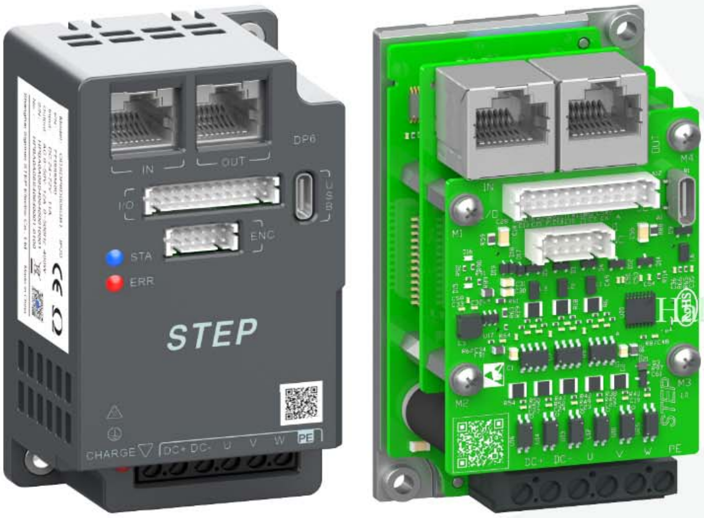
Ω6-DP

DC servo system

Instruction Manual



Preface

Introduction to the Materials

The Ω6-DP series servo is the flagship drive developed by Sigriner. It boasts swift response and precise control, featuring a 23bit high-precision encoder for high-accuracy positioning, maintaining millimetre-level precision. Its dynamic response is lightning-fast, easily meeting high-speed and high-precision requirements. With superior performance and reliable quality, it delivers powerful performance, easily handling up to 3 times overload. Its soft landing function ensures precise force control, maintaining accuracy within an error margin of 3 grams. The design is minimalist, yet its efficiency has been significantly enhanced: the overall volume has been reduced by 70%, and power density has increased by 390%. With a power coverage of 750W, it supports communication methods such as EtherCAT, pulse, CANopen/RS485. It can be paired with low-voltage linear motors, low-voltage DDR, voice coil motors, ZR motors, frameless torque motors, and coreless motors, primarily used in industries such as semiconductors, 3C motors, new energy, and precision machine tools.

List of product operation manuals

list
Specification for Ω6-DP DC Servo System
Specification for Ω6-DN DC Servo System

Regarding manual acquisition

● This manual is not shipped with the product. If you need to obtain an electronic PDF file, you can obtain it through the following methods:

● Log in to the official website of STEP (https://www.stepelectric.com/), navigate to "Product Center - Motion Control", search for the keyword, and download.

Manual revision record

date	revised version	Involved chapters	Revision Description	remark
2025.10.01	V1.0	--	First version released	

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Safety precautions

safety sign

Types and meanings of warning signs
Before installation, wiring construction, maintenance, and inspection, please read and use this manual and other accompanying materials thoroughly.
Please start using the equipment after confirming the knowledge about the equipment, safety information, and precautions.
This manual categorizes safety precautions into two levels: "Danger" and "Caution".

Warning sign	meaning
danger	This sign indicates that improper operation may lead to dangerous situations, potentially resulting in death or serious injury.
Attention	This sign indicates that if operated incorrectly, there is a possibility of dangerous situations occurring, resulting in moderate injuries, minor injuries, and equipment damage.

In addition, even items recorded under "Caution" may lead to serious consequences due to different situations. All text marked with a warning sign contains important content, please follow them.
Use symbols as needed to make the displayed points easy to understand at a glance.

symbol	meaning
	Indicating prohibited content
	Instruct the behavior of general users

Precautions

<table>
<tr><td colspan="3">danger</td></tr>
<tr><td rowspan="13"></td><td>Please avoid using it in places where water is prone to splash, in environments containing corrosive or flammable gases, and near combustible materials.</td><td rowspan="2">It may lead to fire, electric shock, malfunction, and damage</td></tr>
<tr><td>The temperature of servo drives, servo motors, and peripheral devices is relatively high. Please ensure to maintain a distance and refrain from placing flammable materials in the vicinity.</td></tr>
<tr><td>Do not use it in places with intense vibration and shock.</td><td>It may lead to electric shock, injury, and fire</td></tr>
<tr><td>Do not use the wire when it is immersed in oil or water.</td><td>It may lead to electric shock, malfunction, and damage</td></tr>
<tr><td>Do not place it near heating elements such as heaters or large wire wound resistors.</td><td rowspan="2">It may lead to fires and malfunctions</td></tr>
<tr><td>Do not connect the motor directly to a commercial power supply.</td></tr>
<tr><td>Do not perform wiring or operation with wet hands.</td><td>It may lead to electric shock, injury, and fire</td></tr>
<tr><td>Low-voltage series drives are available in both enclosed and open versions. The enclosed version is designed to protect the internal circuitry by separating it from potentially exposed surfaces. The open version must be used within a cabinet that meets the appropriate level of protection. The metal areas and components on the drive are considered hazardous zones. Never insert your hand into the drive when it is live, and avoid touching the hazardous zones.</td><td>It may cause burns, electric shock, injuries, and fires</td></tr>
<tr><td>Please do not touch the shaft end key slot of the motor with your bare hands.</td><td rowspan="2">It may lead to injury</td></tr>
<tr><td>Please do not touch the rotating part of the servo motor while it is operating.</td></tr>
<tr><td>Please do not rotate the motor using external force.</td><td>It may lead to fires and malfunctions</td></tr>
<tr><td>Please avoid subjecting the wire to excessive external force, heavy pressure, clamping, and other forms of damage.</td><td>It may lead to electric shock, malfunction, and</td></tr>
</table>

		damage
	When connecting an approved isolated auxiliary power supply to the drive, the circuit must be isolated from hazardous live parts through reinforced insulation or double insulation, and comply with relevant safety standards. It is strictly prohibited to connect unisolated rectification equipment as a power source.	It may lead to electric shock, injury, malfunction, damage, and fire
	It should be installed in a place with less dust and where it will not come into contact with water, oil, etc.	Improper placement may lead to electric shock, fire, malfunction, and damage
	Install the motor and driver on non-combustible materials such as metal.	When installed on combustible materials, it may cause a fire
	Wiring work must be carried out by professional electrical engineers. Only qualified personnel are allowed to install, debug, maintain, and repair servo drives. "Qualified" refers to possessing relevant knowledge, undergoing professional training, and being authorized to complete tasks such as transportation, assembly, installation, debugging, and motor operation.	People without relevant professional knowledge may cause electric shock and injury when carrying out wiring operations
	Please refer to the instruction manual for correct wiring.	Failure to connect the wires correctly may lead to electric shock, injury, malfunction, and damage
	The power cable should use copper conductors, and the recommended wire size is a 600V Class 2 heat-resistant indoor PVC cable with a continuous maximum allowable temperature of 75°C. The cable should be securely connected, and the electrical parts must be effectively insulated through insulation materials.	Incorrect wiring and short circuits may lead to electric shock, fire, and malfunction
	Please be careful not to let foreign objects enter the wiring section of the terminal strip. Use appropriate tools to tighten the screws according to the specified torque for each terminal. Control circuit cable wiring should be carried out in accordance with UL508 standard requirements	It may lead to short circuit, arcing, poor contact, damage, and malfunction
	The grounding wire of the drive motor must be connected to the protective earth (PE) terminal. The PE terminal of the isolated	Failure to connect the wires correctly

	switching power supply should be connected to the "system grounding" point. Please refer to the instruction manual for proper wiring. Before powering on, ensure that all system components are reliably connected to the earth ground (the current-carrying capacity of the PE wire must be exactly the same as that of the three UVW phase wires, so that the motor current can be instantly discharged to the PE in case of a fault). Low-resistance grounding is the fundamental guarantee for electrical safety.	may result in electric shock, injury, malfunction, and damage
	Please ensure proper and standardized installation. Failure to do so may lead to fires or other personal accidents.	Failure to conduct a standardized installation may lead to injury, electric shock, fire, malfunction, and damage
	Please install it in the external emergency stop circuit to ensure timely operation stop and power cut-off in case of emergency.	
	An overcurrent protection device, a residual current device (RCD), a high temperature protection device, and an emergency stop device must be installed	Failure to install or confirm may result in electric shock, injury, or fire
	Relevant safety confirmation must be carried out after an earthquake occurs.	
	Before moving, wiring, inspecting, or maintaining the drive, the power must be cut off. Even if the motor is at a standstill, the power cable may still carry high voltage. It is necessary to completely disconnect the drive from all power sources and wait for the charging indicator light to turn off for 1 minute, ensuring that there is no risk of electric shock (it is recommended to use a multimeter to measure and confirm the absence of voltage before proceeding). Hot plugging is prohibited for any terminals.	When performing work without cutting off the power supply, electric shock may occur
Attention		
	Do not grasp the cable or the shaft of the motor during transportation.	It may cause injury
	During transportation and installation, please avoid dropping or inverting it.	It may lead to injury and malfunction
	Do not stand on the product, and do not place heavy objects on the product.	It may lead to electric shock, injury, malfunction, and damage
	Please do not place any obstacles that hinder ventilation around the motor and drive peripherals.	The temperature rise caused by the influence of obstacles may

		ultimately lead to a fire
	Do not use it in direct sunlight.	It may lead to injury and fire
	Do not block the heat dissipation holes, and do not put in foreign objects.	It may cause injury and fire
	Do not subject the product to strong impacts.	It may lead to malfunctions
	Do not subject the shaft of the motor to strong impacts.	It may cause malfunctions in detectors and other equipment
	Do not frequently switch on and off the main power supply of the drive.	It may lead to malfunctions
	Do not use electromagnetic contactors to start and stop the motor on the main power supply side.	
	Do not make extreme gain adjustments or modifications to the drive. Ensure that the machine remains stable during operation and movement.	It may cause injury
	The holding brake built into the motor cannot be used to stop a running load.	It may lead to injury and malfunction
	After the power outage ends and power is restored, there may be a sudden restart, so please do not approach the machine. To avoid accidents during the restart and ensure personal safety, please take precautions.	It may cause injury
	Under no circumstances should it be modified, dismantled, or repaired by oneself.	It may lead to fire, electric shock, injury, and malfunction
	Please install the equipment properly based on its body weight and rated power.	Improper installation and setup may lead to injuries and malfunctions
	Please follow the specified installation method and direction.	
	The lifting bolt of the motor is only used for moving the motor, not for moving the machine.	If used for machine transportation, it may cause injury and malfunction
	Ensure that the motor and driver are used within the temperature and humidity range specified in the instruction manual..	Improper installation and setup may lead to injuries and
	The spacing between the drive and other machines within the control box should be set to the specified distance.	

