: External braking resistor overload

  Cause:

  The accumulative heat of the braking resistor exceeds the set value.

Cause	Troubleshooting	Solution
1. The external braking resistor is connected improperly or disconnected.	Remove the external braking resistor and measure whether its resistance is "∞" (infinite). Measure whether the resistance between terminals P⊕ and C is "∞" (infinite).	Replace with a new external braking resistor. If the resistance measured is the same as the nominal value, connect the external braking resistor between terminals P ⊕ and C.
		Connect the external braking resistor between terminals P ⊕ and C with a proper cable.
2. The jumper between terminals P ⊕ and D is shorted or disconnected when the built-in braking resistor is used.	Measure whether the resistance between terminals P ⊕ and D is "∞" (infinite).	Ensure terminals P ⊕ and D are jumpered.

Cause	Troubleshooting	Solution
3. H02.25 (Braking resistor type) is set improperly when an external braking resistor is used.	• View the setpoint of H02.25. • Check whether the resistance of the external braking resistor connected between P ⊕ and C is too large by comparing it with the value listed in Table "Specifications of the braking resistor". • Check whether the value of H02.27 is larger than the resistance of the external braking resistor between terminals P ⊕ and C.	Set H02.25 according to section Wiring and Setting of Braking Resistor in SV680F-INT Series Servo Drive Hardware Guide. H02.25 = 1 (external, naturally ventilated) H02.25 = 2 (external, forced-air cooling)
4. The resistance of the external braking resistor is too large.		Select a proper braking resistor according to Section "Specifications of the Braking Resistor" in "SV680F-INT Series Servo Drive Hardware Guide".
5. The setpoint of H02.27 (Resistance of external braking resistor) is higher than the resistance of the external braking resistor used.		Set H02.27 according to the resistance of the external braking resistor used.
6. The input voltage of the main circuit is beyond the specified range.	Check whether the input voltage of the main circuit cable on the drive side is within the following range: • 200 V servo drive:• Value range: 200 V to 240 V• Allowable deviation: –10% to +10% (198 V to 242 V) • 400 V servo drive:• Value range: 400 V to 440 V• Allowable deviation: –10% to +10% (342 V to 484 V)	Replace or adjust the power supply according to the specified range.
7. The load moment of inertia ratio is too large.	Perform moment of inertia auto-tuning according to Section "Inertia auto-tuning" in "SV680F-INT Series Servo Drive Function Guide". Or calculate the total mechanical inertia based on mechanical parameters. Check whether the actual load inertia ratio exceeds 30.	• Select an external braking resistor with large capacity and set H02.26 (Power of the external braking resistor) to a value consistent with the actual power. • Select a servo drive with large capacity. • Reduce the load if allowed. • Increase the acceleration/ deceleration time if allowed. • Increase the motor operation cycle if allowed.
8. The motor speed is excessively high and deceleration is not done within the set time. The motor is in the continuous deceleration status during cyclic operation.	View the motor speed curve in cycle running and check whether the motor is in deceleration status for a long period.	
9. The capacity of the servo drive or the braking resistor is insufficient.	View the motor's single cycle speed curve and calculate whether maximum braking energy can be absorbed completely.	
10. The servo drive is faulty.	-	Replace the servo drive.

- A921.0: Dynamic brake resistor overload alarm

  Cause:

  The dynamic braking resistor is close to overload.

Cause	Troubleshooting	Solution
1. The accumulative heat of the dynamic braking resistor is close to the maximum thermal capacity of the resistor. 2. The resolution setting of the third party encoder (if any) is too small.	1. Check whether the value of H0b.98 exceeds 70%. 2. For an ABZ encoder, check H00.31. For a BiSS-C/Endat2.2 encoder, check H00.39. For an SSI encoder, check H00.39 and H00.43.	1. Ensure that the motor cannot be driven reversely in the dynamic braking state. 2. For an ABZ encoder, set H00.31 correctly. For a BiSS-C/Endat2.2 encoder, set H00.39 correctly. For an SSI encoder, set H00.39 and H00.43 correctly.

- A922.0: Resistance of the external braking resistor too small
  Cause:

  The value of H02.27 (resistance of external braking resistor) is lower than the value of H02.21 (permissible min. resistance of external braking resistor).

Cause	Troubleshooting	Solution
When an external braking resistor is used (H02.25 = 1 or 2), the resistance of this resistor is lower than the minimum resistance allowed by the servo drive.	Measure whether the resistance of the external braking resistor between terminals P ⊕ and C is lower than the value of H02.21 (Permissible minimum resistance of braking resistor).	• If yes, replace with an external braking resistor that matches the drive, set H02.27 to a value consistent with the resistance of this resistor, and connect this resistor between terminals P ⊕ and C. • If not, set H02.27 to a value consistent with the resistance of the external braking resistor used.

- A924.0: Regenerative transistor overtemperature
  Cause:

  The estimated temperature of the regenerative transistor is higher than H0A.49 (discharge overtemperature threshold).

Cause	Troubleshooting	Solution
1. The junction temperature of the regenerative transistor is too high. 2. The regenerative transistor will be turned off automatically after overload occurs.	The regenerative transistor temperature exceeds the threshold defined by H0A.49.	Control the working conditions and usage of the regenerative transistor.

- A940.0: Change of controlled motor is detected. It is recommended to restore factory settings before use
  Cause:

  Change of controlled motor is detected. It is recommended to restore factory settings before use If PLC process objects are used, it is recommended to check the process object parameters.

Cause	Troubleshooting	Solution
It is detected that the control type of the controlled motor has changed (for example, changing from rotary servo motor control to linear motor control). To ensure the normal functions and thresholds of the drive, it is recommended to restore the factory settings before use. The alarm is raised only once.	Check whether the value of H00.00 is changed.	It is recommended to restore the factory settings before use when any change is made in the controlled motor. You can also maintain the original parameter settings. If PLC process objects are used, it is recommended to check the process object parameters.

- A941.0: Parameter modifications activated at next power-on

  Cause:

  When the parameter effective mode of the drive is set to "Re-power-on", after the parameter value is changed, the servo drive prompts the user to power on again.

Cause	Troubleshooting	Solution
The parameters modified are those whose "Effective time" is "Next power-on".	Check whether parameters you modified are those whose "Effective Time" is "Next power-on".	Power off and on the servo drive again.

- A942.0: Parameter saved frequently

  Cause:

  The number of parameters modified at a time exceeds 700.

Cause	Troubleshooting	Solution
Too many parameters are modified and saved to EEPROM at a brief interval.	Check whether parameters are modified through the host controller at a brief interval.	Check the operation mode. For parameters that need not be saved to EEPROM, set H0E.01 to the correct value before the host controller perform write operation.

- A950.0: Forward overtravel alarm

  Cause:

  The logic of the DI allocated with FunIN.14: P-OT (positive limit switch) is valid.

Cause	Troubleshooting	Solution
1. The logic of the DI assigned with FunIN.14 (P-OT function 14, positive limit switch) is effective.	Check whether a certain DI in group H03 is assigned with FunIN.14. Check whether the logic of DI corresponding to the bit of H0b.03 (Monitored DI status) is effective.	Check the running mode. On the prerequisite of safety, send a reverse command or rotate the motor to deactivate the logic of the DI terminal allocated with DI function 14.
2. The servo position feedback reaches the positive software position limit.	Check whether the position feedback (H0b.17) is close to the value of H0A.41. Check whether the software position limit is set in H0A.40.	Ensure the servo drive references are proper, allowing the load travel range to be within the software position limit.

- A950.1: Target position is larger than forward soft limit threshold

  Cause:

  The set target position is larger than the forward soft limit threshold.

Cause	Troubleshooting	Solution
The target position setting is too large or the software limit threshold is too small.	Check the setpoint of the target position in the program. Check whether the software limit function (H0A.01) is enabled and check the value of H0A.41 and the target position.	Lower the target position setpoint or increase the forward soft limit threshold.

- A952.0: Reverse overtravel alarm

  Cause:

  The logic of the DI allocated with FunIN.15: N-OT (negative limit switch) is valid.

Cause	Troubleshooting	Solution
1. The logic of the DI assigned with FunIN.15 is effective.	Check whether a certain DI in group H03 is assigned with FunIN.15. Check whether the logic of DI corresponding to the bit of H0b.03 (Monitored DI status) is effective.	Check the operation mode. On the prerequisite of ensuring safety, send a forward run command or rotate the motor to deactivate the logic of DI assigned with FunIN.15.
2. The servo position feedback reaches the negative software position limit.	Check whether the position feedback (H0b.17) is close to the value of H0A.43. Check whether the software position limit is set in H0A.40.	Ensure the servo drive references are proper, allowing the load travel range to be within the software position limit.

- A952.1: Target position is smaller than reverse soft limit threshold

  Cause:

  The set target position is larger than the reverse soft limit threshold.

Cause	Troubleshooting	Solution
The set target position is too small or the reverse soft limit threshold is too large.	Check the setpoint of the target position in the program. Check whether the software limit function (H0A01) is enabled and check the value of H0A.43 and the target position.	Increase the target position setpoint or decrease the reverse soft limit threshold.

- A971.0: Undervoltage alarm for voltage drop protection

  Cause:

  The bus voltage is lower than the undervoltage threshold. This alarm can be masked by setting bit1 of H0A.88 to 1.

Cause	Troubleshooting	Solution
The bus voltage is lower than the undervoltage threshold.	Check the bus voltage. This alarm can be masked by setting bit1 of H0A.88 to 1.	Check the power supply.

- A980.0: Frequency division output overflow

  Cause:

  Frequency division output overflow.

Cause	Troubleshooting	Solution
1. The frequency division output is too large. Calculation overflows. 2. The resolution setting of the third party encoder (if any) is too small.	1. Check whether an A510.0 alarm has occurred and set H05.17 to a proper value so that A510.0 disappears. 2. For an ABZ encoder, check H00.31. For a BiSS-C/Endat2.2 encoder, check H00.39. For an SSI encoder, check H00.39 and H00.43.	1. Set H05.17 to a proper value or reduce the maximum operating speed. 2. For an ABZ encoder, set H00.31 correctly. For a BiSS-C/Endat2.2 encoder, set H00.39 correctly. For an SSI encoder, set H00.39 and H00.43 correctly.

- AA41.0: Torque ripple compensation failure

  Cause:

  Torque ripple compensation failure.

Cause	Troubleshooting	Solution
Auto-tuning torque fluctuation compensation failure	1. Check whether homing is not performed during cogging torque ripple auto-tuning of the incremental encoder. 2. Confirm whether emergency stop or external fault interruption occurs during cogging torque ripple auto-tuning. 3. Torque ripple compensation auto-tuning failed. Please try again.	1. Perform homing during cogging torque ripple auto-tuning of the incremental encoder. 2. Avoid emergency stop or external fault interruption during cogging torque ripple auto-tuning. 3. Torque ripple compensation auto-tuning failed. Please try again.

- AE19.7: Unsupported overtravel stop mode

  Cause:

  You have selected an unsupported overtravel stop mode through H02.07.

Cause	Troubleshooting	Solution
Set H02.07 to any of the following overtravel stop modes: 1: Stop at zero speed, keeping position lock state 4: Stop based on ramp 2, keeping position lock state 7: Not responding to overtravel	Check the setpoint of H02.07.	Set H02.07 to any of the following overtravel stop modes: 1: Stop at zero speed, keeping position lock state 4: Stop based on ramp 2, keeping position lock state 7: Not responding to overtravel

17.4 Solutions To Faults and Alarms [Functional Safety Model]

17.4.1 List of Fault and Alarm Codes

The servo drive can output the current highest-level fault/alarm code.

No. 1 non-resettable faults:

Table 17–5 List of No. 1 non-resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable
E101	E101.3	CRC error during safety parameter initialization	No.1	No
	E101.4	Error in upper and lower limits verification during safety parameter initialization	No.1	No
	E101.5	Address error in read/write operation after the number of parameters changes	No.1	No
E104	E104.5	The number of interrupts in the safety module FPGA is abnormal	No.1	No
	E104.6	Safety module FPGA interrupt timed out	No.1	No
E145	E145.0	Safety module chip diagnosis failure	No.1	No
	E145.1	Safety module program execution exception	No.1	No
E153	E153.2	A fatal error occurred on the PSAFE safety protocol stack	No.1	No
E740	E740.0	Encoder communication timeout	No.1	No
	E740.2	Encoder communication error	No.1	No
	E740.3	Absolute encoder single-turn calculation error	No.1	No
	E740.6	Encoder write error	No.1	No
	E740.9	Encoder data transmit delay too long	No.1	No
E750	E750.0	Deviation of master QEP and subdivision quadrant too large (over 2 pulses)	No.1	No
	E750.1	Difference between safety encoder master and slave positions too large	No.1	No
	E750.2	QEP difference between encoder master and slave too large	No.1	No
	E750.3	Difference between safety encoder master and slave analog values too large	No.1	No
	E750.4	Encoder chip power supply diagnosis exception	No.1	No
	E750.5	Encoder master and slave SN mismatch	No.1	No
	E750.6	Encoder chip diagnosis exception	No.1	No
	E750.7	Encoder SPI communication error, no response from slave	No.1	No
E751	E751.0	Safety module encoder CRC check error	No.1	No
	E751.1	Excessive deviation between speeds calculated by MCU1 and MCU2 of safety module	No.1	No
	E751.2	Safety module position 1 & 2 check error	No.1	No
	E751.3	Safety encoder version number CRC error	No.1	No

No. 1 resettable faults:

Table 17–6 List of No. 1 resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable
E124	E124.0	Different DIs allocated with the same function	No.1	Yes
	E124.1	DI1 input circuit diagnosis exception	No.1	Yes
	E124.2	DI2 input circuit diagnosis exception	No.1	Yes
	E124.3	DI3 input circuit diagnosis exception	No.1	Yes
	E124.4	DI4 input circuit diagnosis exception	No.1	Yes
	E124.5	DI5 input circuit diagnosis exception	No.1	Yes
E125	E125.0	SSM assigned with non-safety DO serial number	No.1	Yes
	E125.1	DO1 output circuit diagnosis exception	No.1	Yes
	E125.2	DO2 output circuit diagnosis exception	No.1	Yes
	E125.4	DO4 output circuit diagnosis exception	No.1	Yes
	E125.5	DO5 output circuit diagnosis exception	No.1	Yes
E134	E134.1	Discrepancy at two input signals of DI1	No.1	Yes
	E134.2	Discrepancy at two input signals of DI2	No.1	Yes
	E134.3	Discrepancy at two input signals of DI3	No.1	Yes
	E134.4	Discrepancy at two input signals of DI4	No.1	Yes
	E134.5	Discrepancy at two input signals of DI5	No.1	Yes
E135	E135.0	Chip 3.3V signal diagnosis exception	No.1	Yes
E150	E150.0	STO safety state applied	No.1	Yes
	E150.1	STO input state abnormal	No.1	Yes
	E150.2	Buffer 5 V supply error	No.1	Yes
	E150.3	STO input circuit hardware diagnosis failure	No.1	Yes
	E150.4	PWM Buffer hardware diagnosis failure	No.1	Yes
	E150.5	STO input signal interference	No.1	Yes
E151	E151.0	SCI communication exception between servo drive and safety module	No.1	Yes
	E151.1	SCI communication exception between two MCUs of the safety module	No.1	Yes
E152	E152.0	Failure of parameter verification between two MCUs of the safety module	No.1	Yes
	E152.1	Timeout for sending CRC between two MCUs of the safety module	No.1	Yes
E153	E153.0	SLS1 variable ratio error	No.1	Yes
	E153.1	MCU1 and MCU2 data not synchronized	No.1	Yes
E631	E631.0	SBC brake circuit diagnosis exception	No.1	Yes

No. 2 resettable faults

Table 17–7 List of No. 2 resettable faults

Fault Code	Fault subcode	Fault Name	Fault level	Resettable
EE20	EE20.0	Safety bus WireBreak	No.2	Yes
	EE20.1	Inconsistent PROFIsafe target address	No.2	Yes
	EE20.2	Invalid PROFIsafe target address	No.2	Yes
	EE20.3	Invalid or inconsistent PROFIsafe source address	No.2	Yes
	EE20.4	PROFISafe watchdog time is 0	No.2	Yes
	EE20.5	PROFIsafe SIL level setting error	No.2	Yes
	EE20.6	PROFIsafe CRC length mismatch	No.2	Yes
	EE20.7	PROFISafe F parameter version mismatch	No.2	Yes
	EE20.8	PROFISafe F parameter CRC error	No.2	Yes
	EE20.9	PROFIsafe device-specific fault	No.2	Yes
	E20.C	PROFIsafe I parameter CRC error	No.2	Yes
	E20.D	F_Block_ID set in PROFISafe F parameter is not supported	No.2	Yes
	E20.E	PROFISafe communication CRC error	No.2	Yes
	E20.F	PROFIsafe communication timeout	No.2	Yes

No. 3 resettable warnings

Table 17–8 Resettable Alarm List

Warning code	Alarm subcode	Name	Fault level	Resettable
A108	A108.5	Safety module EEPROM write timed out	No.3	Yes
	A108.6	Safety module EEPROM read timed out	No.3	Yes
	A108.7	Safety module EEPROM write check error	No.3	Yes
	A108.8	Safety module EEPROM read check error	No.3	Yes
A115	A115.0	Parameter setting exception warning	No.3	Yes
A160	A160.0	SLS1 exceeded	No.3	Yes
	A160.1	SLS2 exceeded	No.3	Yes
	A160.2	SLS3 exceeded	No.3	Yes
	A160.3	SLS4 exceeded	No.3	Yes
A165	A165.0	SDIp exception	No.3	Yes
	A165.1	SDIn exception	No.3	Yes
A170	A170.0	SS1 deceleration ramp exception	No.3	Yes
	A170.1	SS2 deceleration ramp exception	No.3	Yes
	A170.2	SOS speed or position exceeds limit	No.3	Yes

17.4.2 Solutions to Faults

- E101.3: CRC error during safety parameter initialization
  Cause:

  The CRC value of the safety parameters is abnormal, which generally occurs after software update.

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The voltage of the control circuit power supply drops instantaneously.	• Check whether the control circuit (L1C, L2C) is in the process of power-off or instantaneous power failure occurs. • Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range:• 220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V)• 380 V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	• Restore safety parameters to default settings and write parameters again. • Increase the power supply capacity or replace the power supply with a power supply of higher capacity. Restore the safety parameters to default settings and write the parameters again.
3. Instantaneous power failure occurs when saving parameters.	Check whether instantaneous power failure occurs when saving parameters.	Power on again, restore the safety parameters to default settings and write parameters again.
4. The number of write operations within a certain period of time exceeds the limit.	Check whether parameters are updated frequently through the host controller.	Change the parameter writing method and write parameters again.
5. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E101.4: Error in upper and lower limits verification during safety parameter initialization
  Cause:

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

  2. Values of the safety parameters exceed the limit, which generally occurs after software update.

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The voltage of the control circuit power supply drops instantaneously.	• Check whether the control circuit (L1C, L2C) is in the process of power-off or instantaneous power failure occurs. • Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range:• 220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V)• 380 V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	• Restore safety parameters to default settings and write parameters again. • Increase the power supply capacity or replace the power supply with a power supply of higher capacity. Restore the safety parameters to default settings and write the parameters again.
3. Instantaneous power failure occurs when saving parameters.	Check whether instantaneous power failure occurs when saving parameters.	Power on again, restore the safety parameters to default settings and write parameters again.
4. The number of write operations within a certain period of time exceeds the limit.	Check whether parameters are updated frequently through the host controller.	Change the parameter writing method and write parameters again.
5. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E101.5: Address error in read/write operation after the number of parameters changes

  Cause:

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

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E104.5: The number of interrupts in the safety module FPGA is abnormal

  Cause:

  The number of interrupts detected in 1 ms is less than four.

Cause	Troubleshooting	Solution
1. The FPGA is abnormal.	Power on and off repeatedly. The probability of failure is high.	Replace the servo drive and safety module.
2. The interrupt pin includes dry joint.		
3. The connection between the servo drive and the safety module is abnormal.		

- E104.6: Safety module FPGA interrupt timed out
  Cause:

  The FPGA interrupt is running longer than the interrupt dispatch time.

Cause	Troubleshooting	Solution
The safety module has failed.	Power on and off repeatedly. The probability of failure is high.	Replace the servo drive and safety module.

- E124.0: Different DIs allocated with the same function
  Cause:

  The function numbers of the safety DI terminals are duplicated.

Cause	Troubleshooting	Solution
One DI function cannot be reused by two or more DI terminals.	Check whether the same number is selected for different DIs.	Ensure that the number is unique.

- E124.1: DI1 input circuit diagnosis exception
  Cause:

  Send a diagnostic signal to DI1 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI1 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI1, and observe whether the input signal of DI1 changes (You can sample and analyze the input signal of DI1 through the background software oscilloscope).	• If the DI1 circuit is abnormal, shield DI1 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.2: DI2 input circuit diagnosis exception
  Cause:

  Send a diagnostic signal to DI2 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI2 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI2, and observe whether the input signal of DI2 changes (You can sample and analyze the input signal of DI2 through the background software oscilloscope).	• If the DI2 circuit is abnormal, shield DI2 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.3: DI3 input circuit diagnosis exception
  Cause:

  Send a diagnostic signal to DI3 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI3 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI3, and observe whether the input signal of DI3 changes (You can sample and analyze the input signal of DI3 through the background software oscilloscope).	• If the DI3 circuit is abnormal, shield DI3 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.4: DI4 input circuit diagnosis exception

  Cause:

  Send a diagnostic signal to DI4 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI4 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI4, and observe whether the input signal of DI4 changes (You can sample and analyze the input signal of DI4 through the background software oscilloscope).	• If the DI4 circuit is abnormal, shield DI4 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E124.5: DI5 input circuit diagnosis exception

  Cause:

  Send a diagnostic signal to DI5 to detect whether the feedback signal is correct.

Cause	Troubleshooting	Solution
The MCU sent a diagnostic signal. The feedback signal is incorrect.	• Check whether the DI5 circuit is normal. • Disconnect and then reconnect the 24V input voltage of DI5, and observe whether the input signal of DI5 changes (You can sample and analyze the input signal of DI5 through the background software oscilloscope).	• If the DI5 circuit is abnormal, shield DI5 by setting its function number to 0. • If it cannot be shielded, it is recommended to replace the safety control board.

- E125.0: SSM assigned with non-safety DO serial number

  Cause:

  Check whether SSM is assigned to DO3 and DO6.

Cause	Troubleshooting	Solution
The SSM cannot use non-safety DO as signal output.	Check whether the function numbers of DO3 and DO6 are set to 12: SSM-active.	Do not assign the function numbers of DO3 and DO6 as SSM functions.

- E125.1: DO1 output circuit diagnosis exception

  Cause:

When DO1 is active, the MCU sends a diagnostic pulse to DO1 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO1, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO1 output circuit.	Shield DO1, and the safety module no longer detects whether there is a leakage current risk in DO1.

- E125.2: DO2 output circuit diagnosis exception
  Cause:

  When DO2 is active, the MCU sends a diagnostic pulse to DO2 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO2, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO2 output circuit.	Shield DO2, and the safety module no longer detects whether there is a leakage current risk in DO2.

- E125.4: DO4 output circuit diagnosis exception
  Cause:

  When DO4 is active, the MCU sends a diagnostic pulse to DO5 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO4, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO4 output circuit.	Shield DO4, and the safety module no longer detects whether there is a leakage current risk in DO4.

- E125.5: DO5 output circuit diagnosis exception
  Cause:

  When DO5 is active, the MCU sends a diagnostic pulse to DO5 to detect whether the AD sampling value of the feedback signal is below 0.3 V.

Cause	Troubleshooting	Solution
After the MCU sends a diagnostic pulse to DO5, the feedback voltage received by the MCU is not below the expected 0.3 V.	Execute fault reset to check whether the fault can be cleared. If the fault persists, check whether there is leakage current in the DO5 output circuit.	Shield DO5, and the safety module no longer detects whether there is a leakage current risk in DO5.

- E134.1: Discrepancy at two input signals of DI1
  Cause:

  Check whether the DI1 input signal exceeds the value of H20.14.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI1 exceeds the value of H20.14.	Observe whether the difference lasts longer than the setpoint of H20.14.	Ensure the difference does not lasts longer than the value of H20.14.

- E134.2: Discrepancy at two input signals of DI2
  Cause:

  Check whether the DI2 input signal exceeds the value of H20.15.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI2 exceeds the value of H20.15.	Check whether the difference lasts longer than the setpoint of H20.15.	Ensure the difference does not last longer than the setpoint of H20.15.

- E134.3: Discrepancy at two input signals of DI3
  Cause:

  Check whether the DI3 input signal exceeds the value of H20.16.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI3 exceeds the value of H20.16.	Observe whether the difference lasts longer than the setpoint of H20.16.	Ensure the difference does not lasts longer than the value of H20.16.

- E134.4: Discrepancy at two input signals of DI4
  Cause:

  Check whether the DI4 input signal exceeds the value of H20.17.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI4 exceeds the value of H20.17.	Check whether the difference lasts longer than the setpoint of H20.17.	Ensure the difference does not lasts longer than the value of H20.17.

- E134.5: Discrepancy at two input signals of DI5
  Cause:

  Check whether the DI5 input signal exceeds the value of H20.18.

Cause	Troubleshooting	Solution
The fault code is reported when the difference between two inputs of safety DI5 exceeds the value of H20.18.	Observe whether the difference lasts longer than the setpoint of H20.18.	Ensure the difference does not lasts longer than the value of H20.18.

- E135.0: Chip 3.3V signal diagnosis error
  Cause:

  The two chips diagnose whether the supply voltage of each other is within the allowed range of 3.0 V to 3.6 V.

Cause	Troubleshooting	Solution
The chip voltage is out of the range of 3.0 V to 3.6 V.	Perform a power cycle to check if the fault is eliminated.	Replace the servo drive.

- E145.0: Safety module chip diagnosis failure
  Cause:

  The chip diagnosis of the safety module failed.

Cause	Troubleshooting	Solution
1. The CPU diagnosis of the chip failed.	Power on and off repeatedly. The probability of failure is high.	Replace the servo drive and safety module.
2. The RAM diagnosis of the chip failed.		
3. The FLASH diagnosis of the chip failed.		
4. The software program has stack overflow problems.		

- E145.1: Safety module program execution exception

  Cause:

  The internal program execution of the safety module is abnormal and the 16 kHz interrupt function is not executed.

Cause	Troubleshooting	Solution
The internal program execution of the safety module is abnormal and the 16 kHz interrupt function is not executed.	The fault still exists after power off and restart.	Return to the factory for maintenance.

- E150.0: STO safety state applied

  Cause:

  The STO input protection applies (safety state).

Cause	Troubleshooting	Solution
STO is triggered because either or both of two 24 V inputs are disconnected.	1. Check whether the STO function is activated.	There is no need to take any corrective actions. After the STO terminal is back to normal, clear the fault using the fault reset function.
	2. Check whether the STO power supply is normal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
	3. The fault persists after preceding causes are rectified.	Replace the servo drive.

- E150.1: STO input state abnormal

  Cause:

  The single-channel input of STO is ineffective.

Cause	Troubleshooting	Solution
1. STO input power supply is abnormal.	Check whether the STO power supply is normal.	Check whether the 24 V power supply for the STO is stable. Tighten the cables that are loose or disconnected.
2.STO input resistor is abnormal.	After STO is triggered, only one STO signal is sent to MCU after the 24 V power supply is cut off due to input resistor drift.	Replace the servo drive.
3. STO is ineffective	The fault persists after preceding causes are rectified.	Replace the servo drive.

- E150.2: Buffer 5 V voltage detection error

Cause:

The MCU monitors the 5 V power supply of the PWM Buffer to detect whether overvoltage or undervoltage occurs. If the voltage is abnormal, E150.2 occurs.

Cause	Troubleshooting	Solution
The 5 V voltage supplied to the STO Buffer is abnormal due to undervoltage or overvoltage.	Check whether the fault can be removed by a restart. If not, the 5V voltage supplied to the Buffer is abnormal.	Replace the servo drive.

- E150.3: STO input circuit hardware diagnosis failure
  Cause:

  The photocoupler of the front hardware circuit for STO input is inspected. If the photocoupler is short-circuited, the servo will display E150.3.

Cause	Troubleshooting	Solution
Short circuit occurs on the upstream optocoupler of STO1 or STO2.	The fault persists and the keypad displays E150.3 after restart.	Replace the servo drive.

- E150.4: PWM buffer hardware detection failure
  Cause:

  An error occurs on the PWM Buffer integrated circuit during initialization detection upon power-on (the PWM signal cannot be blocked).

Cause	Troubleshooting	Solution
STO Buffer power-on test error	The fault persists and the keypad displays E150.4 after restart.	Replace the servo drive.

- E150.5: STO input signal interference
  Cause:

  The STO input signal is interfered with, but the interference does not meet the noise filtering conditions set in H0A.73.

Cause	Troubleshooting	Solution
Poor contact of the STO terminal or unstable external 24V input voltage may lead to STO misoperation or malfunction.	Check whether the 24V input voltage of the STO terminal is unstable and disconnected repeatedly.	Replace the 24V power supply.

- E151.0: SCI communication exception between servo drive and safety module
  Cause:

  The NXP chip diagnoses in real time whether the heartbeat of the InoBus communication with the main MCU is normal.

Cause	Troubleshooting	Solution
The heartbeat detection between the servo drive and the safety module is abnormal.	Check whether the hardware connection between the servo drive and the board is normal.	Ensure that the physical connection between the board and the servo drive is normal.

- E151.1: SCI communication exception between two MCUs of the safety module
  Cause:

  SCI communication exception between two MCUs of the safety module

Cause	Troubleshooting	Solution
RS232 data exchange communication abnormal inside the safety board.	Check whether the master/slave MCU is programmed successfully when updating the board program. Perform a power cycle to check if the fault is eliminated.	• Check whether interference near the servo drive affects RS232 communication. • If the fault persists after a power cycle, return the drive to the manufacturer for repair.

- E152.0: Failure of parameter verification between two MCUs of the safety module
  Cause:

  The CRC values of the safety parameters read from the EEPROM by the dual MCUs of the safety module are inconsistent.

Cause	Troubleshooting	Solution
1. The software is updated.	Check whether the software is upgraded.	Restore safety parameters to default settings.
2. The voltage of the control circuit power supply drops instantaneously.	• Check whether the control circuit (L1C, L2C) is in the process of power-off or instantaneous power failure occurs. • Measure whether the input voltage of the control circuit cable on the non-drive side is within the following range:• 220 V servo drive: Effective value: 220 V to 240 V Allowable deviation: –10% to +10% (198 V to 264 V)• 380 V servo drive: Effective value: 380 V to 440 V Allowable deviation: -10% to +10% (342 V to 484 V)	• Restore safety parameters to default settings and write parameters again. • Increase the power supply capacity or replace the power supply with a power supply of higher capacity. Restore the safety parameters to default settings and write the parameters again.
3. Instantaneous power failure occurs when saving parameters.	Check whether instantaneous power failure occurs when saving parameters.	Power on again, restore the safety parameters to default settings and write parameters again.
4. The safety module has failed.	If the fault persists though parameters are restored to default settings and the servo drive is powered off and on repeatedly, the safety module is faulty.	Replace the safety module.

- E152.1: Timeout for sending CRC between two MCUs of the safety module
  Cause:

  When the two MCUs of the safety module are powered on for communication, the sending of the CRC times out.

Cause	Troubleshooting	Solution
1. The communication between MCU1 and MCU2 of the safety module is disturbed.	Check for interference around the safety module.	Reduce interference around the safety module.
2. The safety module has failed.	Check whether replacing the safety module solves the problem.	Replace the safety module.

- E153.0: SLS1 variable ratio error
  Cause:

The input value is not within the range of 0-32767 when the SLS variable ratio is used.

Cause	Troubleshooting	Solution
The input SLS variable limit is negative.	Check the input value of S_SLS_LIMIT_A.	Modify the host controller program to ensure that the input value of S_SLS_LIMIT_A is 0 to 32767.

- E153.1: Inconsistent state data of safety channel 1 and safety channel 2

  Cause:

  The state data of safety channel 1 and safety channel 2 are inconsistent.

Cause	Troubleshooting	Solution
1. Dual-channel feedback status synchronization of the safety board is abnormal.	Check whether safety communication are set properly.	Safety communication detected inconsistent dual-channel data.
2. Dual-channel feedback status comparison of the safety board is abnormal.		If the fault persists after a power cycle, return the drive to the manufacturer for repair.

- E153.2: A fatal error occurred on the PSAFE safety protocol stack

  Cause:

  A fatal error occurred on the safety protocol stack.

Cause	Troubleshooting	Solution
1. The safety protocol stack of the safety board is abnormal.	Check whether the board is normal.	If the fault persists after a power cycle, return the drive to the manufacturer for repair.

- E631.0: SBC brake circuit diagnosis exception

  Cause:

  The 24 V input/output of the built-in brake circuit of the drive is abnormal.

Cause	Troubleshooting	Solution
1. The SBC circuit is abnormal when the card is powered on.	Check whether the 24 V voltage of the SBC is normal.	Ensure that the 24 V voltage of the SBC is normal.
2. The brake is abnormal during SBC brake release.	SBC brake circuit is faulty.	In case of the SBC circuit hardware failure, it is recommended to return it to the factory for maintenance.

- E740.0: Encoder communication timeout

  Cause:

  Communication timeout occurs on the absolute encoder.

Cause	Troubleshooting	Solution
The encoder cable is loosened.	1 Check the encoder cable connections. 2 Check whether vibration on site is too strong, which loosens the encoder cable and even damages the encoder. 3 Use a new encoder cable. If the fault disappears, the original encoder cable is damaged.	1 Check whether the encoder version (H00.04) is set properly. 2 Check whether the servo drive software version (H01.00). 3 Check the encoder cable connections. 4 Replace the servo motor.

- E740.2: Encoder communication error

  Cause:

A communication error occurs on the RX side of the encoder.

Cause	Troubleshooting	Solution
1. The encoder is wired improperly.	Check encoder wiring.	Connect the encoder cables according to the correct wiring diagram.
2. The encoder cable connections become loose.	Check for strong vibration, which loosens the encoder cable and even damages the encoder.	Re-connect encoder cables and ensure encoder terminals are connected securely.
3. The encoder Z signal is interfered with.	• Check the field cable layout:• Check whether ambient devices are generating disturbance and whether multiple disturbance sources such as variable-frequency devices are present inside the cabinet. • Make servo drive stay in "Rdy" status and rotate motor shaft counterclockwise (CCW) manually and observer whether H0b.17 (feedback pulse counter) increases/ decreases smoothly. Turning one circle corresponds to five 0–360° (for Z series motors). For X series motors, turning one circle corresponds to four 0–360°. • If H0b.17 changes abnormally during motor rotating, the encoder is faulty. • If no alarm is reported during motor shaft rotating but an alarm is reported during servo drive running, interference may exist.	• It is recommended to use the cables provided by Inovance. • If a customized cable is used, check whether this cable is a shielded twisted pair cable that complies with the specifications. • Route the motor cables and encoder cables through different routes. Ensure the servo motor and servo drive are grounded properly. • Check whether the connectors at both ends of the encoder are in good contact and whether any pin retracts.
4. The encoder is faulty.	• Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. • Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	• Use a new encoder cable. • If the fault persists after the encoder cable is replaced, the encoder may be faulty. In this case, replace the servo motor.
5. The T2 interpolator does not support software reset.	If H00.04 starts with 208, the T2 interpolator is used.	Power up and down again. If the error still exists, continue to troubleshoot according to steps 1 to 4.

- E740.3: Absolute encoder single-turn calculation error

  Cause:

Internal fault of the encoder.

Cause	Troubleshooting	Solution
The encoder is faulty.	1 Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. 2 Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	1 Check whether the encoder version (H00.04) is proper. 2 Check whether the encoder cable is proper. 3 Replace the motor.

- E740.6: Encoder data write error

  Cause:

  The attempt to write the encoder data fails.

Cause	Troubleshooting	Solution
An error occurs when writing the position offset after angle auto-tuning.	Use a new encoder cable. If the fault disappears, the original encoder cable is damaged. Keep the motor in a certain position, power on the system several times and observe the change of H0b.17 (Electrical angle). The electrical angle deviation should be within ±30° when the motor position does not change.	Use a new encoder cable. If the fault persists after the encoder cable is replaced, the encoder may be faulty. In this case, replace the servo motor.

- E740.9: Encoder data transmit delay is too long

  Cause:

  The encoder data transmit delay is set to exceed one current loop period.

Cause	Troubleshooting	Solution
1. The value of H01.59 is set too large.	Power off and restart the drive.	Decrease the value of H01.59.
2. Too many encoder data bits.		Use an encoder with fewer data bits.

- E750.0: Deviation of master QEP and subdivision quadrant too large (over 2 pulses)

  Cause:

  Deviation of master QEP and subdivision quadrant too large (over 2 pulses).

Cause	Troubleshooting	Solution
The encoder disk is contaminated or other photoelectric devices are disturbed.	Power off and restart the drive.	Return to the factory for maintenance.

- E750.1: Difference between safety encoder master and slave positions too large

  Cause:

  Difference between safety encoder master and slave positions too large

Cause	Troubleshooting	Solution
Difference between safety encoder master and slave positions too large	Power off and restart the drive.	Return to the factory for maintenance.

- E750.2: QEP difference between encoder master and slave too large

  Cause:

  The difference between QEP counts of the master and slave is greater than 2.

Cause	Troubleshooting	Solution
Board-level signal interference, encoder disk contamination, external chip fault.	Check the encoder surroundings for interference.	Replace the motor or encoder.

- E750.3: Difference between safety encoder master and slave analog values too large

  Cause:

  Difference between safety encoder master and slave sampled analog values too large

Cause	Troubleshooting	Solution
Difference between safety encoder master and slave sampled analog values too large	Power off and restart the drive.	Return to the factory for maintenance.

- E750.4: Encoder chip power supply diagnosis exception

  Cause:

  LDO or battery voltage is lower than 3.1 V.