		malfunctions
	The DC power supply and the signal voltage of each interface connected to this device must fully comply with the maximum rated values listed in this manual	Using it outside the rated voltage range may lead to electric shock, injury, and fire
	Please connect the brake control relay in series with the immediate stop circuit breaker relay.	Failure to connect may result in injury and malfunction
	Safety devices should be installed to address the issues of built-in brakes, idling and locking of the reducer, and leakage of reducer lubricating grease.	Failure to install may result in damage or contamination
	Please combine the driver and motor according to the requirements.	Failure to use the correct combination may lead to malfunctions and fires
	When conducting a test run, please first disconnect it from other machinery, secure the motor, confirm that it operates normally, and then install it onto the relevant machinery.	Incorrect model and wiring may cause injury
	When an alarm occurs, please eliminate the cause of the alarm and ensure safety before clearing the alarm status and restarting.	Failure to eliminate the cause of the error may lead to injury
	When the drive malfunctions, please cut off the power supply on the drive side.	Injuries may occur due to malfunctions of the equipment
	When not in use for an extended period, the power must be disconnected	Injuries may occur due to malfunctions of equipment
	Please use a USB Type-C cable with independent shielding layer and USB signal GND, or purchase the corresponding USB Type-C cable from Xingelinna (model: 2H/USB3.0-AM TO USB C24)	If cables that do not meet the aforementioned specifications are used, there may be a risk of damaging the drive due to static electricity
	Before powering on, make sure to confirm that all safety measures have been implemented and the installation steps have been completed	Injuries may occur due to malfunctions

	strictly according to this manual. It is essential to verify that the Safe Torque Off (STO) function is working properly and is available.	of equipment

1 Ω6-DP series servo driver

1.1 Model identification method

ODS	DP6	D	003	G	B	1
1-3	4-6	7	8-10	10	11	12

[1-3] Product category ODS: Ω6 single-axis servo product [4-6] Product series DN6: D-series bus servo DP6: D-series pulse servo	[7] Voltage level D：DC 24~72V	[8-10] Power specifications 003：3A 006：6A 012：12A 020：20A
[11] Function type F: Full-featured G: General-purpose B: Basic type	[12] Encoder interface type B: Standard interface Others: Customized interface	[13-14] Special specifications 1: Without shell 2: With shell

1.2 Contents of the nameplate

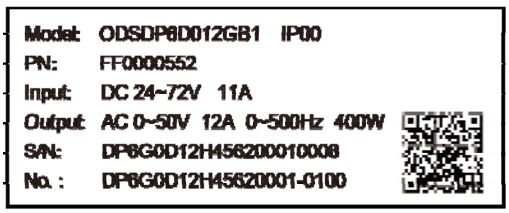


Figure 1.2-1 Nameplate Content (Schematic Diagram)

1.3 Driver Dimensional Specification Table

1.3.1 Size specification table

Drive model	Driver power range	Driver size (mm)
ODSDP6D003GB1 ODSDP6D006GB1 ODSDP6D012GB1 ODSDP6D020GB1	3A 6A 12A 20A	Length 86, depth 40, width 48
ODSDP6D003GB2 ODSDP6D006GB2 ODSDP6D012GB2 ODSDP6D020GB2	3A 6A 12A 20A	Length 90, depth 40.5, width 50

1.3.2 Dimensional drawing

The external dimensions of the AB model drive are shown below: [Unit: mm]

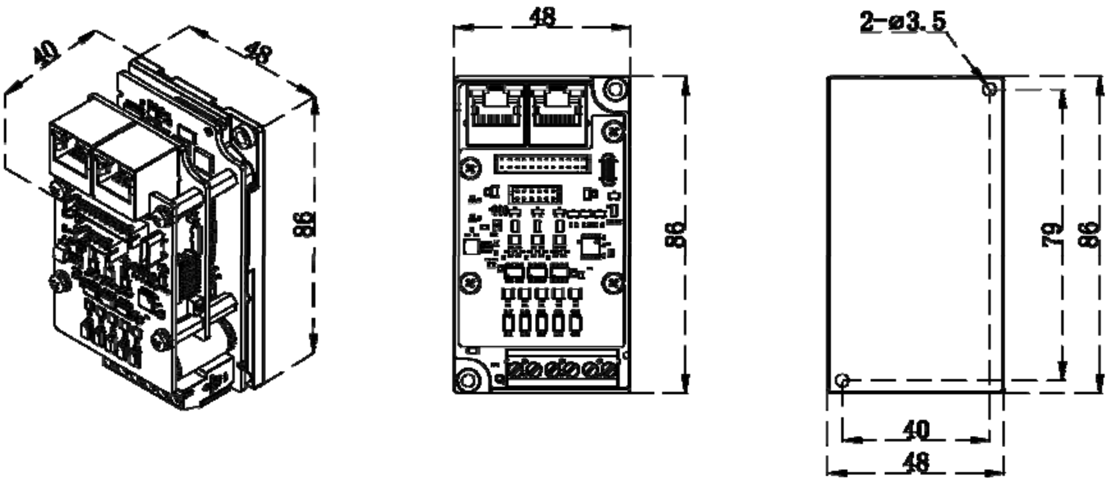


Figure 1.3.2-1 Outline dimension diagram of Type A driver

Recommended fastening screw: 2–M3; Recommended tightening torque: 0.6N·m

Weight: 0.15kg

[Unit: mm]