Cause	Troubleshooting	Solution
The external power supply of the encoder is under voltage, the LDO device is damaged, and the battery voltage is low	• Check whether the battery is correctly connected. • Check whether the encoder is powered normally.	Replace the motor or encoder.

- E750.5: Encoder master and slave SN mismatch

  Cause:

  SN counts of the master and slave are not equal.

Cause	Troubleshooting	Solution
The chip runs abnormally, and the master and slave do not exchange data normally.	Check whether the chip is abnormal due to too high ambient temperature.	Replace the motor or encoder.

- E750.6: Encoder chip diagnosis exception

  Cause:

  The flash, RAM, and chip of the master or slave are diagnosed faulty.

Cause	Troubleshooting	Solution
Chip exception	Check whether the chip is abnormal due to too high ambient temperature.	Replace the motor or encoder.

- E750.7: Encoder SPI communication error, no response from slave

  Cause:

The slave failed to receive the command word from the master, or the master failed to receive the reply frame from the slave.

Cause	Troubleshooting	Solution
Board-level communication interference causes internal CRC failure, peripheral abnormality, etc.	Check whether the chip is abnormal due to too high ambient temperature.	Replace the motor or encoder.

- E751.0: Safety module encoder CRC error

  Cause:

  1. The SN increment received by the safety module is abnormal.

  2. The CRC value calculated by the safety module is inconsistent with the received CRC value.

Cause	Troubleshooting	Solution
1. The encoder cable is abnormal.	Check whether the encoder cables are normal.	Check whether encoder cables are connected properly.
2. The communication with encoder suffers from interference.	Check for interference around the encoder cables.	• Check whether the servo drive and motor are properly grounded, and you can put a magnetic ring on the encoder to reduce the interference. • Replace the motor or encoder.

- E751.1: Excessive deviation between speeds calculated by MCU1 and MCU2 of safety module

  Cause:

  The deviation between the speeds calculated by MCU1 and MCU2 exceeds the threshold.

Cause	Troubleshooting	Solution
1. The communication between MCU1 and MCU2 of the safety module is disturbed.	Check for interference around the safety module.	Reduce interference around the safety module.
2. The safety module has failed.	Check whether replacing the safety module solves the problem.	Replace the safety module.

- E751.2: Safety module position 1 & 2 check error

  Cause:

  The deviation between position 1 and position 2 received by the safety module exceeds the threshold.

Cause	Troubleshooting	Solution
The safety encoder is faulty.	Check whether replacing the safety encoder solves the problem.	Replace the safety encoder.

- EE20.0: Safety bus WireBreak

  Cause:

  Safety bus communication is disconnected.

Cause	Troubleshooting	Solution
Safety bus communication is disconnected.	Reserved.	Reserved.

- EE20.1: Inconsistent PROFIsafe destination address

  Cause:

The local safety destination address is inconsistent with the configuration.

Cause	Troubleshooting	Solution
The local PROFIsafe destination address (H20.64 or DIP switch) is inconsistent with the configured address (F_Dest_Add).	Check the addresses.	Take either of the following measures: 1. Change the local PROFIsafe destination address (H20.64 or DIP switch) to the same as the configured address (F_Dest_Add). Restart the drive to let the modification take effect. 2. Modify the configured destination address (F_Dest_Add) to the same as the local PROFIsafe destination address.

- EE20.2: Invalid PROFIsafe destination address

  Cause:

  The configured safety destination address (F_Dest_Add) is 0 or 65535, which is invalid.

Cause	Troubleshooting	Solution
The configured safety destination address (F_Dest_Add) is 0 or 65535, which is invalid.	1. Check the configured safety destination address. 2. Check whether the GSD file matches the device.	1. If the GSD file is correct, the range of F_Dest_Add is restricted to 1 to 65534. No error will be reported in theory. 2. If the GSD file is incorrect, replace the GSD file.

- EE20.3: Invalid or inconsistent PROFIsafe source address

  Cause:

  The local functional safety source address is inconsistent with the configuration.

Cause	Troubleshooting	Solution
1. The local PROFIsafe source address (H20.63) is inconsistent with the configured address (F_Source_Add). The configured safety destination address (F_Dest_Add) is 0 or 65535, which is invalid.	1. Check the addresses. 2. Check the configured safety source address. Check the GSD file.	1. Take either of the following measures if the addresses are inconsistent: 1) Change the local PROFIsafe source address to the same as the configured source address. Restart the device to let the modification take effect. 2) Change the configured source address to the same as the local PROFIsafe address. 2. If the configured source address (F_Source_Add) is invalid: 1) If the the GSD file is correct,the value range of F_Source_Add is restricted to 1 to 65534, and no error will be reported. 2) If the GSD file is incorrect, replace the GSD file.

- EE20.4: PROFISafe watchdog time is 0

  Cause:

  The configured watchdog time (F_WD_Time) is 0.

Cause	Troubleshooting	Solution
The configured watchdog time (F_WD_Time) is 0.	1. Check the configured watchdog time. 2. Check whether the GSD file matches the device.	1. If the GSD file is correct, the range of F_WD_Time is restricted to 10 to 65535. No error will be reported in theory. 2. If the GSD file is incorrect, replace the GSD file.

- EE20.5: PROFIsafe SIL level setting error
  Cause:

  The configured SIL class exceeds SIL3.

Cause	Troubleshooting	Solution
The configured SIL class exceeds SIL3.	1. Check the value of F_SIL. 2. Check whether the GSD file matches the device.	1. If the GSD file is correct, the value of F_SIL is fixed to SIL3. No error will be reported in theory. 2. If the GSD file is incorrect, replace the GSD file.

- EE20.6: PROFIsafe CRC length mismatch
  Cause:

  F parameter configuration error. If the safety telegram version is V24:

  1) F_CRC_lentgh! = 3-Byte-CRC

  2) The length of F-IO exceeds 12 bytes.

  If the safety telegram version is V26:

  1) F-CRC-Seed != CRC-Seed32且F_CRC_lentgh = 4-Byte-CRC

  2) The length of F-IO exceeds 123 bytes.

Cause	Troubleshooting	Solution
F parameter configuration error. If the safety telegram version is V24: 1) F_CRC_lentgh! = 3-Byte-CRC 2) The length of F-IO exceeds 12 bytes. If the safety telegram version is V26: 1) F-CRC-Seed != CRC-Seed32且 F_CRC_lentgh = 4-Byte-CRC. 2) The length of F-IO exceeds 123 bytes.	1. Check the configuration interface, safety telegram and F parameter setting. If the safety telegram version is V24: 1) Check whether F_CRC_lentgh = 3-Byte-CRC in the F parameter setting interface. 2) Check whether the length of the safety telegram exceeds 12 bytes. If the safety telegram version is V26: 1) Check whether F-CRC-Seed = CRC-Seed32 and F_CRC_lentgh = 4-Byte-CRC. 2) Check whether the length of the safety telegram exceeds 123 bytes. 2. Check whether the GSD file matches the device.	1. If the GSD file is correct, the length of the safety telegram is not allowed to exceed 12 bytes, and F-CRC-Seed and F_CRC_lentgh cannot be modified. Therefore, no error should be reported. 2. If the GSD file is incorrect, replace the GSD file.

- EE20.7: PROFISafe F parameter version mismatch
  Cause:

On the configuration interface, the F parameter version (F_Par_Version) is not 1 (V2 mode).

Cause	Troubleshooting	Solution
On the configuration interface, the F parameter version (F_Par_Version) is not 1 (V2 mode).	1. Check whether F_Par_Version is set to 1. 2. Check whether the GSD file matches the device.	1. If the GSD file is correct, the value of F_Par_Version is fixed to 1. No error should be reported in theory. 2. If the GSD file is incorrect, replace the GSD file.

- EE20.8: PROFISafe F parameter CRC error
  Cause:

  Internal communication error. F parameter CRC failure.

Cause	Troubleshooting	Solution
Internal communication error, F parameter CRC failure.	1. Eliminate field interference.	1: Restart. 2. If restart cannot eliminate the fault, return the device to the manufacturer.

- EE20.9: PROFIsafe device-specific fault
  Cause:

  During F parameter configuration, the PROFISafe protocol stack is detected to be in the fault safety state.

Cause	Troubleshooting	Solution
During F parameter configuration, the PROFISafe protocol stack is detected to be in the fault safety state.	Check the error codes recorded in H20.100 to H20.111 through the software tool.	1. Check the values of H20.100 to H20.111 through the software tool, and then send them to R&D persons. 2: Restart.

- EE20.C: PROFISafe I parameter CRC error
  Cause:

  On the configuration interface, I parameter CRC is configured differently with that defined in the software.

Cause	Troubleshooting	Solution
On the configuration interface, I parameter CRC is configured differently with that defined in the software.	1. Check whether the GSD file matches the device. 2. PROFISafe board software version	1. If the GSD file is correct, I parameter CRC is disabled. No error should be reported in theory. 2. If the GSD file is incorrect, replace the GSD file.

- EE20.D: F_Block_ID set in PROFISafe F parameter is not supported
  Cause:

  The value of field F_Block_ID in F parameter can only be 0, 1, 2, or 3.

Cause	Troubleshooting	Solution
The value of field F_Block_ID in F parameter can only be 0, 1, 2, or 3.	1. Check whether the GSD file matches the device.	1. If the GSD file is correct, F_Block_ID = 0 and is inaccessible to the user. No error should be reported in theory. 2. If the GSD file is incorrect, replace the GSD file.

- EE20.E: PROFISafe communication CRC error
  Cause:

  A CRC error occurs on the received safety telegram.

Cause	Troubleshooting	Solution
Internal communication error. An error occurs on the received safety telegram.	1. Eliminate field interference.	1: Restart. 2. RUN/STOP the PLC.

- EE20.F: PROFIsafe communication timeout
  Cause:

  No new telegram was received in the designated watchdog.

Cause	Troubleshooting	Solution
No new telegram was received in the designated watchdog.	1. Check the setting of configuration parameters. 1) Watchdog parameter (F_WD_ Time). 2) Cycle Time in SafetyAdministration. 3) On the configuration interface, go to Device Property -> Real-time Setting -> I/O Period and check the update time. 2. Check the keypad for wire breakage error (EE08.8 or EE08.9).	1. Increase the F watchdog time. Set it as follows: F_WD_Time > Cycle Time + IO update period x 2 + PROFIsafe cycle x 2 Note: When the current loop is 16K, PROFIsafe cycle = 4 ms, and when the current loop is 8K, PROFISafe cycle = 8 ms. 2. EE08.8 and EE08.9 can cause PROFISafe communication disconnection. You can eliminate the fault according to EE08 troubleshooting.

17.4.3 Solutions to Alarms

- A108.5: Safety module EEPROM write timed out
  Cause:

  Parameter write time exceeds the limit.

Cause	Troubleshooting	Solution
EEPROM abnormal	Power off and restart the drive to check if the modifications to safety parameters take effect.	• Power off and restart the drive. • Replace the safety module.

- A108.6: Safety module EEPROM read timed out
  Cause:

  The parameter read time exceeds the limit.

Cause	Troubleshooting	Solution
EEPROM abnormal	Power off and restart the drive to check if safety parameters can be read.	• Power off and restart the drive. • Replace the safety module.

- A108.7: Safety module EEPROM write check error
  Cause:

  When the safety module function is written to EEPROM, it is read again from EEPROM and compared with the value to be written. The comparison does not match.

Cause	Troubleshooting	Solution
EEPROM write error	Reset the fault and write again.	If the fault remains, it is recommended to replace the safety module.

- A108.8: Safety module EEPROM read check error

  Cause:

  The check on the data read in EEPROM fails.

Cause	Troubleshooting	Solution
The check on the data read in EEPROM fails.	Modify the safety module parameter, power off and on the servo drive again and check whether the modification is saved.	If the modification is not saved and the fault persists after the servo drive is powered off and on repeatedly, replace the servo drive.

- A115.0: Parameter setting error

  Cause:

  1. The SSM hysteresis is equal to or larger than SSM speed threshold.

  2. A safety function not supported by the safety telegram is turned on. For example, SS1E, SS2E or dynamic SLS is on under telegram 30.

Cause	Troubleshooting	Solution
1. SSM hysteresis threshold is equal to or larger than the speed threshold.	1. Check whether the value of H20.72 is greater than or equal to the value of H20.70.	2. Set SSM parameters properly.
2.2. A safety function not supported by the safety telegram is turned on. For example, SS1E, SS2E or dynamic SLS is on under telegram 30.	2. Check whether the safety function not supported by the telegram is enabled by H20.61.	2. The SSM speed threshold is larger than the SSM hysteresis threshold. 3. Enable the corresponding safety function properly.
3. Safety target address: The knob and safety parameters are set to a value other than 0.	3. Check whether the safety target address knob and safety parameters are set to a non-zero at the same time.	4. Set the safety target address properly.

- A160.0: SLS1 exceeded

  Cause:

  The speed feedback real-time value exceeds the limit value of SLS1 after SLS1 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS1 after SLS1 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS1 when the SLS1 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS1 after SLS1 monitoring is active.

- A160.1: SLS2 exceeded

  Cause:

  The speed feedback real-time value exceeds the limit value of SLS2 after SLS2 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS2 after SLS2 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS2 when the SLS3 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS2 after SLS2 monitoring is active.

- A160.2: SLS3 exceeded

  Cause:

  The speed feedback real-time value exceeds the limit value of SLS3 after SLS3 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS3 after SLS3 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS3 when the SLS3 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS3 after SLS3 monitoring is active.

- A160.3: SLS4 exceeded

  Cause:

  The speed feedback real-time value exceeds the limit value of SLS4 after SLS4 monitoring is active.

Cause	Troubleshooting	Solution
The speed feedback real-time value exceeds the limit value of SLS4 after SLS4 monitoring is active.	When the stop mode upon SLS fault is STO, check the fault record to see if the corresponding speed exceeds the limit value of SLS4 when the SLS4 fault occurs.	Control the motor speed so that it does not exceed the limit value of SLS4 after SLS4 monitoring is active.

- A165.0: SDIp exception

  Cause:

  The motor cannot move in the positive direction or the positive movement exceeds the limit.

Cause	Troubleshooting	Solution
The motor moves in the positive direction when not allowed to do so, or the positive movement exceeds the limit.	When the stop mode upon SDI fault is STO, check the fault record to see if the positive rotation speed at the time of fault exceeds the zero speed window of SDI or if the positive rotation position exceeds the zero position window of SDI.	When positive movement is prohibited, ensure that the motor does not exceed the allowable conditions for positive movement.

- A165.1: SDIn exception

  Cause:

  The motor cannot move in the negative direction or the negative movement exceeds the limit.

Cause	Troubleshooting	Solution
The motor moves in the negative direction when not allowed to do so, or the negative movement exceeds the limit.	When the stop mode upon SDI fault is STO, check the fault record to see if the negative rotation speed at the time of fault exceeds the zero speed window of SDI or if the negative rotation position exceeds the zero position window of SDI.	When negative movement is prohibited, ensure that the motor does not exceed the allowable conditions for negative movement.

- A170.0: SS1 deceleration ramp exception

Cause:

After SS1 deceleration ramp monitoring is started, the actual deceleration ramp exceeds the preset monitoring threshold.

Cause	Troubleshooting	Solution
The deceleration and monitoring threshold are not properly set, and the actual deceleration ramp exceeds the monitoring threshold.	Check whether the preset deceleration is within the monitoring threshold range.	Reasonably set the SS1 deceleration and ramp monitoring threshold to ensure that the deceleration is within the monitoring threshold range.

- A170.1: SS2 deceleration ramp exception

  Cause:

  After SS2 deceleration ramp monitoring is started, the actual deceleration ramp exceeds the preset monitoring threshold.

Cause	Troubleshooting	Solution
The deceleration and monitoring threshold are not properly set, and the actual deceleration ramp exceeds the monitoring threshold.	Check whether the preset deceleration is within the monitoring threshold range.	Reasonably set the SS2 deceleration and ramp monitoring threshold to ensure that the deceleration is within the monitoring threshold range.

- A170.2: SOS speed or position exceeds limit

  Cause:

  In the SOS state, the actual speed or position change exceeds the preset monitoring threshold.

Cause	Troubleshooting	Solution
1. The delay time from SS2 to SOS is set too short, as a result the position and speed monitoring to start before the motor stops.	Check whether the delay time from SS2 to SOS is set properly.	Reasonably set the delay time from SS2 to SOS.
2. The speed and position monitoring threshold settings of SOS are unreasonable.	Check whether the speed and position monitoring thresholds of the SOS are properly set.	Reasonably set the speed and position monitoring thresholds of SOS.
3. The load is too large, resulting in insufficient motor output to maintain the position.	Check whether the motor model is proper.	Select a proper motor model.

18 Maintenance

18.1 Maintenance Interval

Electrical and electronic parts inside the servo drive may be mechanically worn out and degraded. To keep the servo drive and servo motor in good condition, perform parts replacement based on the following table. Before replacement, contact the agent or Inovance first to check whether the components need to be replaced.

Target	Type	Standard replacement interval	Remark
Drive	Power bus capacitor	About 8 years (ambient temperature: 30°C; load rate: 80%; uptime per day: 20 hours; standard environment[1])	The standard replacement cycle is for reference only. If any device/component works improperly before the replacement cycle expires, replace it immediately.
	Cooling fan	5 years (ambient temperature: 30°C; load rate: 80%; uptime per day: 20 hours; standard environment[1])	
	Control circuit aluminum electrolytic capacitor	About 10 years (ambient temperature: 30°C; load rate: 80%; uptime per day: 20 hours; standard environment[1])	
	Pre-charge relay	100000 operations (depending on the operating conditions)	
	Pre-charge resistor	20000 operations (depending on the operating conditions)	
	Dynamic brake relay	About 1000 times (rated motor speed; interval: 5 min; inertia ratio: 20/1)	
	Dynamic braking resistor		
Motor	Bearing	22000 h to 40000 h	The standard replacement cycle is for reference only. If any device/component works improperly before the replacement cycle expires, replace it immediately.
	Fan	30000 h to 40000 h	
	Encoder	22000 h to 40000 h	
	Encoder power supply	22000 h to 40000 h	
	Insulation resistance	Check the insulation resistance at least once per year.	Use an insulation resistance gauge (set to 500 VDC) to measure the insulation resistance. Measurement method: Measure the resistance between the PE (grounding) and any phase among U/V/W. The resistance measured should be higher than 10 MΩ.
Device	Overall inspection	Perform overall inspection at least once every five years or every 20000 hours, whichever comes first.	Perform maintenance based on the related maintenance guide of the equipment.

Note

[1]: See standard environment in *"5.2.1 Installation Environment Requirements" on page 41*.

18.2 Routine Maintenance

18.2.1 Routine Maintenance

The standard environmental conditions are as follows: average ambient temperature: 30°C; average load rate: ＜80%; uptime: ＜20 hours per day

Routine checklist

Table 18–1 Routine checklist

No.	Item	Compliance
1	The ambient temperature and humidity are normal. There is no dust or unwanted objects in the servo drive.	☐
2	There is no abnormal vibration or noise.	☐
3	The voltage of the power supply is normal.	☐
4	There is no strange smell.	☐
5	There are no fibers adhered to the air vent.	☐
6	There is no intrusion of unwanted objects on the load end.	☐

Routine cleaning list

Table 18–2 Routine cleaning list

No.	Routine cleaning list	Compliance
1	Clean the dust, especially the metal dust on the surface of the equipment.	☐
2	Keep the front end of the servo drive and the connectors clean.	☐

Note

- Before cleaning, switch off the power supply and clean with an air gun or a piece of dry cloth.
- Do not use gasoline, dilutes, alcohol, or acid or alkaline detergent to prevent enclosure discolor or damage.