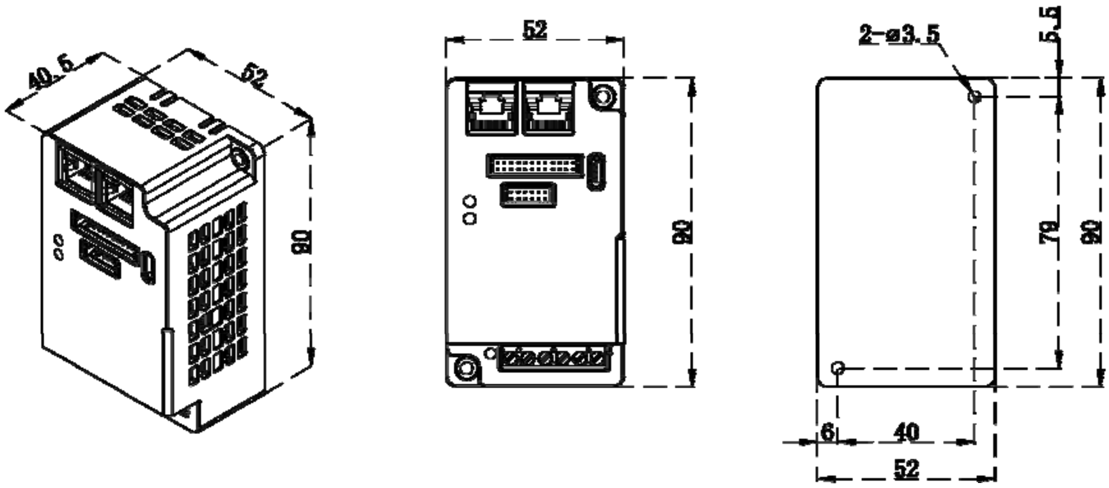


Figure 1.3.2-2 Outline dimensional drawing of Type B driver

Recommended fastening screw: 2–M3; Recommended tightening torque: 0.6N·m

Weight: 0.15kg

1.4 Confirm the names of each part

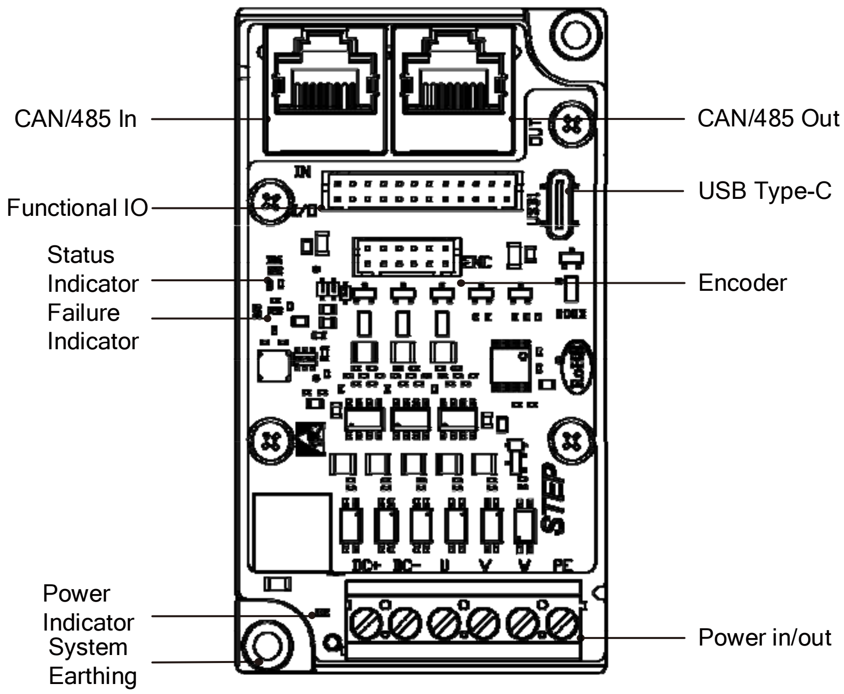


Figure 1.4.1-1 Schematic diagram of Type A driver interface description

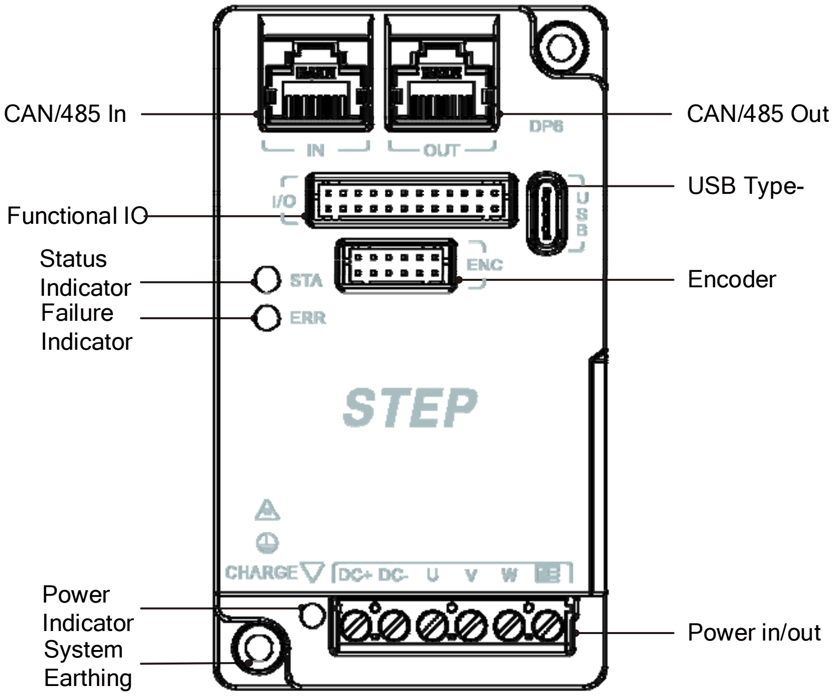


Figure 1.4.1-2 Schematic diagram of B-type driver interface description

1.5 Description of functional styles

The Ω6-D series includes both a general-purpose model and a full-function model.

function	DP6 specification	
	Universal	full-featured
USB communication	√	√
CAN communication	√	√
RS485 communication	√	√
Encoder frequency division output (AB)	√	√
Probe (low speed)	√	√
Positioning compensation	√	√
Pulse/Direction Input	√	√
Hall input	√	√
12-bit ADC input	×	√

1.6 Electrical and Technical Specifications

Universal type and full-function type

<table>
<tr><td rowspan="3">Encoder feedback</td><td>Rotating adaptive encoder</td><td colspan="2">Serial communication encoder;</td></tr>
<tr><td>Linear adaptive encoder</td><td colspan="2">Serial communication encoder; 16Mbps ABZ encoder; BiSS C communication;</td></tr>
<tr><td>Hall signal</td><td colspan="2">Hall encoder feedback</td></tr>
<tr><td rowspan="6">Terms of Use</td><td>Operating temperature</td><td colspan="2">0℃~45℃ (no freezing)</td></tr>
<tr><td>Storage temperature</td><td colspan="2">-20℃~70℃</td></tr>
<tr><td>Operating/Storage Humidity</td><td colspan="2">Below 95%RH (no freezing or condensation allowed)</td></tr>
<tr><td>Vibration resistance strength</td><td colspan="2">Below 5.88 m/s2, 10~60 Hz (continuous use is not allowed at resonance frequency)</td></tr>
<tr><td>Impact resistance</td><td colspan="2">19.6m/ s2</td></tr>
<tr><td>altitude</td><td colspan="2">For normal use, operate at altitudes below 1000m. For use at altitudes between 1000m and 2000m, please reduce the rated power</td></tr>
<tr><td rowspan="4">IO interface connector</td><td rowspan="2">digital signal</td><td>input</td><td>Universal input 4-channel selects the function of universal input based on parameters</td></tr>
<tr><td>output</td><td>Universal output 3-channel, with the function of selecting universal input based on parameters</td></tr>
<tr><td>pulse signal</td><td>output</td><td>2 Output
A and B frequency division output</td></tr>
<tr><td>Pulse/Direction</td><td>input</td><td>Pulse control, supporting 4Mbits</td></tr>
<tr><td rowspan="7">position control</td><td>Vibration suppression control</td><td colspan="2">Two can be set simultaneously</td></tr>
<tr><td>V-type vibration suppression filter</td><td colspan="2">Up to one can be used simultaneously</td></tr>
<tr><td>2 degrees of freedom</td><td colspan="2">available</td></tr>
<tr><td>Load variation suppression control</td><td colspan="2">available</td></tr>
<tr><td>Feedforward function</td><td colspan="2">Available (speed/torque)</td></tr>
<tr><td>Gain switching function 3</td><td colspan="2">available</td></tr>
<tr><td>Friction torque compensation</td><td colspan="2">available</td></tr>
</table>

	Quadrant protrusion suppression function	available
	Torque limit switching function	available
	Motor movable range setting	available
	Torque saturation protection function	available
	Single-turn absolute function	Can be used (when connecting an absolute encoder)
torque control	Speed limit function	The speed limit value can be set based on the parameters
	2 degrees of freedom	Do not use
	Load variation suppression control	Do not use
	Feedforward function	Speed feedforward is not allowed, but total line-down torque feedforward is supported
	Friction torque compensation	Do not use
	Mixed vibration suppression function	Do not use
	Torque limit switching function	The bus 0x60E0/0x60E1 can be used, along with a maximum torque limit
	Torque saturation protection function	Do not use
	Single-turn absolute function	Can be used (when connecting an absolute encoder)
	Vibration suppression control	Do not use
	Model vibration suppression filter	Do not use
	Gain Switching Function No. 3	Do not use
	Quadrant protrusion suppression function	Do not use
	Motor movable range setting	Do not use
	External displacement sensor position information monitor	Do not use
	Lock mode with stop	Do not use

	function	
speed control	2 degrees of freedom	available
	Load fluctuation suppression control	available
	Feedforward function	Torque feedforward and speed offset issued through the main line can be used
	Friction torque compensation	available
	Mixed vibration suppression function	Do not use
	Torque limit switching function	available
	Torque saturation protection function	available
	Single-turn absolute function	Can be used (when connecting an absolute encoder)
	Vibration suppression control	Do not use
	Model vibration suppression filter	Do not use
	Gain Switching Function 3	Do not use
	Quadrant protrusion suppression function	Do not use
	Motor movable range setting	Do not use
	External displacement sensor position information monitor	Do not use
	Lock mode with stop function	Do not use
General	auto-adjust	Based on the upper-level action commands and the action commands issued by the installation and debugging software ΩMaster, the load inertia is estimated and determined in real-time under motor drive conditions, and the gain corresponding to the rigidity setting is automatically set.
	Electronic gear ratio setting	The numerator can be set arbitrarily within the range of 1/1000 to 1000 times, and the denominator can be set arbitrarily within the range of 1 to 2^{30}. Please use within the above range.

	notch filter	5 (2 automatic)	
	Gain switching function	available	
	2-stage torque filter	available	
	Position comparison output function	available	
	protection function	hardware error	Overvoltage, undervoltage, overtemperature, overload, overcurrent, encoder abnormality, etc
		Software error	Excessive position deviation, command pulse frequency division, EEPROM abnormality, etc
	Alarm data tracking function	You can refer to the historical records of alarm data	

2 Installation and connection

2.1 Preparation before installation

2.1.1 Environmental requirements

Please install the driver correctly to prevent malfunctions and accidents.

drive	project	condition
drive	ambient temperature	● Installation/operating temperature: -5°C to 45°C (no freezing; derate when exceeding 45°C, with power derated by 10% for every 5°C increase) ● Storage/transportation temperature: -20°C~65°C (maximum temperature: 85°C for 72 hours) ● Installation/operation/storage humidity: below 95%RH (no freezing or condensation allowed) ● To enhance the reliability of the machine, please use this product in a location where the temperature does not change rapidly. ● When using in a closed space, please

		utilize a cooling fan or air conditioner for cooling, ensuring that the inlet temperature of the equipment remains below 45℃. ● Place the product on a flame-retardant surface, ensuring sufficient space around it for heat dissipation
drive	vibration	Below 5.88m/s^2, 10~60 Hz (continuous use at resonance frequency is not allowed)
	impact	Below 19.6 m/s^2
	altitude	For normal use, keep below 1000m. For use between 1000m and 2000m, please use with derating. Derating by 1% for every 100m increase
	Protection level	● Without shell: IP00; With shell: IP20 ● The open-type version of the drive without a housing does not provide protection against direct contact with hazardous live parts. It needs to be installed within an auxiliary housing or a restricted access area to provide appropriate protection against electric shock.
drive	installation site	● Please install it inside a control cabinet located in a room that is protected from rain and direct sunlight; ● Do not use this product in corrosive environments containing hydrogen sulfide, sulfurous acid, chlorine, ammonia, chlorinating gases, acids, alkalis, salts, flammable gas environments, or near combustible materials; ● In places free from cutting fluid, oil mist, water, metal powder, iron chips, etc; ● A well-ventilated, dry and dust-free location; ● A vibration-free location ● Please refrain from using gasoline, diluent, alcohol, acidic, and alkaline cleaning agents to prevent discoloration or damage to the casing

2.1.2 Space requirements

Please reserve sufficient space for effective heat dissipation.