18.2.2 Periodic Inspection Items

Table 18–3 Periodic checklist

No.	Item	Yes
1	The screws used to fix the couplings between devices are in place.	☐
2	There is no sign of overheating.	☐
3	Terminal blocks are in good condition without any sign of damage.	☐
4	The clamping units of terminal blocks are in place.	☐

18.3 Parts Replacement

18.3.1 Replacing the Servo Drive

Caution

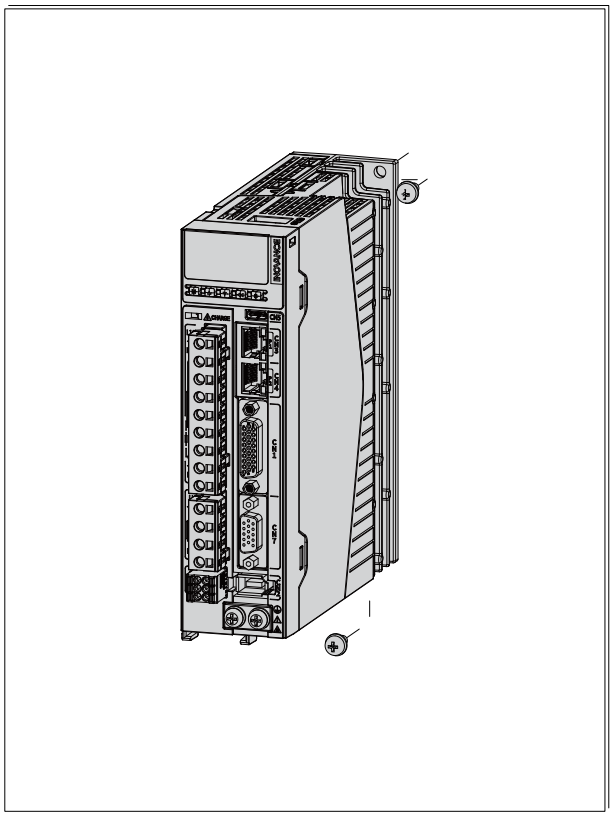
- Note that the drive is energized with high voltage, and all wiring work must be carried out with the drive de-energized.
- Before maintenance, power off the drive, wait for 15 minutes and confirm that the voltage of the drive is lower than 36 VDC. Failure to comply can result in personal injury due to the residual voltage in the capacitor.
- Only trained persons are allowed to repair and maintain the drive. Failure to comply can result in major property loss, severe personal injury or even death.
- Due to the potential external power voltage, exert extreme caution when you are working on the device. Because the power supply and terminals may be live even if the motor does not run.
- Only trained persons are allowed to handle heavy equipment or equipment with high center of gravity. Improper lifting or handling may result in major property loss, serious personal injury or even death.

Procedure

1. Disconnect the drive power supply.
2. Check that the drive voltage is lower than 36 VDC fifteen minutes after power-off.
3. Remove all cables from the drive.
4. Remove the two M4 screws that secure the drive and take off the drive.

   Note:

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



5. Install the drive and fix it with two M4 screws. The recommended torque is 1.2 N·m. After installation is done, check according to the post-installation checklist.
6. Re-connect cables. After wiring is done, check the wiring based on the checklist.
7. Connect the power supply of the drive.
8. Perform a complete commissioning with the commissioning tool.

18.3.2 Replacing the Motor Flat Key

Caution

- Observe all the requirements presented in this chapter. Failure to comply may result in equipment fault or damage.
- Violent disassembly is not allowed. Take enough care during disassembly to prevent personal injury.

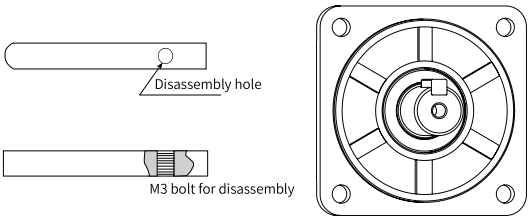
Standard MS1 series motors in frame sizes 60, 80, and 130 adopt C-type flat key that carries the disassembly hole. To disassemble the flat key, select a proper disassembly bolt (inner hexagon bolt recommended) based on the following table.

Specification of disassembly bolt for MS1 series motor		
MS1 motor	Dimensions of the flat key (unit: mm)	Disassembly bolt (inner hexagon bolt)
60	C-type flat key: C5 x 5 x 16.5	M3 x 10 and above
Frame size 80	C-type flat key: C6 x 6 x 25	M3 x 15 and above
Frame size 100	C-type flat key: C8 x 7 x 35	M3 x 20 and above

Specification of disassembly bolt for MS1 series motor		
MS1 motor	Dimensions of the flat key (unit: mm)	Disassembly bolt (inner hexagon bolt)
Frame size 130	C-type flat key: C8 x 7 x 35	M3 x 20 and above
Frame size 180	C-type flat key: C10 x 8 x 64	M3 x 20 and above

- Tool needed: an Allen wrench
- Disassembly procedure:

  1. Select a proper disassembly bolt (inner hexagon bolt recommended) based on the motor model.
  2. Use an Allen wrench to screw down the bolt clockwise until A-A end of the flat key is completely detached from the keyway, as shown below.



19 Technical Data of the Drive

19.1 Electrical Specifications

- Single-phase 200 V drive

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

Note

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

- Three-phase 200 V drive

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

- Three-phase 400 V drive

Item		Size C		Size D		Size E		
Servo Drive Model		T3R5	T5R4	T8R4	T012	T017	T021	T026
Drive Power (kW)		1.0	1.5	2.0	3.0	5.0	6.0	7.5
Max. applicable motor capacity (kW)		1.0	1.5	2.0	3.0	5.0	6.0	7.5
Power supply equipment capacity (kVA)		6.05	9.08	10.23	15.15	22.25	25.0	31.25
Continuous output current (Arms)		3.5	5.4	8.4	12.0	17.0	21.0	26.0
Max. output current (Arms)		11.0	14.0	20.0	30.0	42.5	52.5	65.0
Main circuit	Continuous input current (Arms)	2.4	3.6	5.6	8.0	12.0	16.0	21.0
	Main circuit power supply	3-phase 380 VAC–480 VAC, -10% to +10%, 50 Hz/60 Hz						
	Heat (W)[1]	39.5	63.25	94.82	135.47	187.62	228.28	258.63

Item		Size C		Size D		Size E		
Control circuit	Control circuit power supply	Single-phase 380 VAC–480 VAC, -10% to +10%, 50 Hz/60 Hz						
	Heat (W)[2]	16						
Braking resistor	Resistance (Ω)	100	100	50	50	35	35	35
	Resistor power (W)	80	80	80	80	100	100	100
	Min resistance of external resistor (Ω)	80	60	45	40	35	25	25
	Max. braking energy absorbed by capacitor (J)	36.06	43.79	64.40	64.40	105.62	154.56	154.56
	Braking resistor	Built-in braking resistor						
Cooling mode		Air cooling						
Overvoltage class		III						
Max. Input Surge Current (A)		18.65	18.65	24.86667	24.86667	24.86667	24.86667	24.86667
3τ(ms) (3 x RC time constant[3])		33.6	40.8	45	45	73.8	108	108

Note

- [1]: Main circuit heat refers to the heat generated by the drive under rated output current.
- [2]: Control circuit heat refers to the heat generated by the drive under rated input current.
- [3] RC time constant = Pre-charge resistor R x Bus capacitor C, used to represent the power-on time, that is, the bus voltage becomes stable after the time of 3τ..
- Select the external braking resistor according to actual operating conditions. Fore details, see *"20.5 Braking resistor" on page 914*.

19.2 Technical Specifications

Item			Description
General Specifications	Control mode		IGBT SVPWM control, sine wave current drive mode
			200 V, 400 V: Single-phase/Three-phase full bridge rectification
	Encoder feedback		The drive supports Inovance 20-, 23- and 26-bit multi-turn absolute encoders and functional safety encoders (the drive must be of the functional safety type). The following encoders are supported: Inovance communication encoder, ABZ incremental encoder, BiSS-C encoder, SSI encoder and EnDat 2.2 encoder. You can use the Inovance multi-turn absolute encoder as an incremental encoder if you remove the battery. **Note:** For details, see Section "Description of Commissioning Objects" in SV680F-INT Series Servo Drive Quick Start Guide.
	Conditions for use	Operating/ Storage temperature [1]	0°C to 55°C (average load ratio not exceeding 80% in ambient temperatures between 45°C to 55°C) (non freezing)/ -40°C to 70°C
		Operating/ Storage humidity	Below 90% RH (no condensation)
		Vibration resistance	Operation: • Displacement vibration amplitude: 3.5 mm at 5 Hz–8.4 Hz • Acceleration vibration amplitude: 1 g at 8.4 Hz–200 Hz Product package: • 5 Hz–100 Hz: 0.01g^2/Hz • 200 Hz: 0.001g^2/Hz • Grms = 1.14 g
		Impact resistance	19.6 m/s^2
		IP rating	IP20 Note: excluding terminals (IP00)
		Pollution degree	PD2
		Protection class	Class I
		Altitude	The maximum altitude is 2000 m. • For altitudes not higher than 1000 m, derating is not required • Derating is required for altitudes above 1000 m (derate 1% for every additional 100 m) • For altitudes above 2000 m, contact Inovance.
Speed/ torque control mode	Performance	Speed control range	1 rpm–10000 rpm (The lower limit of the speed control range is that the load can be rotated under rated motor torque)
		Torque control accuracy	±1%
	Input signal	Speed Reference Input	Network-type instructions are from PROFINET communication
		Torque Reference	
Position Control Mode	Input signal	Position reference	Network-type instructions are from PROFINET communication

Item			Description
Input/ Output signal	DI signal	DI signal function assignment	5 DIs DI1–DI3: normal DI (rising edge (24 V input low to high) input delay: 50 μs, falling edge (24 V input high to low) input delay: 200 μs, voltage range: 20 V–30 V) DI4–DI5: fast DI (rising edge (24 V input low to high) input delay: 10 μs, falling edge (24 V input high to low) input delay: 50 μs, voltage range: 20 V–30 V)
	Digital output signal	Output signal function selection	2 DOs With-load capacity: 50 mA Voltage range: 5 V to 30 V
	Analog input signal		AI1 voltage input: 16-bit, -10 V to +10 V; max. allowable voltage: ±12 V
			AI2 voltage input: 12-bit, -10 V to +10 V; max. allowable voltage: ±12 V
	Analog output signal		AO1 voltage output range: -10 V to +10 V
Built-in functions	Overtravel (OT) prevention		The servo drive stops immediately when P-OT or N-OT is active
	Electronic gear ratio		0.001 ⩽ B/A ⩽ 26843545.6
	Protective functions		Including protections against overcurrent, overvoltage, undervoltage, overload, main circuit detection error, heatsink overheat, power phase loss, overspeed, encoder error, CPU error, and parameter error
	Safety Function	Type	STO (standard)/SS1/SS1E/SBC/SOS/SS2/SS2E/SLS/SDI/SSM[2]
		Applicable standard	IEC61800-5-2:2016
	LED display		Main circuit CHARGE indicator, 5-digit LED display
	Vibration suppression		5 notches (including two adaptive notches) available, 50 Hz to 8000 Hz
	Usability functions		One-key parameter tuning, adaptive parameter tuning, intelligent parameter tuning, speed observer, and model tracking
	Communication function	Software commissioning	Type-C
		Multi-station communication	PROFINET, PROFIsafe (available for functional safety models)
		Number of multi-station communication axes	Maximum number of slaves: 65535 (determined by the PLC)
		Axis address setting	No physical knob, automatically assigned by host controller (PROFINET)
		Function	Including status display, user parameter setting, monitored value display, fault tracing display, JOG and auto-tuning, and communication and motion control command setting
	Others		Gain tuning, alarm log, JOG

Note

- [1] Install the servo drive within the allowable ambient temperature range. When it is installed inside a control cabinet, the temperature inside the cabinet must also be within this range.
- [2] For S models only.

19.3 Dynamic Brake Characteristics

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

Maximum braking distance s (turn) is:

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

The coefficient is as follows:

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

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

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

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

19.4 Load Moment of Inertia

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

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

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

Caution

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

Table 19–1 Allowable Load Moment of Inertia

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

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

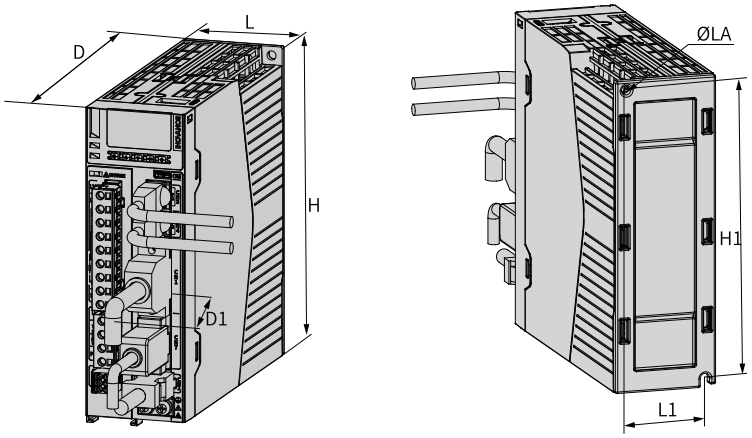
19.5 PROFINET Communication Technical Specifications

PROFINET comprehensive parameters	
Item	Item
Communication protocol	PROFINET
Process Data	RT and IRT
Acyclic	Enables SinaParaS access to profile parameters, function parameters, and safety parameters. The safety parameters are read only. Enables SinaPara (mix) access to function parameters and safety parameters. The safety parameters are read only.
Bus period	RT mode: min. 1 ms IRT mode: min. 250 µs
Sync jitter	< 1 µs
Physical layer	100BASE-TX
Baud rate	100 Mbit/s (100Base-TX)
Duplex mode	Full duplex
Topology	Ring, linear, star, and tree types
Transmission distance	Less than 100 m between two nodes (with proper environment and cables)
Transmission medium	Shielded cables of Cat 5e or higher
Number of slaves	Up to 65535 (dependent on the performance of the PLC)
Bit error rate	10^{-10} Ethernet standard
I&M data	I&M0 to I&M4
GSD version	V2.25, V2.33, V2.43

PROFINET comprehensive parameters	
Item	Item
Configuration version	TIA Portal V11 or higher STEP7 V5.5 or higher SMOTION and 200Smart compatible versions, consistent with SV660F
PROFINET version	V2.4
PROFINET interface	Number of ports: 2 Switch: supported
Type	PROFINET IO device

Function	PROFINET IO devices, support for medium redundancy
Alarm/diagnosis information	Supported
DCP CALL (search for device)	Supported
MRP (ring-type network)	Supported
MRPD (Quick reset ring-type network)	Supported
Profinet system redundancy	Supported
Start priority	Supported
Port disabling	Supported
No configuration is required when you change the configuration.	Supported

19.6 Product Dimensions



Size	L	H	D	L1	H1	D1	ϕLA	Tightening Torque	Mass
	Unit: mm (in.)							Unit: (N·m)	Unit: (kg)
A	45.5 (1.79)	170 (6.69)	150 (5.91)	33 (1.30)	161 (6.34)	75 (2.95)	2×M4	1.2	0.96
C	55±1 (2.17±0.04)	170 (6.69)	173±1 (6.81±0.04)	44 (1.73)	160 (6.30)	75 (2.95)	2×M4	1.2	1.3

Size	L	H	D	L1	H1	D1	ϕLA	Tightening Torque	Mass
	Unit: mm (in.)							Unit: (N·m)	Unit: (kg)
D	80±1 (3.15±0.04)	170 (6.69)	183 (7.20)	71 (2.80)	160 (6.30)	75 (2.95)	3×M4	1.2	1.8
E	90 (3.54)	250 (9.84)	230 (9.06)	78 (3.07)	240.5 (9.47)	75 (2.95)	4×M4	1.2	3.6

20 Options

20.1 Applicable Cables

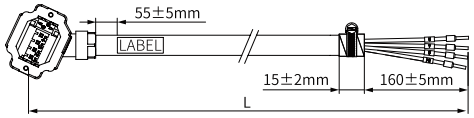
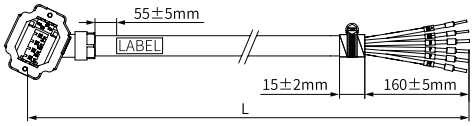
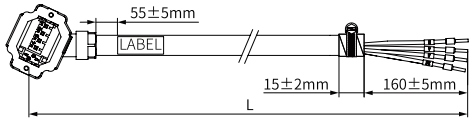
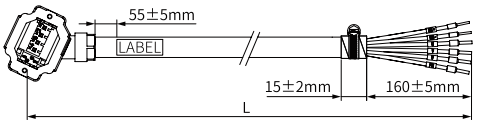
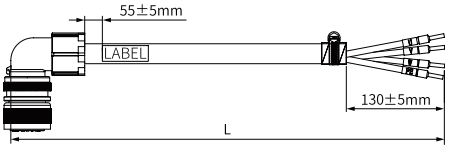
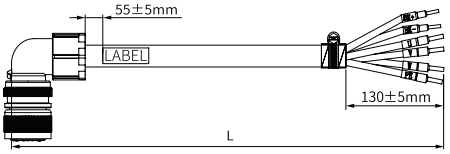
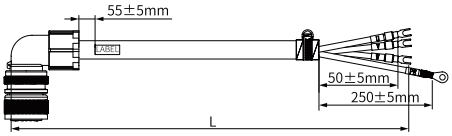
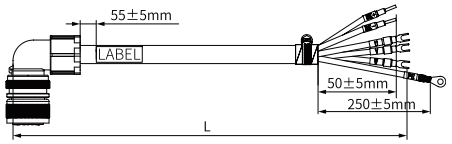
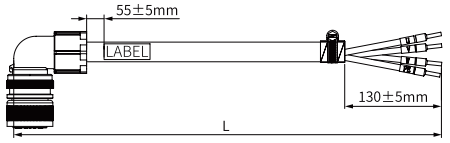
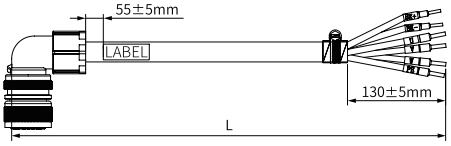
20.1.1 Power cable

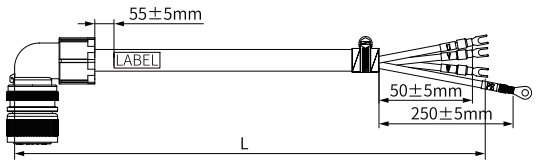
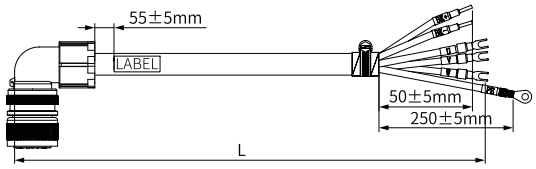
Power Cable Model

S6-L-M ① - 0 ② 0 ③ 1 ④ - 3.0 ⑤ - T ⑥ - INT ⑦

1	**Cable Type** S6-L-B/M: motion control power cable B: with brake M: without brake	3	**Motor Power** 0: 40/60/80 mm frames 1: 100/130/180 mm frames 2: 180 mm frames (4.4 kW and above)	5	**Cable Length (m)** 3.0: 3 5.0: 5 10.0: 10
2	**Connector type at drive side** 0: Spade tongue terminal 1: Pin terminal	4	**Connector type at motor side** 1: 9-core military-spec connector 2: 6-core military-spec connector 7: MS1-tailored connector (front outlet) 8: Ms1-tailored connector (rear outlet)	6	**Special requirements** _: Fixed cable T: Drag chain ⩾ 10 million times
				7	**Version** INT: global version

List of power cables

Motor Model		Cable Model	Cable Length (mm)	Illustration
MS1H1/ MS1H4 motor	Power cable for motor without brake (Front outlet)	S6-L-M107-3.0(-T)-INT	3000	
		S6-L-M107-5.0(-T)-INT	5000	
		S6-L-M107-10.0(-T)-INT	10000	
	Brake (Front outlet)	S6-L-B107-3.0(-T)-INT	3000	
		S6-L-B107-5.0(-T)-INT	5000	
		S6-L-B107-10.0(-T)-INT	10000	
	Power cable for motor without brake (Rear outlet)	S6-L-M108-3.0(-T)-INT	3000	
		S6-L-M108-5.0(-T)-INT	5000	
		S6-L-M108-10.0(-T)-INT	10000	
	Brake (Rear outlet)	S6-L-B108-3.0(-T)-INT	3000	
		S6-L-B108-5.0(-T)-INT	5000	
		S6-L-B108-10.0(-T)-INT	10000	
MS1H2 motor rated 3 kW or below/ MS1H3 motor rated 1.8 kW or below	Power cable for motor without brake	S6-L-M111-3.0(-T)-INT	3000	
		S6-L-M111-5.0(-T)-INT	5000	
		S6-L-M111-10.0(-T)-INT	10000	
	Brake	S6-L-B111-3.0(-T)-INT	3000	
		S6-L-B111-5.0(-T)-INT	5000	
		S6-L-B111-10.0(-T)-INT	10000	
MS1H2 motors (4 kW/5 kW)	Power cable for motor without brake	S6-L-M011-3.0(-T)-INT	3000	
		S6-L-M011-5.0(-T)-INT	5000	
		S6-L-M011-10.0(-T)-INT	10000	
	Brake	S6-L-B011-3.0(-T)-INT	3000	
		S6-L-B011-5.0(-T)-INT	5000	
		S6-L-B011-10.0(-T)-INT	10000	
MS1H3 motors (2.9 kW)	Power cable for motor without brake	S6-L-M112-3.0(-T)-INT	3000	
		S6-L-M112-5.0(-T)-INT	5000	
		S6-L-M112-10.0(-T)-INT	10000	
	Brake	S6-L-B112-3.0(-T)-INT	3000	
		S6-L-B112-5.0(-T)-INT	5000	
		S6-L-B112-10.0(-T)-INT	10000	

Motor Model		Cable Model	Cable Length (mm)	Illustration
MS1H3 (4.4 kW and above)	Power cable for motor without brake	S6-L-M022-3.0(-T)-INT	3000	
		S6-L-M022-5.0(-T)-INT	5000	
		S6-L-M022-10.0(-T)-INT	10000	
	Brake	S6-L-B022-3.0(-T)-INT	3000	
		S6-L-B022-5.0(-T)-INT	5000	
		S6-L-B022-10.0(-T)-INT	10000	

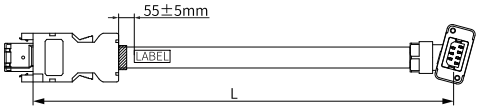
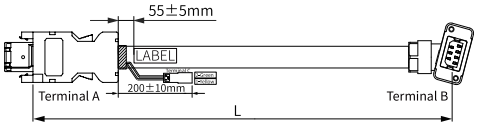
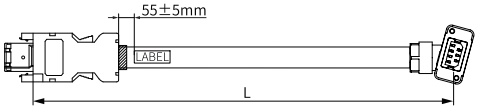
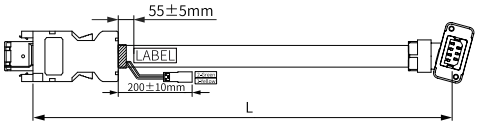
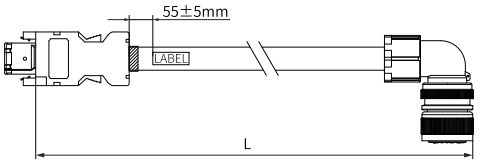
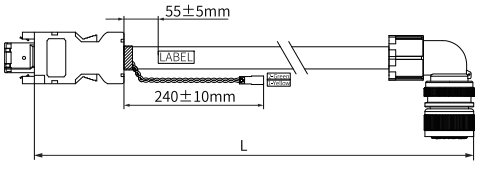
20.1.2 Encoder cable

Encoder Cable Model

S6-L-P ① - 1 ② 2 ③ 1 ④ - 3.0 ⑤ - T ⑥ - INT ⑦

1 **Cable Type** S6-L-P: encoder cable	3 **Encoder** 1: Communication incremental encoder 2: Multi-turn absolute	5 **Cable Length (m)** 3.0: 3 5.0: 5 10.0: 10
2 **Connector type at drive side** 1: USB	4 **Connector type at motor side** 1: 9-core military-spec connector 4: MS1-tailored connector (front outlet) 5: Ms1-tailored connector (rear outlet)	6 **Special requirements** _: Fixed cable T: Drag chain ⩾ 10 million times 7 **Version** INT: global version

List of encoder cables

Motor Model			Cable Model	Cable Length (mm)	Illustration
MS1H1/ MS1H4 terminal-type motor	Front outlet	Single-turn absolute encoder	S6-L-P114-3.0(-T)-INT	3000	
			S6-L-P114-5.0(-T)-INT	5000	
			S6-L-P114-10.0(-T)-INT	10000	
		Multi-turn absolute encoder	S6-L-P124-3.0(-T)-INT	3000	
			S6-L-P124-5.0(-T)-INT	5000	
			S6-L-P124-10.0(-T)-INT	10000	
	Rear outlet	Single-turn absolute encoder	S6-L-P115-3.0(-T)-INT	3000	
			S6-L-P115-5.0(-T)-INT	5000	
			S6-L-P115-10.0(-T)-INT	10000	
		Multi-turn absolute encoder	S6-L-P125-3.0(-T)-INT	3000	
			S6-L-P125-5.0(-T)-INT	5000	
			S6-L-P125-10.0(-T)-INT	10000	
MS1H2/ MS1H3 motor	Single-turn absolute encoder		S6-L-P111-3.0(-T)-INT	3000	
			S6-L-P111-5.0(-T)-INT	5000	
			S6-L-P111-10.0(-T)-INT	10000	
	Multi-turn absolute encoder		S6-L-P121-3.0(-T)-INT	3000	
			S6-L-P121-5.0(-T)-INT	5000	
			S6-L-P121-10.0(-T)-INT	10000	

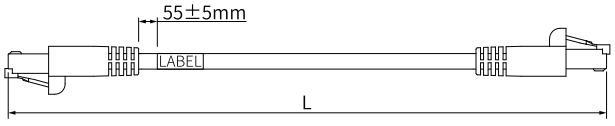
20.1.3 Communication Cable

Model number of communication cables

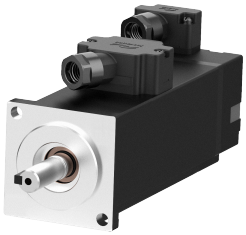
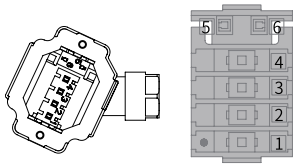
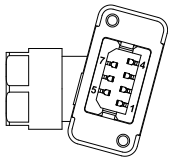
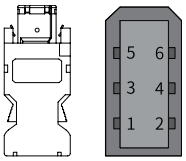
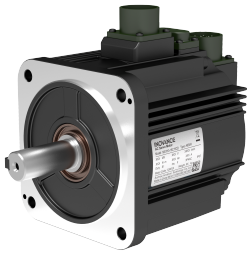
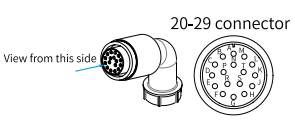
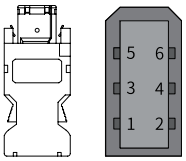
S6-L-T ① - 04 ② - 0.3 ③

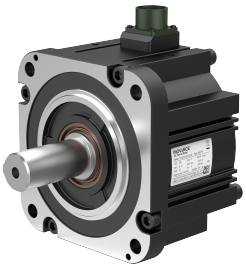
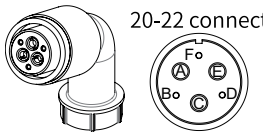
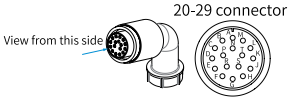
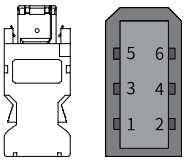
1 **Cable Type** S6-L-T: Motion control communication cable	2 **Cable type** 04: Servo drive network communication cable (CAT.5E&PROFINET) 07: Servo drive network communication cable (CAT6A&PROFINET) 08: Servo drive network communication cable (CAT7&PROFINET)	3 **Cable Length (m)** 0.3: 0.3 2.0: 2 ...

List of communication cables

Cable Name	Cable Model	Cable Length (mm)	Illustration
Servo drive network communication cable (CAT.5E&PROFINET)	S6-L-T04-0.3	300	
Servo drive network communication cable (CAT6A&PROFINET)	S6-L-T07-0.3	300	
Servo drive network communication cable (CAT7&PROFINET)	S6-L-T08-0.3	300	

20.1.4 Terminals on the Motor Side

<table>
<tr><th>Name</th><th>Diagram</th><th colspan="3">Power cable 6-pin connector</th><th colspan="3">Motor-side encoder 7-pin connector</th><th colspan="2">Drive-side 6-pin male connector</th></tr>
<tr><td rowspan="9">Terminals of 40, 60, and 80 flange motors (terminal type)</td><td rowspan="9">  </td><td colspan="3">  </td><td colspan="3">  </td><td colspan="2">  </td></tr>
<tr><td>Pin No.</td><td colspan="2">Signal Name</td><td>Pin No.</td><td colspan="2">Signal Name</td><td>Pin No.</td><td>Signal Name</td></tr>
<tr><td>1</td><td colspan="2">PE</td><td>1</td><td colspan="2">PS+</td><td>1</td><td>+5 V</td></tr>
<tr><td>2</td><td colspan="2">W</td><td>2</td><td colspan="2">PS-</td><td>2</td><td>GND</td></tr>
<tr><td>3</td><td colspan="2">V</td><td>3</td><td colspan="2">DC+</td><td>5</td><td>PS+</td></tr>
<tr><td>4</td><td colspan="2">U</td><td>4</td><td colspan="2">DC-</td><td>6</td><td>PS-</td></tr>
<tr><td>5</td><td colspan="2">Brake</td><td>5</td><td colspan="2">+5 V</td><td rowspan="3">Enclosure</td><td rowspan="3">PE</td></tr>
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<tr><td>7</td><td colspan="2">PE</td></tr>
<tr><td rowspan="10">Terminals of 100 and 130 flange motors</td><td rowspan="10">  </td><td colspan="3">Power cable connector</td><td colspan="3">Encoder cable connector of motors</td><td colspan="3">Drive-side 6-pin male connector</td></tr>
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<tr><td>Pin No.</td><td>Pin No.</td><td>Color</td><td>Pin No.</td><td>Signal Name</td><td>Color</td><td>Pin No.</td><td>Signal Name</td><td>Color</td></tr>
<tr><td>B</td><td>U</td><td>Blue</td><td>A</td><td>PS+</td><td>Blue</td><td>1</td><td>+5 V</td><td>Red</td></tr>
<tr><td>I</td><td>V</td><td>Black</td><td>B</td><td>PS-</td><td>Purple</td><td>2</td><td>GND</td><td>Orange</td></tr>
<tr><td>F</td><td>W</td><td>Red</td><td>E</td><td>Battery (+)</td><td>Brown</td><td>5</td><td>PS+</td><td>Blue</td></tr>
<tr><td>G</td><td>PE</td><td>Yellow/ Green</td><td>F</td><td>Battery (-)</td><td>Black</td><td>6</td><td>PS-</td><td>Purple</td></tr>
<tr><td>C</td><td>Brake</td><td>Red</td><td>G</td><td>+5 V</td><td>Red</td><td rowspan="3">Enclosure</td><td rowspan="3">PE</td><td rowspan="3">-</td></tr>
<tr><td rowspan="2">E</td><td rowspan="2">(polarity insensitive)</td><td rowspan="2">Black</td><td>H</td><td>GND</td><td>Orange</td></tr>
<tr><td>J</td><td>Shield</td><td>-</td></tr>
</table>

<table>
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<tr><td>J</td><td>Shield</td><td>-</td></tr>
</table>

20.2 Electrical Peripherals

20.2.1 Fuse

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

Table 20–1 List of recommended fuses

Servo drive SV680F-INT series			Recommended Fuse		
Size	Model	Rated Input Current (A)	Manufacturer	Rated Current (A)	Model
Single-phase 200 V					
A	S1R6	2.3	Bussmann	5	FWP-5B
	S2R8	4.0		10	FWP-10B
C	S5R5	7.9		20	FWP-20B
	S7R6	9.6		20	FWP-20B
D	S012	12.8		20	FWP-20B
Three-phase 200 V					
A	S1R6	1.1	Bussmann	5	FWP-5B
	S2R8	2.3		5	FWP-5B
C	S5R5	4.4		15	FWP-15B
	S7R6	5.1		15	FWP-15B
D	S012	8.0		20	FWP-20B
E	S018	8.7		20	FWP-20B
	S022	11.0		35	FWP-35B
	S027	23.8		40	FWP-40B

Servo drive SV680F-INT series			Recommended Fuse		
Size	Model	Rated Input Current (A)	Manufacturer	Rated Current (A)	Model
Three-phase 400 V					
C	T3R5	2.4	Bussmann	5	FWP-5B
	T5R4	3.6		10	FWP-10B
D	T8R4	5.6		15	FWP-15B
	T012	8.0		20	FWP-20B
E	T017	12.0		35	FWP-35B
	T021	16.0		35	FWP-35B
	T026	21.0		40	FWP-40B

20.2.2 Electromagnetic contactor

Table 20–2 Recommended electromagnetic contactor models

Servo drive SV680F-INT series			Recommended Contactor		
Size	Model	Rated Input Current (A)	Manufacturer	Current (A)	Model
Single-phase 200 V					
A	S1R6	2.3	Schneider	9	LC1 D09
	S2R8	4.0		9	LC1 D09
C	S5R5	7.9		9	LC1 D09
	S7R6	9.6		12	LC1 D12
D	S012	12.8		18	LC1 D18
Three-phase 200 V					
A	S1R6	1.1	Schneider	9	LC1 D09
	S2R8	2.3			
C	S5R5	4.4			
	S7R6	5.1			
D	S012	8.0		9	LC1 D09
E	S018	8.7		12	LC1 D12
	S022	11.0			
	S027	23.8		25	LC1 D25
Three-phase 400 V					
C	T3R5	2.4	Schneider	9	LC1 D09
	T5R4	3.6		9	LC1 D09
D	T8R4	5.6		9	LC1 D09
	T012	8.0		9	LC1 D09
E	T017	12.0		18	LC1 D18
	T021	16.0		18	LC1 D18
	T026	21.0		25	LC1 D25

20.2.3 Breaker

Table 20–3 Recommended circuit breaker models

Servo drive SV680F-INT series			Recommended Circuit Breaker		
Size	Model	Rated Input Current (A)	Manufacturer	Current (A)	Model
Single-phase 200 V					
A	S1R6	2.3	Schneider	4	OSMC32N2D4
	S2R8	4.0		6	OSMC32N2D6
C	S5R5	7.9		16	OSMC32N2D16
	S7R6	9.6		16	OSMC32N2D16
D	S012	12.8		20	OSMC32N2D20
Three-phase 200 V					
A	S1R6	1.1	Schneider	4	OSMC32N3D4
	S2R8	2.3		6	OSMC32N3D6
C	S5R5	4.4		16	OSMC32N3D16
	S7R6	5.1		16	OSMC32N3D16
D	S012	8.0		16	OSMC32N3D16
E	S018	8.7		20	OSMC32N3D20
	S022	11.0		25	OSMC32N3D25
	S027	23.8		32	OSMC32N3D32
Three-phase 400 V					
C	T3R5	2.4	Schneider	4	OSMC32N3D4
	T5R4	3.6		6	OSMC32N3D6
D	T8R4	5.6		10	OSMC32N3D10
	T012	8.0		16	OSMC32N3D16
E	T017	12.0		20	OSMC32N3D20
	T021	16.0		25	OSMC32N3D25
	T026	21.0		32	OSMC32N3D32

Note

- For UL-compliant products, see *"Table 21–1 Recommended protective devices" on page 927* for recommended fuse/circuit breaker models.
- The rated current of the circuit breaker can be reduced as low as the rated current of the drive, if the load and operation conditions permit.
- This table only lists the recommended models. You can also use fuses/circuit breakers of the same specifications from other manufacturers that comply with UL North America certification.

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

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

Requirements of the common DC busbar on the circuit breaker

- Each drive in the common DC bus system must be connected to an independent circuit breaker, and the common DC bus system also needs a main circuit breaker to power on/off all drive in the common DC bus system at the same time.
- The peak current of the AC-side switching device must cover the following values:

$$I_{ac,peak=}\frac{\sqrt{2}\times V_{ac}}{R_{eq}}$$

V_{ac} is the grid input voltage with a range of 380 VAC to 440 VAC (±10%) or 200 VAC to 240 VAC (±10%).

R_{eq} is the equivalent resistance of the drive pre-charge resistor (in Ω). The pre-charge resistance under each power is shown in the following table.

Model (SV680-F-IN-T*****)	S1-R6	S2-R8	S5-R5	S7-R6	S012	S018	S022	S027	T3-R5	T5-R4	T8-R4	T012	T017	T021	T026
Pre-charge resist-ance/Ω	20	20	40	40	30	30	30	30	40	40	30	30	30	30	30

R_{eq} is calculated as follows:

$$\frac{1}{R_{eq}}=\frac{1}{R_1}+\frac{1}{R_2}+\cdots\cdots+\frac{1}{R_n}$$

R_1 to R_n are pre-charge resistances of the drives in the common bus system. If there are three drives in the common bus system, then n = 3.