Type A and Type B drives (rated power of 400W and below) support zero-distance installation. Considering installation tolerances, it is recommended to reserve an appropriate distance between the drives.

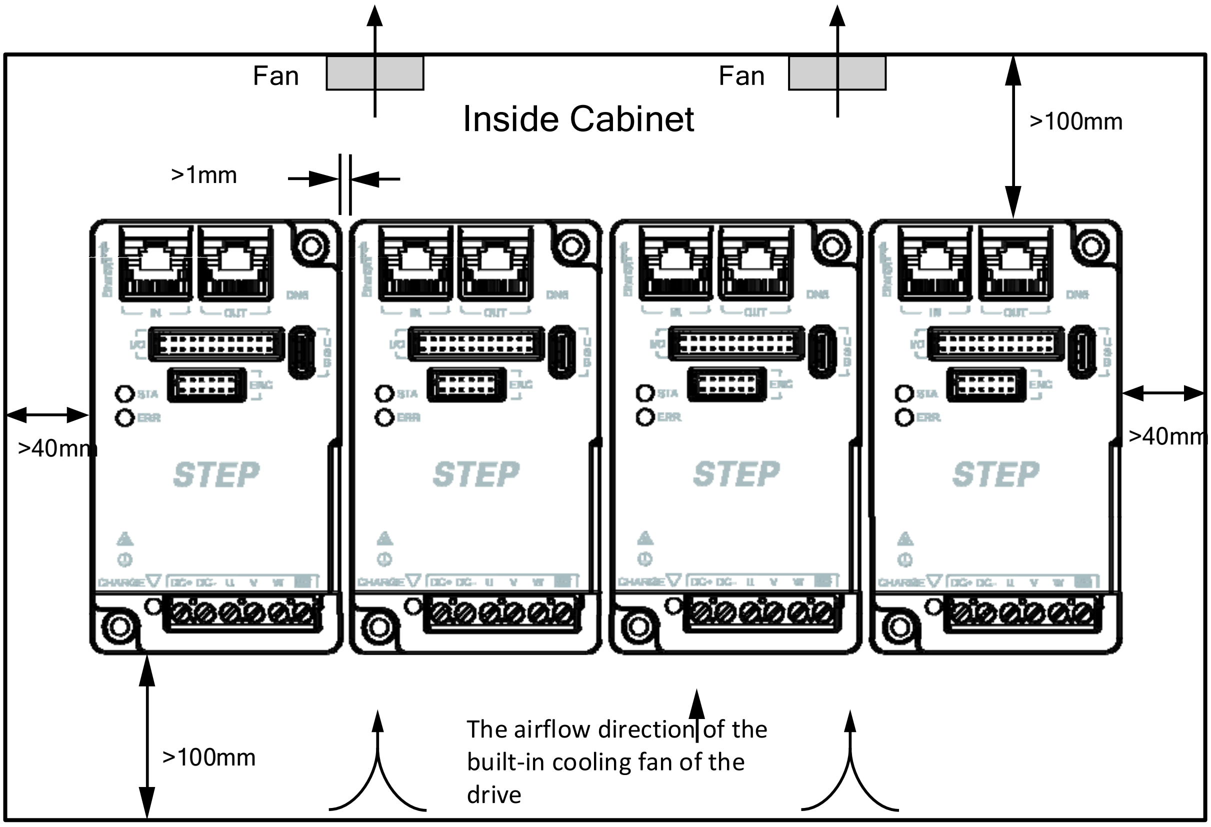


Figure 2.1.2-1 Installation Direction and Spacing

2.2 Mechanical installation

2.2.1 Installing the driver

The servo drive supports wall-mounted installation.

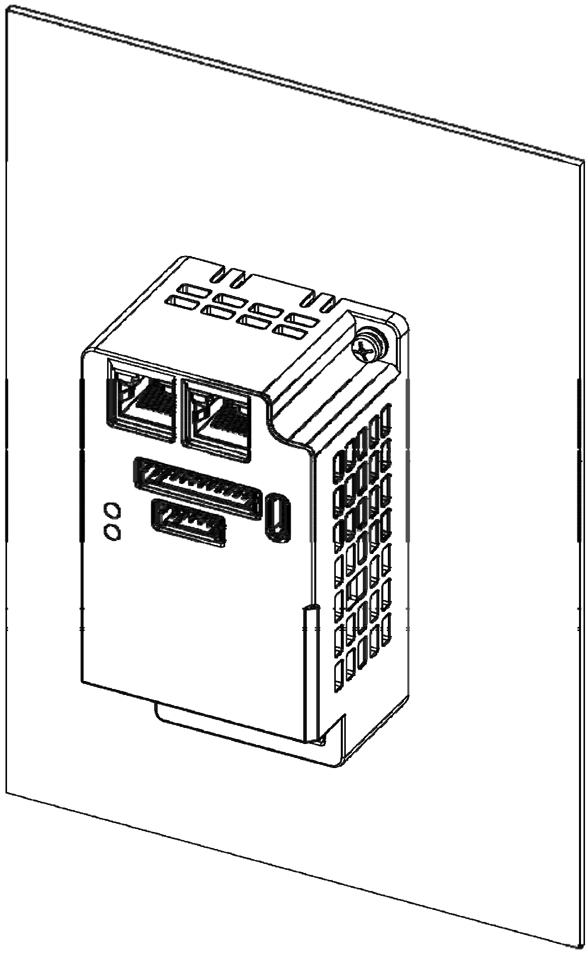


Figure 2.2.1-1 Schematic diagram of wall-mounted installation

(1) Please install the drive vertically upwards to facilitate heat dissipation.
(2) When mounting brackets are required, they must be made of flame-retardant material.
(3) Please reserve sufficient space for effective cooling. Please adhere to the space requirements outlined in 2.1.2.
(4) Please install a fan inside the control cabinet to ensure uniform temperature distribution within it.
(5) Regarding the environment inside the control cabinet, please ensure compliance with the environmental requirements outlined in 2.1.2.
(6) When determining the tightening torque for product installation screws, it is necessary to consider the strength of the screws and the material of the installation location. Please ensure that they are in a state of no loosening or damage.
Example: When using steel screws, the recommended screw model and tightening torque are: M3 screw with a torque within the range of 0.5~1.2N·m;
(7) Please ensure that the grounding terminal is properly grounded, otherwise there may be a risk of electric shock or interference causing malfunctions.