20.2.4 AC Input Reactor

Selection

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

Table 20–4 AC input reactor model selection

Servo drive SV680F-INT series			Applicable Reactor	Inductance (mH)
Size	Model	Rated Input Current (A)		
Three-phase 200 V				
A	S1R6	1.1	MD-ACL-10-5-4T	5
	S2R8	2.3	MD-ACL-10-5-4T	5
C	S5R5	4.4	MD-ACL-10-5-4T	5
	S7R6	5.1	MD-ACL-10-5-4T	5
D	S012	8.0	MD-ACL-10-5-4T	5

Servo drive SV680F-INT series			Applicable Reactor	Inductance (mH)
Size	Model	Rated Input Current (A)		
E	S018	8.7	MD-ACL-15-3-4T	3
	S022	11.0	MD-ACL-15-3-4T	3
	S027	23.8	MD-ACL-40-1.45-4T	1.45
Three-phase 400 V				
C	T3R5	2.4	MD-ACL-10-5-4T	5
	T5R4	3.6	MD-ACL-10-5-4T	5
D	T8R4	5.6	MD-ACL-10-5-4T	5
	T012	8.0	MD-ACL-10-5-4T	5
E	T017	12.0	MD-ACL-15-3-4T	3
	T021	16.0	MD-ACL-40-1.45-4T	1.45
	T026	21.0	MD-ACL-40-1.45-4T	1.45

Dimensions

- Inovance input reactors

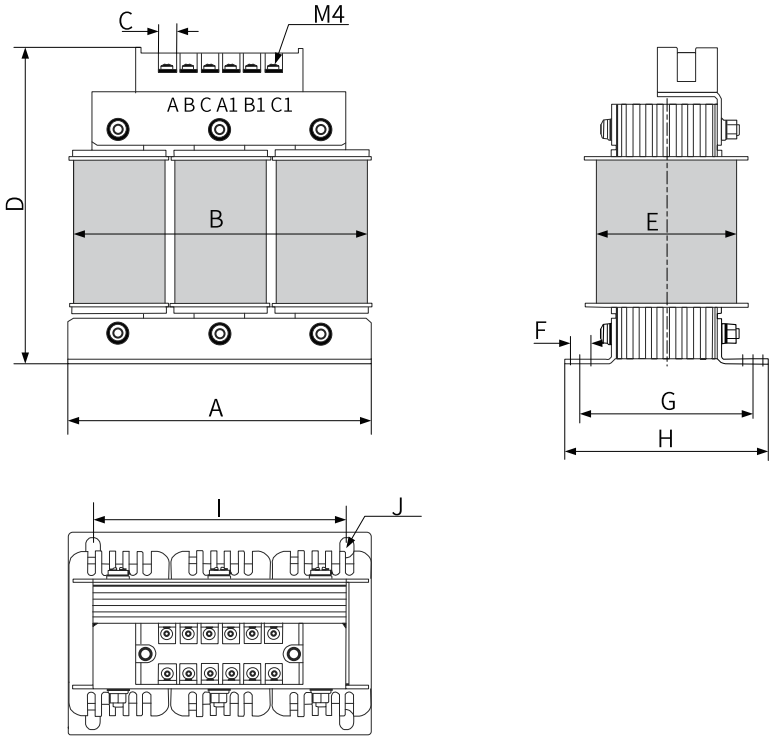


Figure 20-1 Dimensions of 10–15 A AC input reactors

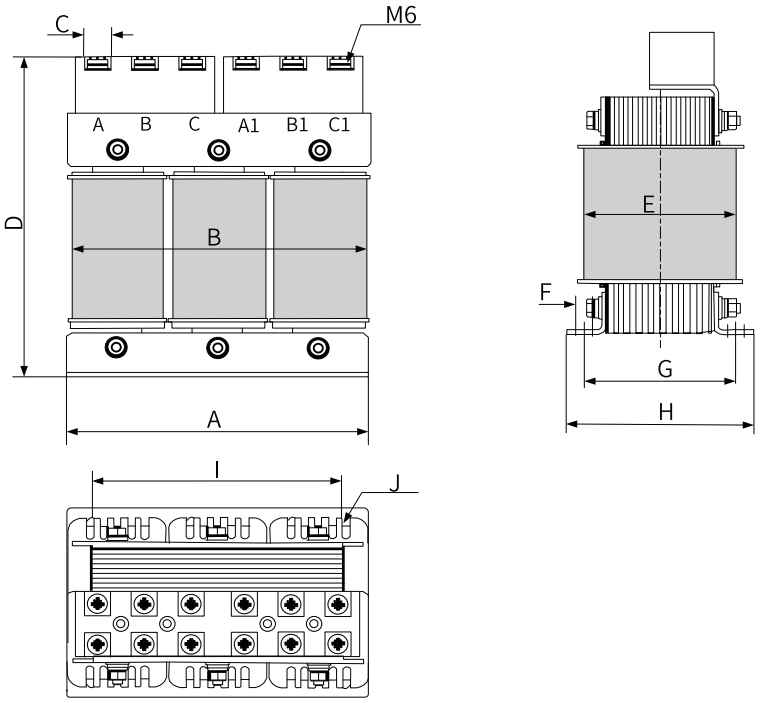


Figure 20-2 Dimensions of 40 A (1.45 mH) AC input reactors

Table 20–5 Dimensions of Inovance AC input reactors (unit: mm)

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

20.2.5 EMC filter

Selection

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

Table 20–6 Standard EMC filter model and appearance

Filter Model		Appearance
Schaffner	FN2090 series	
	FN3287 series	

Table 20–7 Filter model selection (Schaffner)

Servo drive SV680F-INT series			Applicable Filter
Size	Model	Rated Input Current (A)	
Single-phase 200 V			
A	S1R6	2.3	FN 2090-3-06
	S2R8	4.0	FN 2090-4-06
C	S5R5	7.9	FN 2090-8-06
	S7R6	9.6	FN 2090-10-06
D	S012	12.8	FN 2090-16-06
Three-phase 200 V			
A	S1R6	1.1	FN 3287-10-44-C28-R65
	S2R8	2.3	FN 3287-10-44-C28-R65
C	S5R5	4.4	FN 3287-10-44-C28-R65
	S7R6	5.1	FN 3287-10-44-C28-R65
D	S012	8.0	FN 3287-10-44-C28-R65
E	S018	8.7	FN 3287-10-44-C28-R65
	S022	11.0	FN 3287-16-44-C33-R65
	S027	23.8	FN 3287-25-33-C33-R65
Three-phase 400 V			
C	T3R5	2.4	FN 3287-10-44-C28-R65
	T5R4	3.6	FN 3287-10-44-C28-R65
D	T8R4	5.6	FN 3287-10-44-C28-R65
	T012	8.0	FN 3287-10-44-C28-R65
E	T017	12.0	FN 3287-16-44-C33-R65
	T021	16.0	FN 3287-16-44-C33-R65
	T026	21.0	FN 3287-25-33-C33-R65

Dimensions

- Dimensions of Schaffner FN 2090 series filters

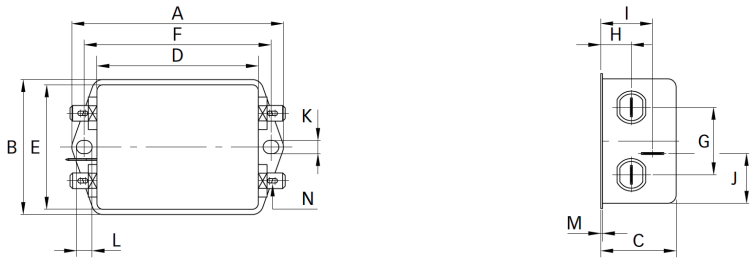


Figure 20-3 Dimensions of FN 2090 series filters (unit: mm)

Table 20–8 Dimensions of FN 2090 series filters (unit: mm)

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

- Dimensions of Schaffner FN 3287 series filters

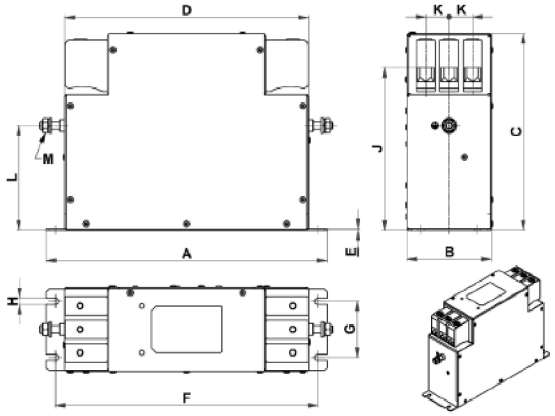


Figure 20-4 Dimension drawing of FN 3287 series filters (unit: mm)

Table 20–9 Dimensions of FN 3287 series filters (unit: mm)

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

20.2.6 Magnetic Ring and Ferrite Clamp

The magnetic ring is intended to be installed on the input or output side of the drive. Install the magnetic ring as close to the drive as possible. Installing the magnetic ring on the input side can

suppress the noise in the input power supply system of the drive. When it is installed on the output side, it can reduce the interference generated by the drive to external devices and the bearing current.

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

Selection

- Amorphous magnetic ring: featuring a high permeability within 1 MHz and excellent anti-interference performance, but not as low-cost as the ferrite clamp. See *" Dimensions" on page 912* for details..
- Ferrite clamp: featuring a good interference suppression performance within a frequency band above 1MHz, applicable to low-power servo drives and signal cables, low-cost and easy to install

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

Dimensions

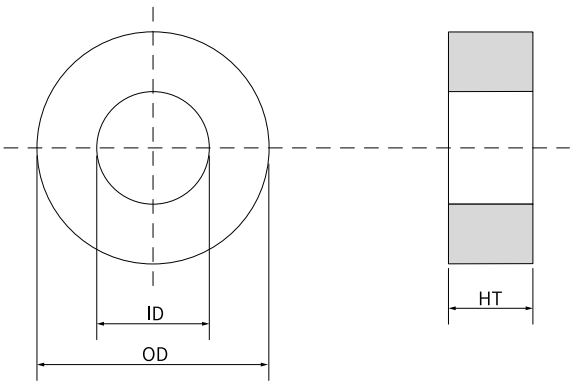


Figure 20-5 Dimensions of the magnetic ring

Table 20–10 Dimensions of the magnetic ring

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

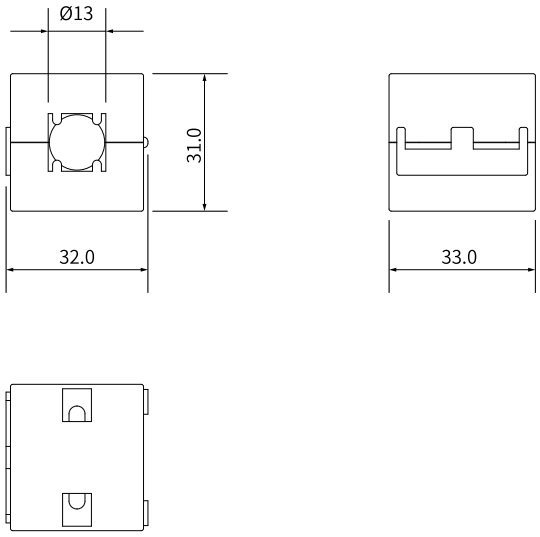


Figure 20-6 Dimensions of the ferrite clamp

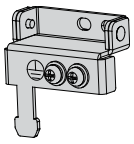
Table 20–11 Dimensions of the ferrite clamp

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

20.3 Shield Bracket

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

Table 20–12 Shield Bracket

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

Note

For instructions of installing the shield bracket, see *"5.5.5 Instructions for Installing the Shield Bracket" on page 52*.

20.4 Absolute Encoder Batteries

Selection

Select an appropriate battery according to the following table.

Table 20–13 Description of the absolute encoder battery

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

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

Note

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

20.5 Braking resistor

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

Table 20–14 Specifications of the braking resistor

Servo Drive Model	Specifications of Built-in Braking Resistor			Min. Permissible Resistance of External Braking Resistor (Ω) (H02.21)
	Resistance (Ω)	Power (Pr) (W)	Processing Power (Pa) (W)	
S1R6	-	-	-	40
S2R8	-	-	-	
S5R5	50	50	40	
S7R6	25	80	64	20
S012				15

Servo Drive Model	Specifications of Built-in Braking Resistor			Min. Permissible Resistance of External Braking Resistor (Ω) (H02.21)
	Resistance (Ω)	Power (Pr) (W)	Processing Power (Pa) (W)	
S018	20	100	80	20
S022				
S027				
T3R5	100	80	64	80
T5R4	100			60
T8R4	50			45
T012				40
T017	35	100	80	35
T021				25
T026				

Note

- The built-in braking resistor is not available in standard S1R6 or S2R8 models. You can install an external braking resistor as needed or contact Inovance to order customized S1R6 and S2R8 models that carry the built-in braking resistor.
- The processing power (P_a) of the built-in braking resistor is affected by the ambient temperature and actual load rate of the drive.

The kinetic energy generated upon braking of a reciprocating motor is converted into electric energy that fed back to the bus capacitor. When the bus voltage rises above the braking voltage threshold, the braking resistor starts consuming the excessive energy fed back by the motor. The motor speed curve is as shown in *"Figure 20–7" on page 915* .

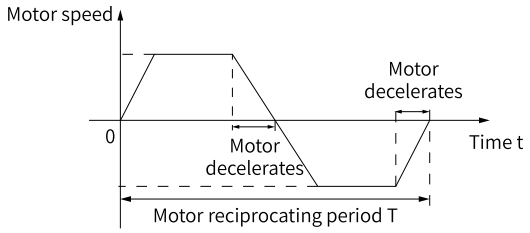


Figure 20-7 Motor speed curve

Energy calculation

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

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

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

Table 20–15 200 V motor energy data

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

Capacity (kW)	Servo Motor Model MS1H*-*******-*****	Rotor Inertia J (kgm^2)	EO Generated During Decelerating from Rated Speed to a Standstill (J)	Max. Braking Energy Absorbed by the Capacitor E_C (J)
1.8	MS1H3-18C15CB-**31R-INT MS1H3-18C15CB-**34R-INT	24.9×10^4 (27.2×10^4)	30.78 (33.63)	78.19
2.9	MS1H3-29C15CB-**31R-INT MS1H3-29C15CB-**34R-INT	44.7×10^4 (52.35×10^4)	55.26 (64.72)	114.43
4.4	MS1H3-44C15CB-**31R-INT MS1H3-44C15CB-**34R-INT	64.9×10^4 (72.55×10^4)	80.23 (89.69)	114.43
0.1	MS1H4-10B30CB-**31R-INT MS1H4-10B30CB-**34R-INT	0.102×10^4 (0.104×10^4)	0.50 (0.51)	9.3
0.2	MS1H4-20B30CB-**31R-INT MS1H4-20B30CB-**34R-INT	0.22×10^4 (0.23×10^4)	1.09 (1.14)	9.3
0.4	MS1H4-40B30CB-**31R-INT MS1H4-40B30CB-**34R-INT	0.43×10^4 (0.44×10^4)	2.13 (2.18)	18.59
0.55	MS1H4-55B30CB-**31R-INT	1.12×10^4	5.54	32.42
0.75	MS1H4-75B30CB-**31R-INT MS1H4-75B30CB-**34R-INT	1.46×10^4 (1.51×10^4)	7.22 (7.47)	32.42
1.0	MS1H4-10C30CB**31R-INT MS1H4-10C30CB**34R-INT	1.87×10^4 (1.97×10^4)	9.25 (9.74)	32.42

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

Table 20–16 400 V motor energy data

Capacity (kW)	Servo Motor Model MS1H*-*******-*****	Rotor Inertia J (kgm^2)	Braking Energy E_O (J) Generated During Operation	Max. Braking Energy Absorbed by the Capacitor E_C (J)
1.0	MS1H2-10C30CD-**31R-INT MS1H2-10C30CD-**34R-INT	1.78×10^4 (2.6×10^4)	8.8 12.86	36.06
1.5	MS1H2-15C30CD-**31R-INT MS1H2-15C30CD-**34R-INT	2.35×10^4 (3.17×10^4)	11.62 (15.68)	43.79
2.0	MS1H2-20C30CD-**31R-INT MS1H2-20C30CD-**34R-INT	2.92×10^4 (3.74×10^4)	14.44 (18.49)	64.40
2.5	MS1H2-25C30CD-**31R-INT MS1H2-25C30CD-**34R-INT	3.49×10^4 (4.3×10^4)	17.26 (21.26)	64.40
3.0	MS1H2-30C30CD-**31R-INT MS1H2-30C30CD-**34R-INT	6.4×10^4 (9.38×10^4)	31.65 (46.38)	64.40
4.0	MS1H2-40C30CD-**31R-INT MS1H2-40C30CD-**34R-INT	9×10^4 (11.98×10^4)	44.51 (59.24)	105.62

Capacity (kW)	Servo Motor Model MS1H*-*******-*****	Rotor Inertia J (kgm^2)	Braking Energy E_O (J) Generated During Operation	Max. Braking Energy Absorbed by the Capacitor E_C (J)
5.0	MS1H2-50C30CD-**31R-INT MS1H2-50C30CD-**34R-INT	11.6×10^4 (14.58×10^4)	57.36 (72.10)	154.56
0.85	MS1H3-85B15CD-**31R-INT MS1H3-85B15CD-**34R-INT	13.56×10^4 (15.8×10^4)	16.76 (19.53)	36.06
1.3	MS1H3-13C15CD-**31R-INT MS1H3-13C15CD-**34R-INT	19.25×10^4 (21.5×10^4)	23.8 (26.58)	43.79
1.8	MS1H3-18C15CD-**31R-INT MS1H3-18C15CD-**34R-INT	24.9×10^4 (27.2×10^4)	30.78 (33.63)	64.40
2.9	MS1H3-29C15CD-**31R-INT MS1H3-29C15CD-**34R-INT	44.7×10^4 (52.35×10^4)	55.26 (64.72)	64.40
4.4	MS1H3-44C15CD-**31R-INT MS1H3-44C15CD-**34R-INT	64.9×10^4 (72.55×10^4)	80.23 (89.69)	105.62
5.5	MS1H3-55C15CD-**31R-INT MS1H3-55C15CD-**34R-INT	86.9×10^4 (94.55×10^4)	107.43 (116.89)	154.56
7.5	MS1H3-75C15CD-**31R-INT MS1H3-75C15CD-**34R-INT	127.5×10^4 (135.15×10^4)	157.62 (167.08)	154.56

Note

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

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

Selection of the braking resistor for a servo rotary motor

- **Without external load torque**

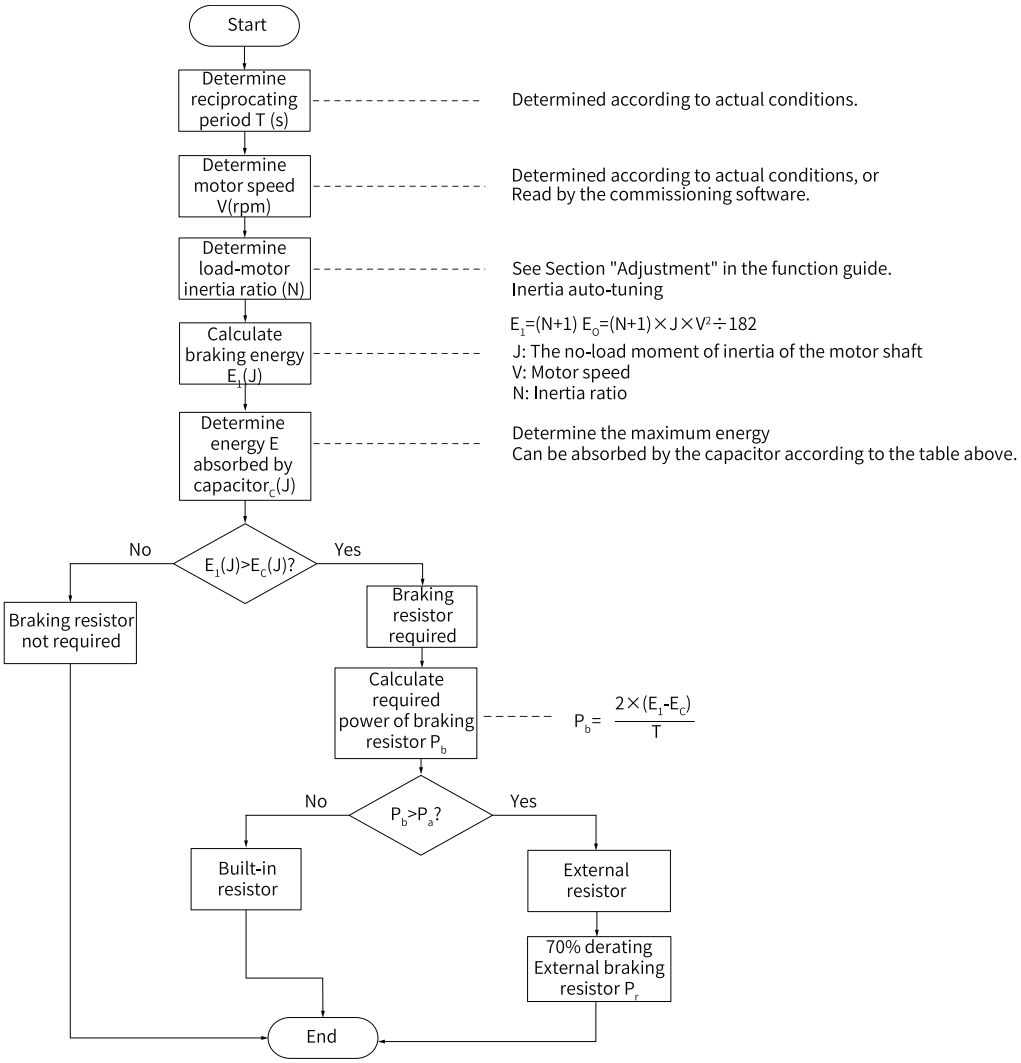


Figure 20-8 Flowchart for selecting the braking resistor

Note

- Take the process in which the motor decelerates from 3000 RPM to 3000 RPM as an example, suppose the load inertia is N times the motor inertia, then the braking energy is (N+1) x E_O when the motor decelerates from 3000 RPM to 3000 RPM, and the energy consumed by the braking resistor is (N+1) x EO - EC (EC represents the energy absorbed by the capacitor). The energy consumed by the braking resistor is (N + 1) x E_O - E_C (E_C represents the energy absorbed by the capacitor). Suppose the reciprocating cycle is T, then the power of the braking resistor needed is 2 x [(N + 1) x E_O - E_C]/T. See *"Table 20–15 200 V motor energy data" on page 916* and *"Table 20–16 400 V motor energy data" on page 917* for values of E_O and E_C .
- Determine whether to use the braking resistor according to the preceding figure and select a built-in or an external braking resistor as needed. Then, set H02.25 accordingly.
- The resistor with aluminum case is recommended.

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

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

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

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

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

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

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.21	0x0215	Permissible minimum resistance of braking resistor	1Ω to 1000Ω	40	Ω	Unchangeable	"H02_en.21" on page 499
H02.24	0x0218	Resistor heat dissipation coefficient	10% to 100%	30	%	Real-time	"H02_en.24" on page 500
H02.25	0x0219	Braking resistor type	0: Built-in 1: External, natural cooling 2: External, forced air cooling 3: No resistor needed	3	-	Real-time	"H02_en.25" on page 500
H02.26	0x021A	Power of external braking resistor	1 W–65535 W	40	W	Real-time	"H02_en.26" on page 501
H02.27	0x021B	Resistance of external braking resistor	15Ω to 1000Ω	50	Ω	Real-time	"H02_en.27" on page 501

- Braking resistor not needed
  When $E_1 < E_C$, the braking resistor is not needed because the braking energy can be absorbed by the bus capacitor. In this case, set H02.25 to 3.
- Using the built-in braking resistor
  When $P_b < P_a$ and $E_1 > E_C$, use the built-in braking resistor. In this case, set H02.25 to 0.

  When using the built-in braking resistor, connect terminals $P_\oplus$ and D with a jumper bar.
- Using an external braking resistor
  When P_b is greater than P_a, use an external braking resistor. Set H02.25 to 1 or 2 based on the cooling mode of the braking resistor.

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

Cable specifications of the external braking resistor: For CE, see *"6.1.4.1 Cable Specifications (CE)" on page 61*. For UL, see *"6.1.4.1 Cable Specifications (CE)" on page 61*. Set H02.25 to 1 or 2 based on the cooling mode of the braking resistor. Check and set the following parameters.

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.21	0x0215	Permissible minimum resistance of braking resistor	1Ω to 1000Ω	40	Ω	Unchangeable	*" H02_en.21" on page 499*
H02.25	0x0219	Braking resistor type	0: Built-in 1: External, natural cooling 2: External, forced air cooling 3: No resistor needed	3	-	Real-time	*" H02_en.25" on page 500*
H02.26	0x021A	Power of external braking resistor	1 W–65535 W	40	W	Real-time	*" H02_en.26" on page 501*
H02.27	0x021B	Resistance of external braking resistor	15Ω to 1000Ω	50	Ω	Real-time	*" H02_en.27" on page 501*

Caution

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

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

☆ Related parameters:

Parameter	Communication Address	Name	Value	Default	Unit	Change Mode	Page
H02.24	0x0218	Resistor heat dissipation coefficient	10% to 100%	30	%	Real-time	*" H02_en.24" on page 500*

Note

Higher resistor heat dissipation coefficient indicates higher braking efficiency.

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

  When the load is in the generating state continuously, it is recommended to adopt the common DC bus mode.

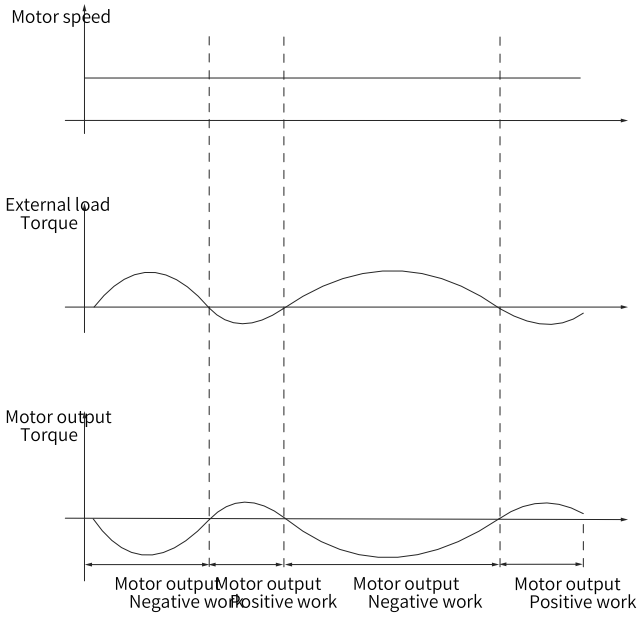


Figure 20-9 Example of the curve with external load torque

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

21 Certifications and Standards Requirements

21.1 CE Certification



Figure 21-1 CE Marking

- The CE mark indicates compliance with the Low Voltage Directive LVD), Electromagnetic Compatibility (EMC), and Restriction of Hazardous Substances (RoHS) directives.
- The CE mark is required for engaging in commercial business (production, importation, and distribution) in Europe.
- The drive complies with LVD, EMC, and RoHS directives and carries the CE mark.
- Machines and devices integrated with this drive must also comply with CE requirements for distribution in Europe.
- The integrator who integrates this drive into other products and attaches CE mark to the final assembly has the responsibility of ensuring compliance with CE certification.

21.1.1 Requirements for Compliance with EMC

The drive is applicable to the first environment and second environment and complies with EMC directive 2014/30/EU and standard EN 61800-3.

As required by EMC Directive 2014/30/EU and standard EN IEC 61800-3, install an EMC filter on the input side of the drive and use shielded cables on the output side. Ensure the filter is grounded properly and the shield of the output cable is grounded 360 degrees.



When applied in the first environment, the drive may generate radio interference. In addition to the CE compliance requirements described in this chapter, take additional measures to prevent radio interference if necessary.

Introduction to EMC standards

Electromagnetic compatibility (EMC) describes the ability of electrical and electronic devices or systems to work properly in the electromagnetic environment without introducing electromagnetic interferences that disturb the operation of other local devices or systems. In other words, EMC includes two aspects: 1) The electromagnetic interference generated by a device during normal operation cannot exceed a certain limit. 2) The device must have sufficient immunity to the electromagnetic interference in the environment.

EN 61800-3 defines the following two types of environments.

- First environment: Environment that includes domestic premises, and establishments directly connected without intermediate transformers to a low-voltage power supply network which supplies buildings used for domestic purposes
- Second environment: Environment that includes all establishments other than those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes

Devices are divided into the following four categories based on the intended application environment.

- Category C1: a Power drive system (PDS) with the rated voltage less than 1000 V, intended for use in the first environment.
- Category C2 equipment: PDS with rated voltage less than 1000 V, which is neither a plug-in device nor a movable device and, when used in the first environment, is intended to be installed and commissioned only by professionals.
- Category C3 equipment: PDS with rated voltage less than 1000 V, intended for use in the second environment and not intended for use in the first environment.
- Category C4 equipment: PDS with rated voltage equal to or above 1000 V, or rated current equal to or above 400 A, or intended for use in complex systems in the second environment.

21.1.2 Requirements for Compliance with LVD

The drive has been tested in accordance with EN61800-5-1 to determine compliance with LVD. Observe the following requirements to enable machines and devices integrated with this drive to comply with LVD.

Installation location

Install the drive in a place with overvoltage category III and pollution degree 1 or 2 as specified by EN61800-5-1.

Installation Environment

For requirements of the installation environment, see *"5.2.1 Installation Environment Requirements" on page 41*.

Protection

The drive must be installed in a fireproof cabinet with doors that provide effective electrical and mechanical protection. The installation must conform to local and regional laws and regulations and relevant IEC standards.

IP20-rated drives intended to be installed inside the cabinet must be installed in a structure that prevents intrusion of unwanted objects from the top and the front.

Main Circuit Cable Requirements

For wiring requirements of main circuit terminals, see *"6.1.2 Wiring Precautions and Requirements" on page 57*.

Requirements of protective devices

To comply with EN 61800-5-1, install a fuse/circuit breaker on the input side of the drive to prevent accidents caused by short circuit in the internal circuit.

See *"20.2.1 Fuse" on page 904* for recommended fuse models and *"20.2.3 Breaker" on page 906* for recommended breaker models.

21.2 UL/cUL Certification

21.2.1 UL/cUL Certification



Figure 21-2 UL/cUL marking

The UL/cUL mark commonly applies to products sold in the United States and Canada. Products with UL/cUL mark have been inspected and assessed by the UL organization. To pass UL/cUL certification, main built-in components of electrical products must also be UL certified.

The drive has been tested in accordance with UL 61800–5–1 and CSA C22.2 No. 274 to determine compliance with UL/cUL standards. Observe the following requirements to enable machines and devices integrated with this drive to comply with UL/cUL standards.

Installation location

Install the drive in a place with overvoltage category III and pollution degree 1 or 2 as specified by UL61800–5–1.

Ambient temperature

According to the protection level, the ambient temperature must be maintained within the following range:

Ambient temperature for open-type drives: 0°C to 50°C.

Installation requirements

Installation requirements for open-type drives:

SV680F-INT series servo drives are open-type drives that must be installed in a fireproof cabinet with the housing that provides effective electrical and mechanical protection. The installation must conform to local laws and regulations and related NEC requirements.

Main Circuit Cable Requirements

Warning

On-site installation of output terminals (such as P ⊕ , C, and N ⊖) is not allowed.

- Terminals P ⊕ , C, and N ⊖ are used to connect optional parts. Do not connect these terminals to an AC power supply.
- To protect the main circuit, separate and cover the surface that may come into contact with the main circuit.
- The control circuit is the internal safety extra-low voltage (SELV) circuit that must be strictly insulated and isolated from other circuits. Make sure that the control circuit is connected to the external SELV circuit.
- Prevent foreign matters from entering the wiring part of the terminal block.
- Do not solder the twisted conductors.
- The tightening torque may vary with terminals. Tighten terminal screws with the specified tightening torque. You can use the torque screwdriver, ratchet, or wrench.
- When using an electric screwdriver to tighten terminal screws, set a low speed to prevent damage to the terminal screws.
- Tighten the terminal screws with an angle not higher than 5°. Failure to comply may damage the terminal screws.

Wiring requirements of the control circuit

Observe the requirements in UL508 during wiring.

Cable requirements

Cable dimensions must be compliant with requirements in NEC (National Electric Code) and CEC (Canadian Electrical Code) Part I and local regulations.

- Use cables with copper conductors.
- The recommended cables for the main circuit are 600 V Class 2 heat-resistant indoor PVC cables that can work under temperature of 75°C continuously. Requirements:
  - Ambient temperature: ＜ 40°C.
  - Normal operating ratings

If the recommended cable specifications for peripheral devices or optional parts exceed the applicable cable specification range, contact Inovance.

Cable selection

To comply with UL61800-5-1 and CSAC22.2 No. 274-17, power cables used for the drive must meet the following requirements:

- Compliant with NEC, Table 310-16 of NFPA70 and NFPA779.
- Comprised of copper conductors with a rated temperature not lower than 75°C (167°F).
- Cable size must be 14AWG or higher.

- With a rated voltage not lower than the rated voltage of the servo drive.
- It is recommended to use cables compliant with UL758 Style 2517 and Style 2586 as motor main circuit cables.

Requirements of protective devices

To comply with UL61800-5-1, install a fuse/circuit breaker on the input side of the drive to prevent accidents caused by short circuit in the internal circuit.

Install sufficient protective devices against short circuit in branch circuits according to applicable regulations and this guide. The drive is applicable to circuits with a rated breaking capacity lower than 5kA and 65 kA and a maximum voltage of 440 VAC (class 400 V).

Note

All breaker protective devices must be UL-certified.

For the SV680F-INT drive applied in North America, the recommended protective devices are as follows:

Table 21–1 Recommended protective devices

Drive Model		Circuit breaker (A)	Class J fuse (A)	Recommended inverse time lag breaker[1] (A)
Single-phase 200 V				
Size A	S1R6	15	6	40
	S2R8	10	10	40
Size C	S5R5	15	20	40
	S7R6	15	20	100
Size D	S012	20	20	100
Three-phase 200 V				
Size A	S1R6	5	6	40
	S2R8	10	6	40
Size C	S5R5	15	15	40
	S7R6	15	15	100
Size D	S012	20	20	100
Size E	S018	30	20	100
	S022	30	35	100
	S027	40	40	100
Three-phase 400 V				
Size C	T3R5	15	6	100
	T5R4	15	10	100
Size D	T8R4	20	15	100
	T012	20	20	100
Size E	T017	30	35	100
	T021	30	35	100
	T026	40	40	100

Note

[1]: It is recommended to use an inverse time circuit breaker for a parallel multi-drive system.

21.3 KC Certification



Figure 21-3 KC Certification Mark

The KC mark indicates compliance with ROK standards related to safety (KC) and EMC (KCC).

- The KC mark is required for engaging in commercial business (production, importation, and distribution) in the ROK.
- Machines and devices integrated with this drive must also comply with KC requirements for distribution in the ROK.
- The integrator who integrates this drive into other products and attaches KC mark to the final assembly has the responsibility of ensuring compliance with KC certification.
- Observe the following requirements to enable machines and devices integrated with this drive to comply with KC standards.



21.4 UKCA Certification



Products exported to Great Britain must carry a UKCA mark. However, the products with the CE mark can still be exported to the United Kingdom.

21.5 Functional Safety Certification



EC directives and standards

Low Voltage Directive 2014/35/EU Standard EN 61800-5-1

EMC Directive 2014/30/EU Standard EN 61800-3: 2018

Machinery Directive 2006/42/EC (Safety Functions) Standard IEC 61800-5-2

22 Appendix

22.1 Solutions To Common EMC Problems

22.1.1 Residual Current Device Malfunction

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

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

When malfunction occurs on the RCD, take the following measures.

Table 22–1 Measures against leakage current

Symptom	Possible Cause	Solution
The RCD trips at the moment of power-on.	The anti-interference performance of the RCD is weak.	• It is recommended to use Siemens or Schneider RCDs. • Use a RCD with a higher tripping current. • Move the unbalanced load to the front end of the RCD.
	The tripping current of the RCD is too low.	
	An unbalanced load is connected to the rear end of the RCD.	
	The capacitance of the front end of the servo drive is too high.	
The RCD trips during operation.	The anti-interference performance of the RCD is weak.	• It is recommended to use Siemens or Schneider RCDs. • Use a RCD with a higher tripping current. • Install a simple filter on the input side of the drive and wind the magnetic ring on the LN and RST cables near the RCD, as shown in *"Figure 22–1 Magnetic ring on the input side" on page 930*. • Reduce the carrier frequency without compromising the performance. • Reduce the length of motor cables.
	The tripping current of the RCD is too low.	
	An unbalanced load is connected to the rear end of the RCD.	
	For motor cables and the motor, the distributed capacitance to ground is too high.	

Figure 22-1 Magnetic ring on the input side

22.1.2 Harmonic Suppression

To suppress harmonics and improve the power factor to allow the drive to fulfill the standards, install an AC input reactor on the input side of the drive. For details about reactor models, see *"20.2.4 AC*

Input Reactor" on page 907. For details about the installation method, see *"5.5.2 Instructions for Installing the AC Input Reactor" on page 49*.

22.1.3 Control Circuit Interference

22.1.3.1 High-speed Pulse Interference

Take the measures listed in the following table to suppress interference.

No.	Step
1	Used shielded twisted pair cables with both ends of the cable grounded (see *" I/O signal cable selection" on page 78*).
2	Connect the motor enclosure to the PE terminal of the drive.
3	Connect the PE terminal of the drive to the PE terminal of the mains power supply.
4	Add an equipotential bonding grounding cable between the host controller and drive (see *" Grounding the control cabinet system" on page 70*).
5	Separate signal cables from power cables with a distance of at least 30 cm.
6	Wind the signal cable onto a ferrite clamp or magnetic ring for one to two turns (see *"5.5.4 Instructions for Installing the Magnetic Ring and Ferrite Clamp" on page 50*).
7	At the drive output side, wind the output U/V/W cable onto a magnetic ring for two to four turns. For details, see *"5.5.4 Instructions for Installing the Magnetic Ring and Ferrite Clamp" on page 50*.
8	Use shielded power cables and ground the shield properly.