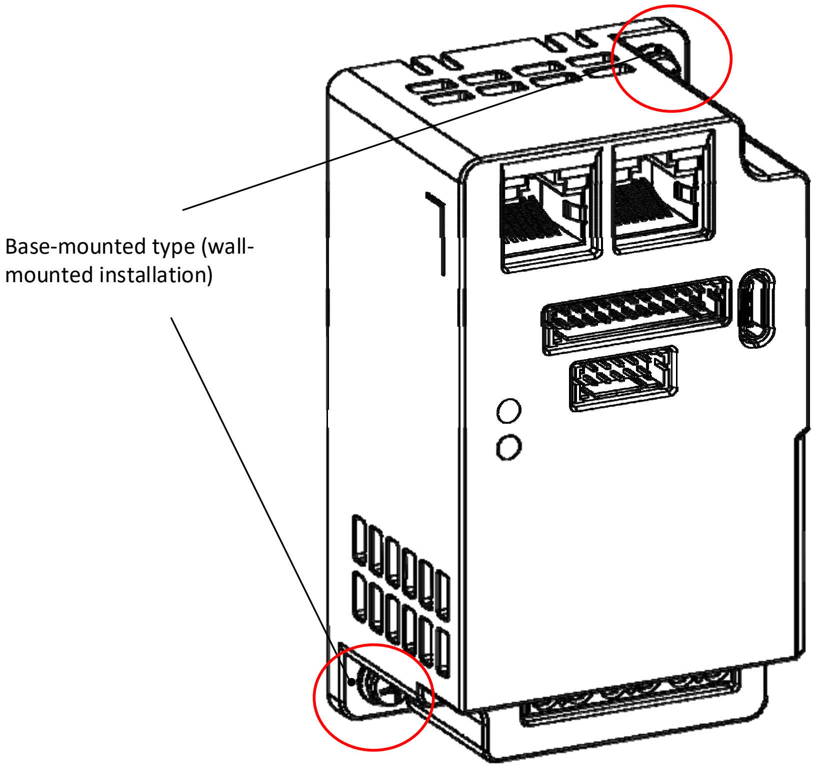


Figure 2.2.1-2 Position of driver mounting holes

2.3 Electrical system installation

2.3.1 Electrical system connection diagram

2.3.1.1 System wiring diagram

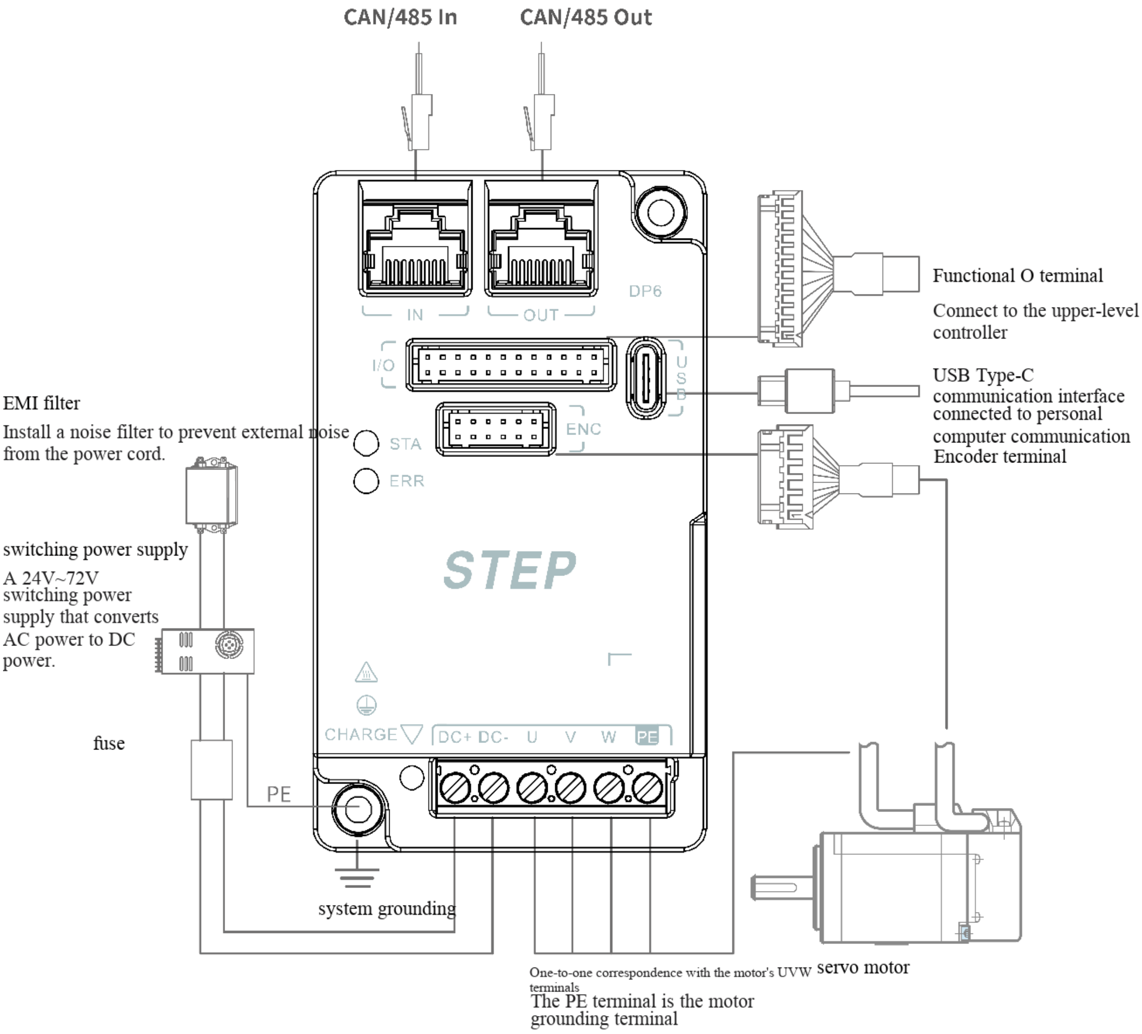


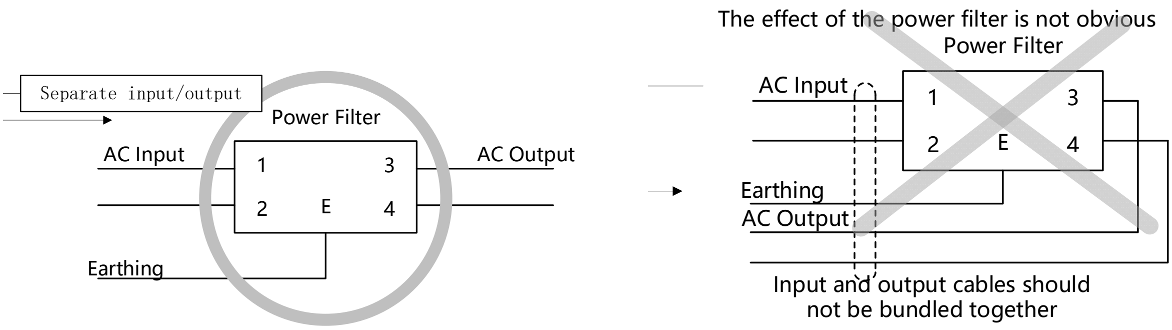
Figure 2.3.1.1_1 Schematic diagram of system wiring

2.3.1.2 System composition description

1) Please ensure that the driver is powered by an isolated power supply or a traction battery, and avoid using rectified power supply that is not isolated from the grid. To prevent cross-contact accidents in the servo system, please use a fuse on the input power supply.

2) When connecting to an external power supply, please pay attention to the power capacity, especially when supplying power to multiple drives simultaneously. Insufficient power capacity can lead to insufficient supply current, resulting in drive failure.

3) When connecting an EMI filter to an isolated power supply, please note the following:



4) Instructions for installing the ferrite bead: When securing the ferrite bead, do not apply excessive pressure to the cable. If the power cord comes with a sheath, the sheath must be removed. Insert the organized DC+, DC- power cords into the ferrite bead to achieve interference reduction. If it does not work, increase the number of ferrite beads around the coil. When installing the ferrite bead on the motor wire, it is important to insert the organized U, V, W wires together into the ferrite bead to achieve interference reduction. Please thread the signal wire through the ferrite bead and wind it according to actual needs. If interference is high, increase the number of windings.

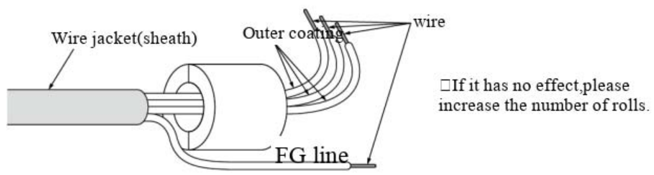


Figure 2.3.1.2-2 Magnetic Ring Connection Diagram

Installation requirements for magnetic rings:

cable	Instructions
signal line	Please wind the necessary number of signal wires onto the magnetic ring.
encoder cable	Please wind the encoder wire around the magnetic ring to the necessary number of turns.
power cord	When a wire sheath (outer skin) is attached, the wire sheath of the ferrite bead (including the one dedicated for the power cord) installation part must be removed. Place the organized DC+, DC- wires into the ferrite bead to achieve the effect of reducing interference. If there is no effect, please implement countermeasures such as adding ferrite beads (including the one dedicated for the power cord).
motor wire	When installing magnetic rings (including those specifically for motor wires) on the cables recommended by our company, the wire sheath (outer skin) of the installation part must be removed. Place the organized U, V, and W wires into the ferrite magnetic rings to achieve the effect of reducing interference. If it does not work, please implement countermeasures such as adding signal-enhancing magnetic rings (including those specifically for motor wires).

5) Contactor

Used to connect/disconnect the main power supply of the drive. Please install a coil surge absorber before use.

It is strictly prohibited to use contactors for the operation and stopping of motors. Since motors are large inductive components, the instantaneous high voltage generated may cause the contactor to break down.

2.3.2 Introduction to servo terminal blocks

2.3.2.1 Wiring of Interface J2 (I/O)

The servo driver panel features one I/O interface, serving as the connection port for the driver's digital input/digital output/frequency division output/analog input, as well as the STO function. The following figure depicts the front view of the interface:

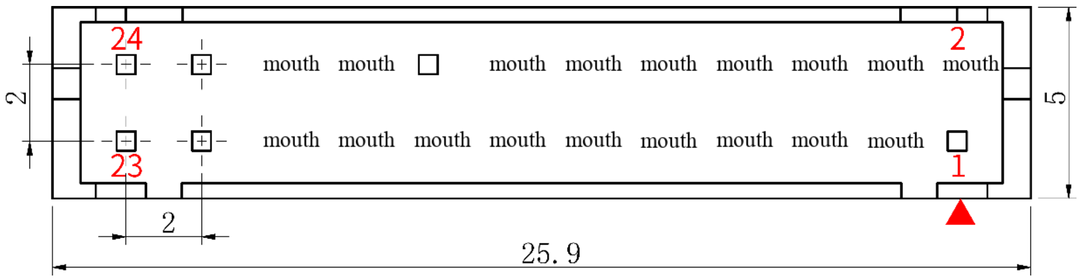


Figure 2.3.2.1-1 J2 Interface

J2 interface definition

terminal number	definition	symbol	signal name	Functional Description
1	SO1+	SO1+	digital output	DO digital output 1+
2	COM +	COM +	Optocoupler input common terminal	Optocoupler input common terminal
3	SO1-	SO1-	digital output	DO digital output 1-
4	SI_1	SI_1	Digital input	DI digital input 1
5	SO2+	SO2+	digital output	DO digital output 2+
6	SI_2	SI_2	Digital input	DI digital input 2
7	SO2-	SO2-	digital output	DO digital output 2-
8	SI_3	SI_3	Digital input	DI digital input 3
9	SO3+	SO3+	digital output	DO digital output 3+
10	SI_4	SI_4	Digital input	DI digital input 4

11	SO3-	SO3-	digital output	DO digital output 3-
12	SI_STO	SI_STO	STO digital input	STO function
13	OA+	OA+	Phase A positive terminal	Pulse frequency division output A phase +
14	OB+	OB+	Phase B positive terminal	Pulse frequency division output B phase +
15	OA-	OA-	A-phase inverting terminal	Pulse frequency division output A phase-
16	OB-	OB-	Phase B negative terminal	Pulse frequency division output B phase-
17	PULSE1	PULSE1	Pulse signal input	Pulse input 1
18	OPC	OPC	Pulse direction common terminal	Pulse direction optocoupler common terminal
19	PULSE2	PULSE2	Pulse signal input	Pulse input 2
20	GND	GND	Ground signal	signal ground
21	SIGN1	SIGN1	Direction signal input	Direction input 1
22	ADC_IN	ADC_IN	Analog signal input	ADC input
23	SIGN2	SIGN2	Direction signal input	Direction input 2
24	PE	PE	Shielding and grounding	The internal part has been connected to the ground terminal

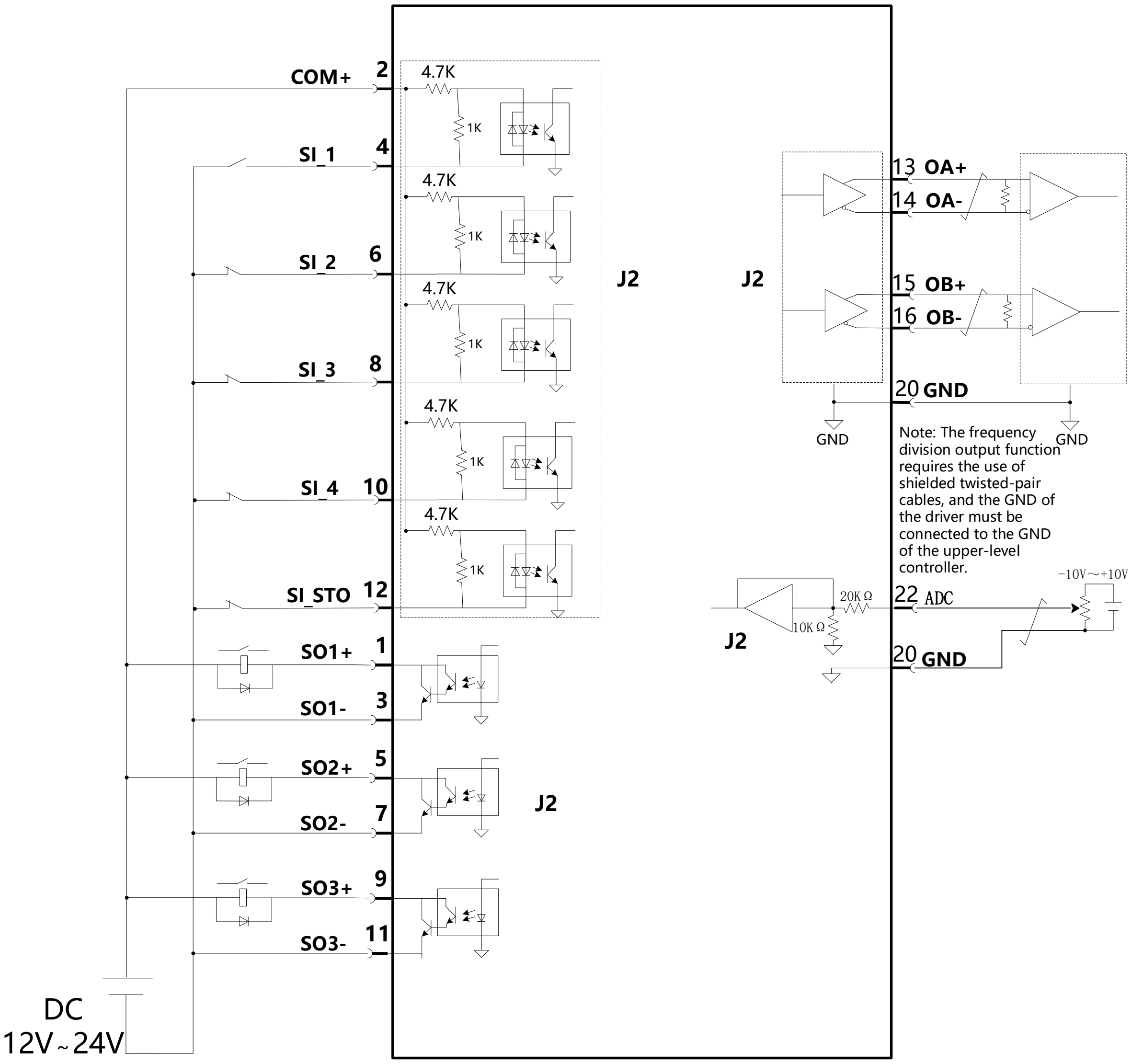


Figure 2.3.2.1-2 Connector J2 Input/Output NPN Type Connection

*Note:

1. COM+ is the optocoupler input common terminal, and customers should connect it according to their actual needs. When COM+ is connected to a 24V positive terminal, it follows an NPN connection method; when connected to a 24V negative terminal, it follows a PNP connection method.
2. The output is divided into positive and negative terminals. The positive terminal is connected to a 24V positive pole in a PNP configuration, with the load connected to the negative terminal; the negative terminal is connected to a 24V negative pole in an NPN configuration, with the load connected to the positive terminal.

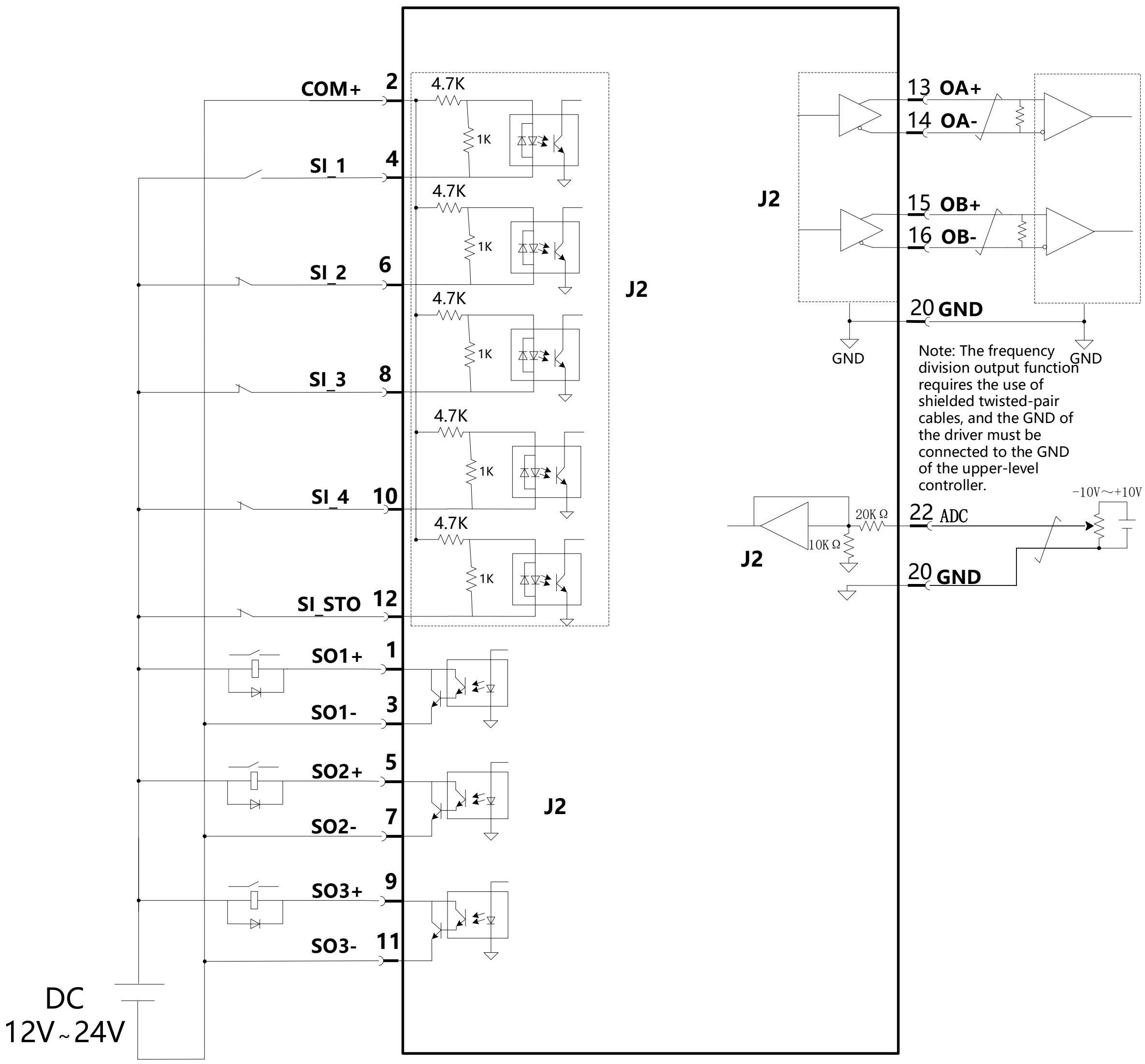


Figure 2.3.2.1-3 Input/Output PNP Type Connection of Connector J2

*Note:

1. COM+ is the optocoupler input common terminal, and customers should connect it according to their actual needs. When COM+ is connected to a 24V positive terminal, it follows an NPN connection method; when connected to a 24V negative terminal, it follows a PNP connection method.
2. The output is divided into positive and negative terminals. The positive terminal is connected to a 24V positive pole in a PNP configuration, with the load connected to the negative terminal; the negative terminal is connected to a 24V negative pole in an NPN configuration, with the load connected to the positive terminal.