22.1.3.2 Interference with Control Circuit Wiring

For analog/frequency-division input/fully closed-loop wiring, see *"22.1.3.1 High-speed Pulse Interference" on page 931* for details.

22.1.3.3 Common I/O Signal Interference

The drive generates strong interference during operation. Although EMC measures are taken, interference may still exist due to improper wiring or grounding during use. When the drive disturbs or is disturbed by other devices, adopt the following measures.

No.	Step
1	Use shielded cables as the I/O signal cables and connect the shield to the PE terminal. For details, see *" I/O signal cable selection" on page 78*.
2	Reliably connect the PE terminal of the motor to the PE terminal of the servo drive, and connect the PE terminal of the servo drive to the PE terminal of the grid.
3	Add an equipotential bonding grounding wire between the host controller and the servo drive.
4	At the drive output side, wind the output U/V/W cable onto a magnetic ring for two to four turns. For details, see *"5.5.4 Instructions for Installing the Magnetic Ring and Ferrite Clamp" on page 50*.
5	Increase the filter capacitance for low-speed DIs. A capacitance up to 0.1 μF is recommended, as shown in *"Figure 22-2 I/O signal cables with capacitance increased" on page 932*.
6	Increase the filter capacitance between AI and GND. A capacitance up to 0.22 μF is recommended.

No.	Step
7	Wind the signal cable onto a ferrite clamp or magnetic ring for one to two turns (see *"5.5.4 Instructions for Installing the Magnetic Ring and Ferrite Clamp" on page 50*).
8	Use shielded power cables and ground the shield properly.

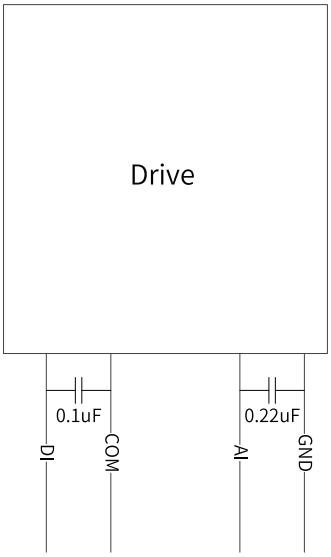
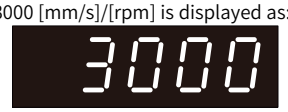
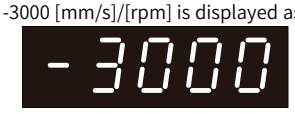
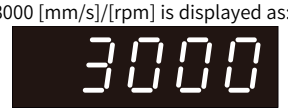
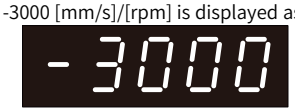
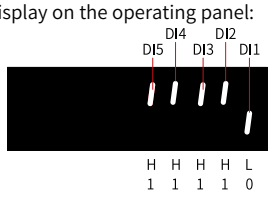
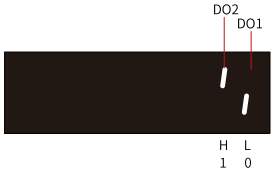


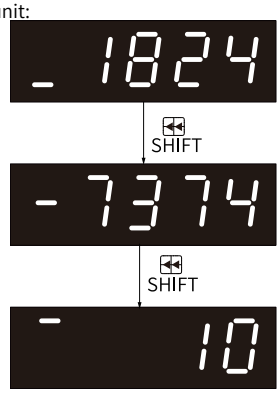
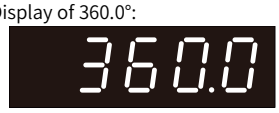
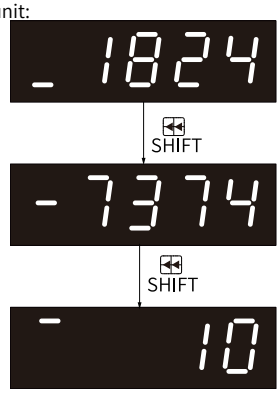
Figure 22-2 I/O signal cables with capacitance increased

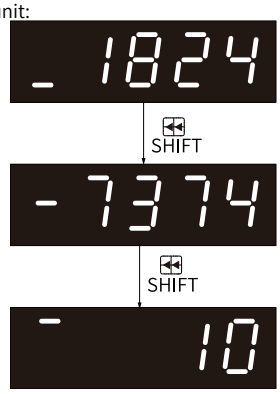
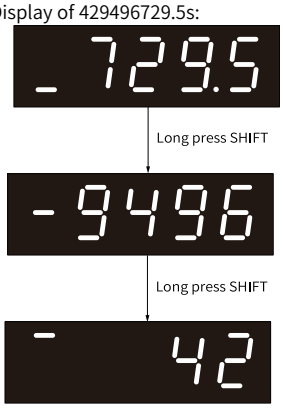
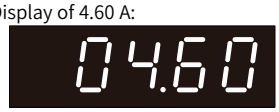
22.2 Display of Monitoring Parameters

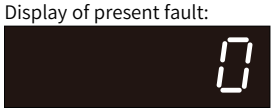
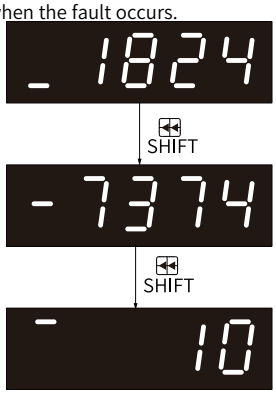
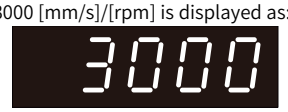
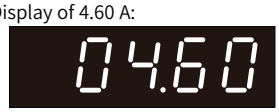
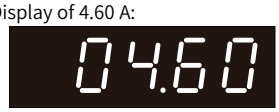
- H0b parameters monitor the operating state of the servo drive. You can enable keypad monitoring display by H02.32. The parameter group number displayed is H0b and the group offset is the setpoint of H02.32.
- When the valid offset is set in H02.32, the keypad enters the "state display" mode if the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

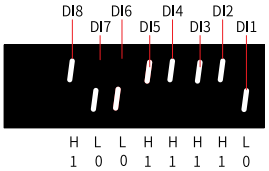
The following table describes the monitoring parameters in group H0b.

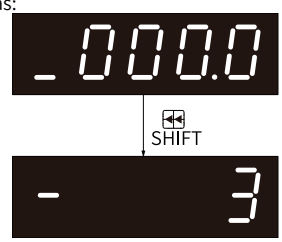
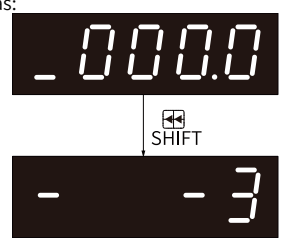
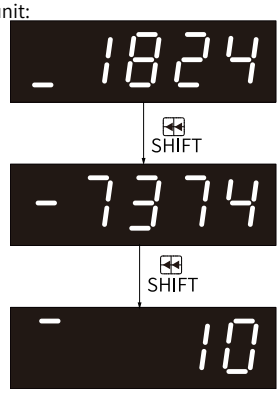
Parameter	Name	Accuracy	Unit	Meaning	Example
H0b.00	Motor speed actual value	1	[mm/s]/[rpm]	Display the motor speed actual value.	3000 [mm/s]/[rpm] is displayed as:  -3000 [mm/s]/[rpm] is displayed as: 
H0b.01	Speed reference	1	[mm/s]/[rpm]	Indicates the present speed reference of the drive in the position and speed control modes.	3000 [mm/s]/[rpm] is displayed as:  -3000 [mm/s]/[rpm] is displayed as: 
H0b.02	Internal torque reference	0.1	%	Display the present torque reference. The setpoint 100.0% corresponds to the rated torque of the motor.	Display of 100.0%:  Display of -100.0%: 
H0b.03	Input (DI) signal monitoring	1	-	Displays the optocoupler status of DI terminals: When the upper LED turns on, the optocoupler is disabled (indicated by "1"). Lower LED segments turned on: The optocoupler is switched on (indicated by "0"). The value of H0b.03 read in the software tool is a decimal.	For example, if DI1 is low level and DI2 to DI5 are high level, the corresponding binary value is "11110", and the value of H0b.03 read in the software tool is 30. Display on the operating panel: 
H0b.05	Output (DO) signal monitoring	1	-	Displays the optocoupler status of DO1 to DO5: When the upper LED turns on, the optocoupler is disabled (indicated by "1"). Lower LED segments turned on: The optocoupler is switched on (indicated by "0"). The value of H0b.05 read in the software tool is a decimal.	For example, if DO1 is low level and DO2 is high level, then, the binary value is "10". The value of H0b.05 read in the software tool is 2. Display on the operating panel: 

Parameter	Name	Accuracy	Unit	Meaning	Example
H0b.07	Absolute position counter	1	reference unit	It indicates the present absolute position of the motor (in reference unit).	Display of 1073741824 in reference unit: 
H0b.09	Mechanical angle	0.1	°	Indicates the current mechanical angle (p) of the motor. The value 0 indicates that the mechanical angle is 0°. Maximum value of H0b.09 for an incremental encoder: Number of encoder pulses per revolution x 4 - 1. For example, the maximum value of H0b.09 for a 2500-PPR incremental encoder is 9999. Maximum value of H0b.09 for an absolute encoder is 65535. The actual mechanical angle is calculated using the following formula: $\text{Actual mechanical angle} = \frac{\text{H0b.09}}{\text{H0b.09 max. value} + 1} \times 360.0°$	Display of 10000p: 
H0b.10	Electrical angle	0.1	°	Display the electrical angle of the motor.	Display of 360.0°: 
H0b.12	Average load ratio	0.1	%	Displays the ratio of the average load torque to the rated torque of the motor.	Display of 100.0%: 
H0b.13	Input position reference counter (32-bit decimal)	1	reference unit	Counts and displays the number of input position references.	Display of 1073741824 in reference unit: 

Parameter	Name	Accuracy	Unit	Meaning	Example
H0b.15	Encoder position deviation counter (32-bit decimal)	1	encoder unit	Encoder position deviation = Sum of input position references (encoder unit) – Sum of pulses fed back by the encoder (encoder unit)	Display of 10000 in encoder unit: 
H0b.17	Feedback pulse counter (32-bit decimal)	1	encoder unit	Counts and displays the number of pulses fed back by the motor encoder (encoder unit).	Display of 1073741824 in encoder unit: 
H0b.19	Total power-on time (32-bit decimal)	0.1	s	Counts and displays the total power-on time of the servo drive.	Display of 429496729.5s: 
H0b.24	Phase current RMS value	0.1	A	Displays the RMS value of the phase current of the motor.	Display of 4.60 A: 
H0b.26	Bus voltage	0.1	V	Displays the DC bus voltage of the main circuit input voltage after rectification.	Display of 311.0 V rectified from 220 VAC:  Display of 537.0 V rectified from 380 VAC: 
H0b.27	Module temperature	1	°C	Displays the temperature of the power module inside the servo drive.	Display of 27°C: 

Parameter	Name	Accuracy	Unit	Meaning	Example
H0b.33	Fault log	1	-	Used to select the previous fault to be viewed. 0: Present fault 1: 2nd last fault 2: 3rd last fault ... 19: 20th last fault	0: Display of present fault: 
H0b.34	Fault code of the selected fault	1	-	H0b.34 display the fault you selected with H0b.33. When no fault occurs, the value of H0b.34 is 0.	If H0b.33 is 0, and H0b.34 is A941.0, the current fault code is 941.0. Corresponding display: 
H0b.35	Timestamp of the selected fault	0.1	s	Displays the total operating time of the servo drive when the selected fault occurred. When no fault occurs, the value of H0b.35 is 0.0.	If H0b.34 is A941.0 and H0b.35 is 1073741824, the current fault code is 941 and the total operating time of the servo drive is 1073741824s when the fault occurs. 
H0b.37	Motor speed upon occurrence of the selected fault	1	[mm/s]/[rpm]	Motor speed upon occurrence of the selected fault. When no fault occurs, the value of H0b.37 is 0.	3000 [mm/s]/[rpm] is displayed as:  -3000 [mm/s]/[rpm] is displayed as: 
H0b.38	Motor phase U current upon occurrence of the selected fault	0.1	A	Displays the RMS value of motor phase U winding current when the selected fault occurred. When no fault occurs, the value of H0b.38 is 0.0.	Display of 4.60 A: 
H0b.39	Motor phase V current upon occurrence of the selected fault	0.1	A	Display the RMS value of motor phase V winding current when the selected fault occurred. When no fault occurs, the value of H0b.39 is 0.0.	Display of 4.60 A: 

Parameter	Name	Accuracy	Unit	Meaning	Example
H0b.40	Bus voltage upon occurrence of the selected fault	0.1	V	Display the DC bus voltage of the main circuit when the selected fault occurred. When no fault occurs, the value of H0b.40 is 0.0.	Display of 311.0 V rectified from 220 VAC:  Display of 537.0 V rectified from 380 VAC: 
H0b.41	Input terminal state on selected fault	1	-	Display the high/low level status of DI1 to DI8 when the selected fault occurred. The method for determining the DI level status is the same as that of H0b.03. When no fault occurs, all DIs are displayed as low level in H0b.41 (indicated by the decimal value 0).	Display of H0b.41 = 158: 
H0b.53	Position deviation counter (32-bit decimal)	1	reference unit	Position deviation = Sum of input position references (reference unit) - Sum of pulses fed back by the encoder (reference unit)	Display of 10000 in reference unit: 

Parameter	Name	Accuracy	Unit	Meaning	Example
H0b.55	Motor speed actual value	0.1	[mm/s]/[rpm]	Display the motor speed actual value.	3000.0 [mm/s]/[rpm] is displayed as:  -3000.0 [mm/s]/[rpm] is displayed as: 
H0b.64	Real-time input position reference counter	1	reference unit	Displays the value of the position reference counter before being divided or multiplied by the electronic gear ratio. This value is independent of the servo drive status and the control mode.	Display of 1073741824 in reference unit: 

22.3 DIDO Function Assignment

Code	Name	Function Name	Description	Remarks
Description of DI Signals				
FunIN.3	GAIN-SEL	Gain switchover	• H08.09 = 1: • Inactive: Speed control loop being PI control • Active: Speed control loop being P control • H08.09 = 2: • Inactive: Fixed to the 1st group of gains • Active: Fixed to the 2nd group of gains	The corresponding terminal logic is recommended to be level-triggered.
FunIN.14	P-OT	Positive limit switch	Active: Forward drive inhibited Inactive: Forward drive permitted	Overtravel prevention applies when the machine moves beyond the limit. It is recommended that the corresponding terminal logic is level-triggered.

Code	Name	Function Name	Description	Remarks
FunIN.15	N-OT	Negative limit switch	Overtravel prevention applies when the load moves beyond the limit. Active: Reverse drive inhibited Inactive: Reverse drive allowed	The corresponding terminal logic is recommended to be level-triggered.
FunIN.18	JOGCMD+	Forward jog	Active: Input based on command Inactive: Command input stopped	The corresponding terminal logic is recommended to be level-triggered.
FunIN.19	JOGCMD–	Jog in the reverse direction	Active: Input in reverse to the command Inactive: Command input stopped	The corresponding terminal logic is recommended to be level-triggered.
FunIN.24	GEAR_SEL	Electronic gear ratio switchover	Inactive: Electronic gear ratio 1 Active: Electronic gear ratio 2	The corresponding terminal logic is recommended to be level-triggered.
FunIN.31	HomeSwitch	Home switch	Inactive: The switch is not triggered Active: The switch is triggered.	The corresponding terminal logic must be level-triggered. It is recommended to assign this function to a high-speed DI terminal. If the logic is set to 2 (rising edge active), the servo drive forcibly changes it to 1 (active high). If the logic is set to 3 (falling edge active), the servo drive forcibly changes it to 0 (active low). If the logic is set to 4 (both rising edge and falling edge active), the servo drive forcibly changes it to 0 (low level active).
FunIN.34	Emergence Stop	Emergency stop	Active: Position lock is applied after stop at zero speed. Inactive: Current operating state is unaffected.	The corresponding terminal logic is recommended to be level-triggered.
FunIN.35	ClrPosErr	Position deviation cleared	Inactive: Position deviation not cleared Active: Position deviation cleared	The corresponding terminal logic is recommended to be level-triggered.
FunIN.38	TouchProbe1	Touch probe 1	Inactive: Touch probe is not triggered. Active: Touch probe is triggerable.	The touch probe logic is only related to the touch probe function.
FunIN.39	TouchProbe2	Touch probe 2	Inactive: Touch probe is not triggered. Active: Touch probe is triggerable.	The touch probe logic is only related to the touch probe function.
FunIN.56	MExTriger	External switch of EPOS program block	Active: If H28.68 = 1, the program block function triggers the enabling operation. Inactive: No external DI program block trigger signal.	-
Description of DO signals				

Code	Name	Function Name	Description	Remarks
FunOUT.1	S-RDY	Ready to switch on	The servo drive is ready to receive the S-ON signal. Inactive: The servo drive not ready. Active: The servo drive is ready.	-
FunOUT.9	BK	Brake	Active - Brake signal is output. Disabled - Brake signal not output.	-
FunOUT.10	WARN	Alarm	Inactive: The servo drive issued no alarm or the alarm has been reset. Active - The servo drive issued an alarm.	-
FunOUT.11	ALM	Fault	The servo drive is faulty. Inactive: No fault occurred on the servo drive or the fault has been reset.	-
FunOUT.21	SrvOn	Enable completed	Active: Enable completed. Inactive: Enable not completed.	-
FunOUT.25	CMP	Position compare DO	Inactive: The servo drive did not pass the target position comparison point. Active: The servo drive passed the target position comparison point.	-
FunOUT.26	LoopState	Closed loop state	0: Semi-closed-loop Position feedback signals come from the built-in encoder of the servo motor. 1: Full closed-loop Position feedback signals come from the full closed-loop external encoder.	-
FunOUT.30	WARN OR ALM	Warning or fault output	Active: An alarm or fault is present. Inactive: No warning or fault.	-
FunOUT.32	EDM	EDM output	Active: STO is triggered Inactive: STO is not triggered	The EDM outputs active signals only when both the 24 V input voltages for STO1 and STO2 are disconnected.

Table 22–2 Communication forced DO wire breakage output

Type	Data	Description
bit0	0	Maintain DO1 output
	1	DO1 output prohibited
bit1	0	Maintain DO2 output
	1	DO2 output prohibited

22.4 Service and Support

Should you encounter a safety accident during the use or operation of the product, or face challenges in operating and maintaining the equipment, which remain unresolved after the relevant documentation is consulted, we provide multiple channels to ensure prompt resolution:

- Channel #1: Contact service@inovance.com.
- Channel #2: Visit https://www.inovance.com/global to access document downloads, after-sales support, spare parts ordering, repair applications, and authenticity verification services.
- Channel #3: Download My Inovance app (https://zshc-eu.inovance.com/download-pc/) where you can access products info and documentation, and query product parameters.

We are committed to providing you with quick and professional technical support, and we look forward to your satisfaction and trust.

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