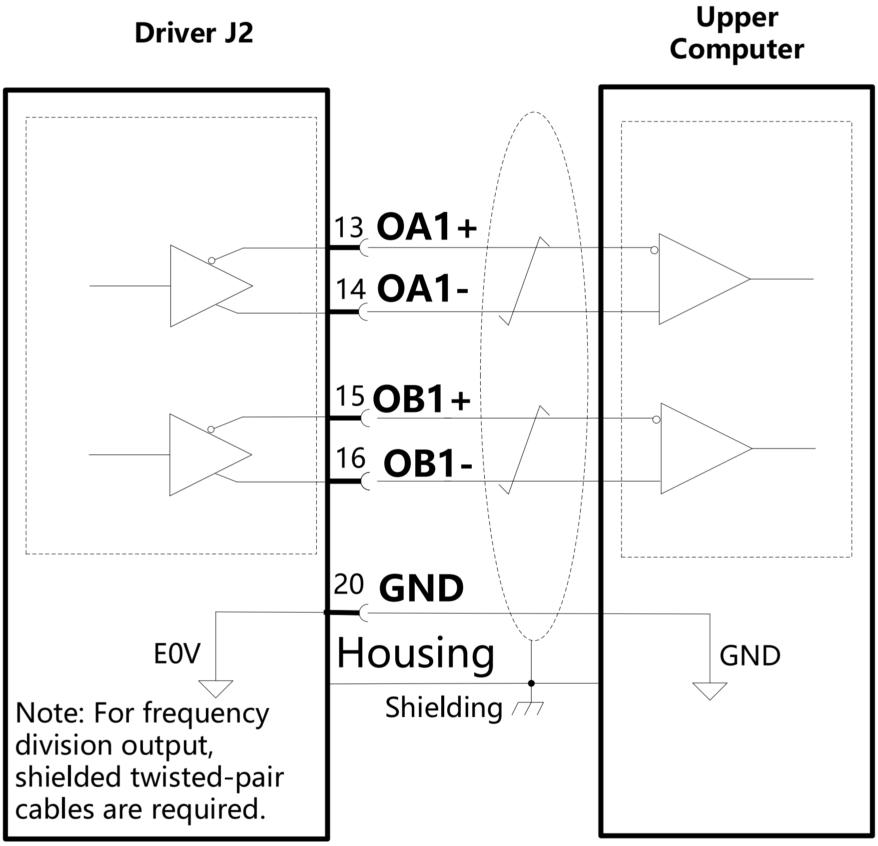


Figure 2.3.2.1-4 Schematic diagram of differential reception

*Note: When using a differential receiving circuit, pin 17 of the servo driver serves as the internal GND of the driver and must be connected to the GND of the differential receiver on the host computer. Otherwise, abnormalities may occur under severe interference conditions.

2.3.2.2 Wiring of connector J1 (ENC encoder)

The servo driver J1 serves as an encoder interface, with the interface definition as follows.

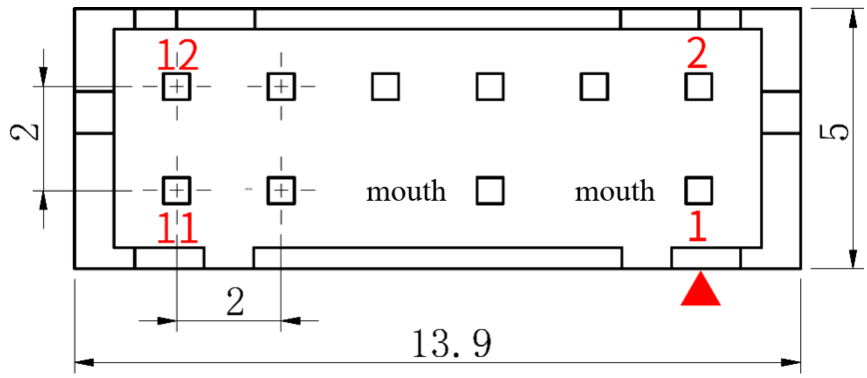


Figure 2.3.2.2-1 J1 Interface

J1 (ENC) interface definition

name	symbol	Connector pin No	content
Encoder power supply	GND	1	Encoder power supply negative pole
	5.2V	2	Encoder power supply positive pole
encoder signal	IN_A+	3	Absolute encoder signal +/BISS-C communication DAT+/ ABZ encoder A-phase input +
	IN_A-	4	Absolute encoder signal-/BISS-C communication DAT-/ ABZ encoder A-phase input-
encoder signal	IN_B+	5	BISS-C communication CLK+/ABZ encoder B-phase input+
	IN_B-	6	BISS-C communication CLK-/ABZ encoder B-phase input-
encoder signal	IN_Z+	7	ABZ encoder Z-phase input +
	IN_Z-	8	ABZ encoder Z-phase input-
Hall signal	CS1	9	Hall input 1
	CS2	10	Hall input 2
	CS3	11	Hall input 3
Shielding and grounding	PE	12	The internal part has been connected to the ground terminal

Rotating servo compatible encoder:

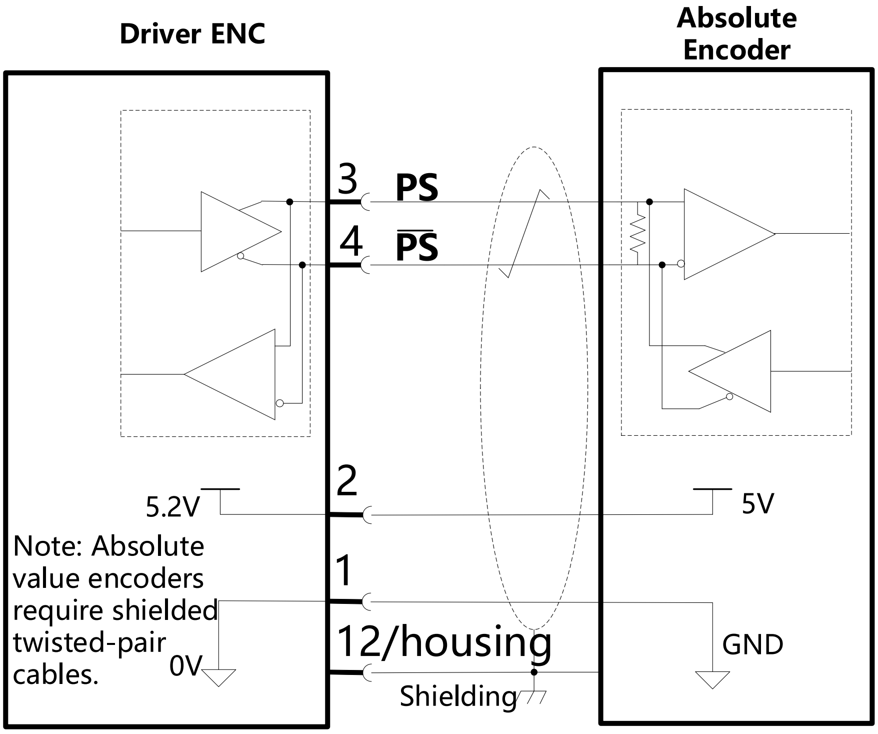


Figure 2.3.2.2-2 Absolute encoder wiring

Note: Drive alarm 210 indicates abnormal protection due to encoder communication disconnection. Please check whether the drive encoder wiring is correct, the encoder plug is securely inserted, the encoder type is correctly selected, and the encoder is functioning properly.

Linear servo-compatible encoder (ABZ incremental encoder):

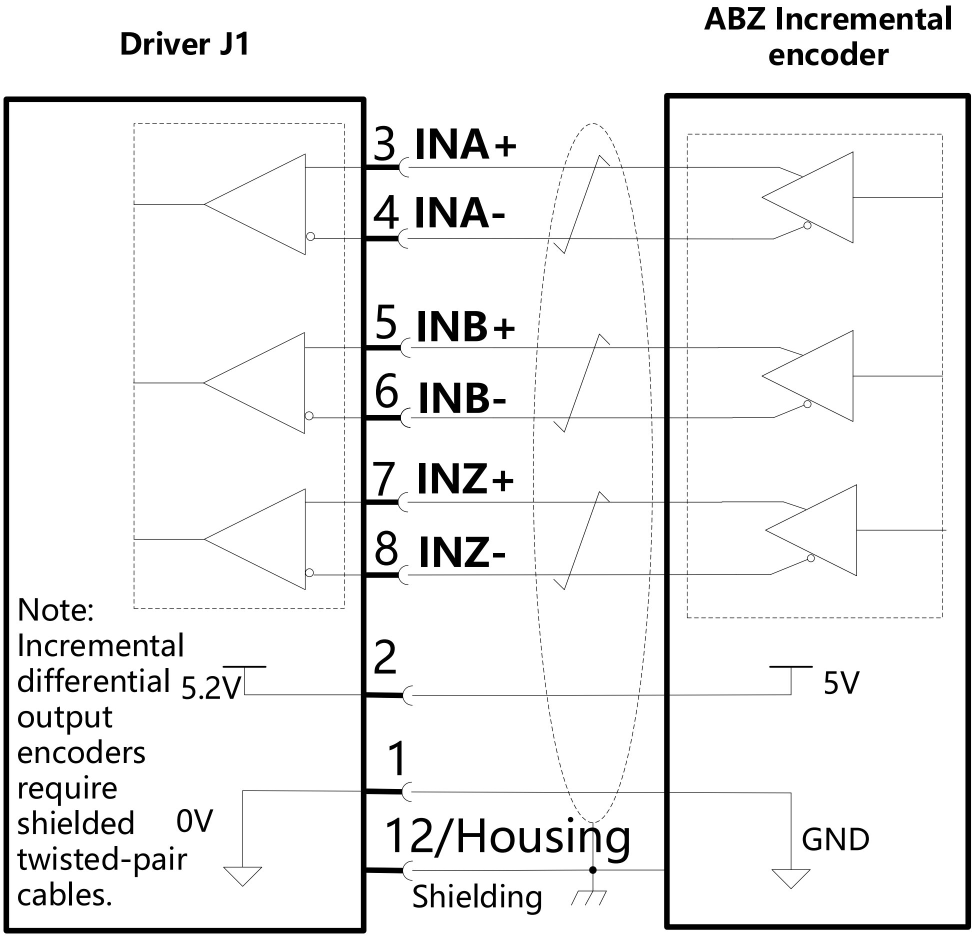


Figure 2.3.2-3 Wiring of ABZ incremental encoder

Note: When selecting an ABZ incremental encoder, the driver supports a disconnection detection function. When the encoder reports 550, please check the corresponding wiring of the encoder, whether the encoder plug is securely inserted, and whether the encoder is functioning properly.

Linear servo compatible encoder (BiSS C encoder):

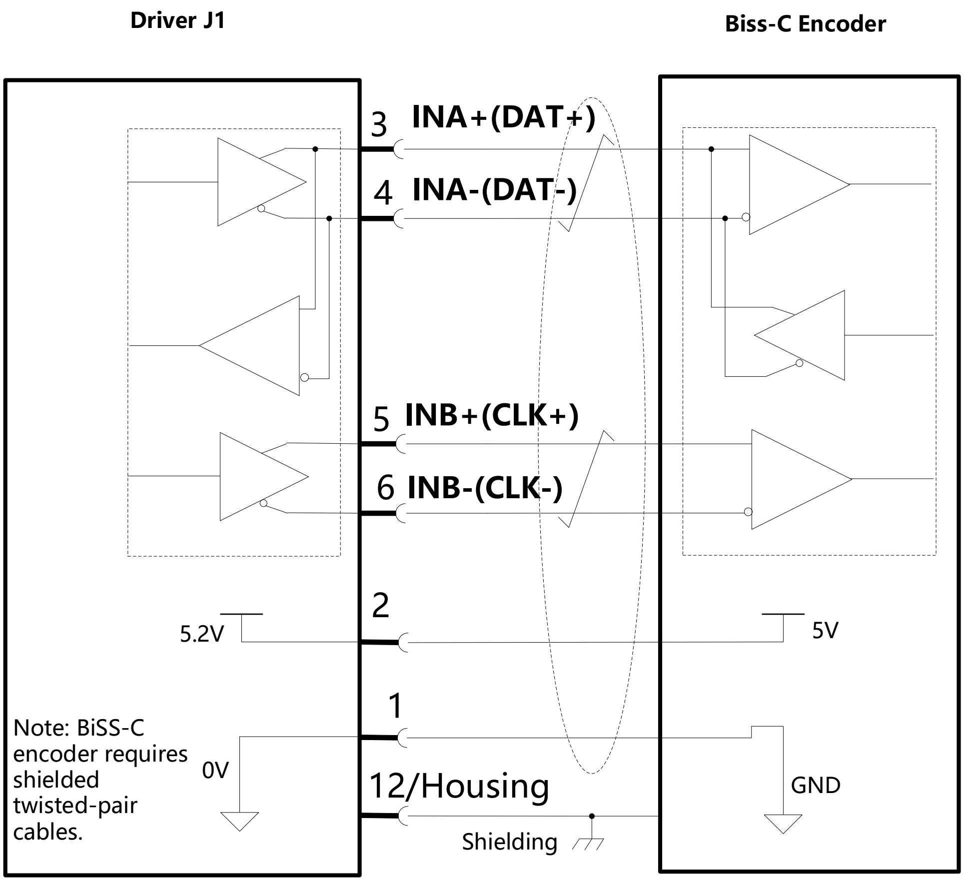


Figure 2.3.2-4 Biss-C encoder wiring

5.3.2.3 Connector (power and power line)

J1 provides the driver power supply, servo motor power supply, and grounding port. The driver power supply and control power supply share the same input.

Interface definition of J1:

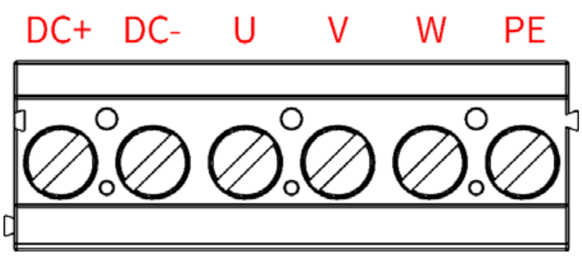


Figure 2.3.2.3-1 Power Supply and Power Line Interfaces

name	symbol	Connector pin No	content

DC+	DC+	1	DC input positive connection port
DC-	DC-	2	DC input negative connection port
U	U	3	Motor U-phase output
V	V	4	Motor V-phase output
W	W	5	Motor W-phase output
PE	PE	6	System PE grounding

DC+ and DC- are the power interfaces for the driver, which share the same power supply for both driving and control. U, V, and W are the power line interfaces for the motor, connecting to the U, V, and W phases of the servo motor. PE is the motor ground terminal, which is used for grounding by connecting the motor's grounding wire to the motor ground terminal for common grounding.

2.3.2.4 Wiring of connectors JP1 and JP2 (EtherCAT bus)

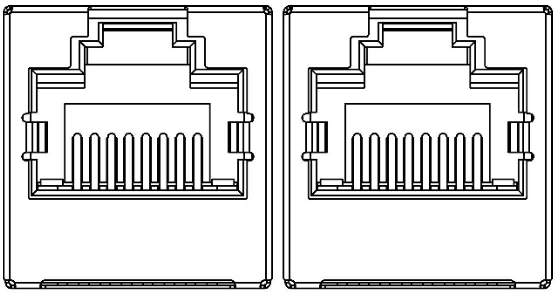


Figure 2.3.2.4-1 JP1/IP2 Interface

JP1 (RJ45) EtherCAT communication connector IN

name	symbol	Connector pin No	content
CAN communication H	CANH	1	CAN differential signal H
CAN communication L	CANL	2	CAN differential signal L
Empty (not used)	NC	3	Please do not connect any devices
485 communication B	485B	4	485 differential B signal
485 communication A	485A	5	485 differential A signal
"Empty (not used)"	NC	6	Please do not connect any devices
signal ground	GND	7	signal ground
signal ground	GND	8	signal ground
Shielding and grounding	PE	9	Outer shielding layer

JP2 (RJ45) CAN & RS485 communication connector OUT

name	symbol	Connector pin No	content
CAN communication H	CANH	1	CAN differential signal H

CAN communication L	CANL	2	CAN differential signal L
terminating resistor	Terminal_R+	3	120Ω terminal resistor R+
485 communication B	485B	4	485 differential B signal
485 communication A	485A	5	485 differential A signal
terminating resistor	Terminal_R-	6	120Ω terminal resistor R-
signal ground	GND	7	signal ground
signal ground	GND	8	signal ground
Shielding and grounding	PE	9	Shell shielding layer

*Note: When multiple devices are used in series, the last device needs to be equipped with an end connector on JP2 to ensure the correct insertion of the communication terminal resistor. End connectors are divided into two types according to the communication mode: CAN and RS485. When the communication mode changes, the corresponding end connector needs to be replaced and cannot be mixed.

contact method	Connector pin No	symbol	content
CAN	1---3	CANH~120R+	1-3 for short circuiting, 4/5/7/8 are prohibited for use
	2---6	CANL~120R-	2-6 are short-circuited, and 4/5/7/8 are prohibited for use
RS485	4---3	485A~120R+	4-3 short circuit, 1/2/7/8 are prohibited for use
	5---6	485B~120R-	5-6 are for short connections, while 1/2/7/8 are prohibited for use

2.3.2.5 Wiring of USB connector (host computer)

The wiring of the USB connector is connected to the computer's USB module. It allows for parameter setting changes and monitoring.

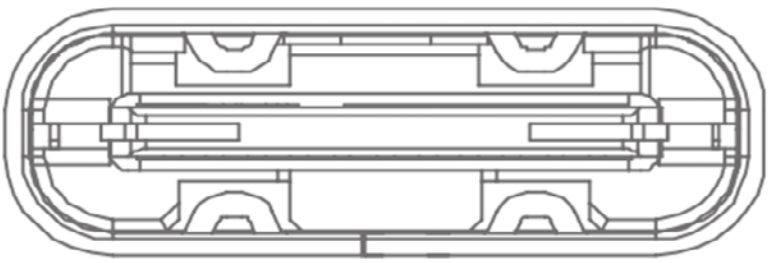


Figure 2.3.2.5-1 USB Interface

name	symbol	Connector pin No	content
USB Type-C	GND	A1, B12, A12, B1	The grounding wire has been connected to the control circuit
	VBUS	A4, B9, A9, B4	Used when communicating with a

	D-	A7, B7	computer
	D+	A6, B6	

*Please ensure that the TYPE-C cable used avoids situations such as communication interruptions. It is recommended to use a TYPE-C cable with a magnetic ring.

*Regarding USB compatibility issues with some computers, please check if the COM is functioning properly in the computer's Device Manager

*Drivers need to be installed for WIN7 system, while WIN10 system supports driver-free installation

3 Basic settings and trial operation

3.1 Debugging tools

3.1.1 Host computer debugging software communication

1. Preparation before communication

The Ω6s-D series servo debugging software, Ω Master, requires the Windows® operating system to run. No installation is necessary. After decompression, simply click on the corresponding .exe application to use it.

Note:

(1) The Ω Master debugging software can be obtained by contacting the corresponding sales or technical support personnel.

(2) The PC port is connected to the servo driver via a USB Type-C cable. It is recommended to use a USB cable with a shielding layer and a magnetic ring, otherwise it may be affected by electromagnetic interference in the on-site environment, leading to abnormal data acquisition and communication.

(3) The USB Type-C data cable is an optional accessory, available for purchase through the sales outlet. Model: 109.03.05010014-00, black data cable 1.5 with magnetic ring, USB3.0 A TO TYPE CL=1.5 BK

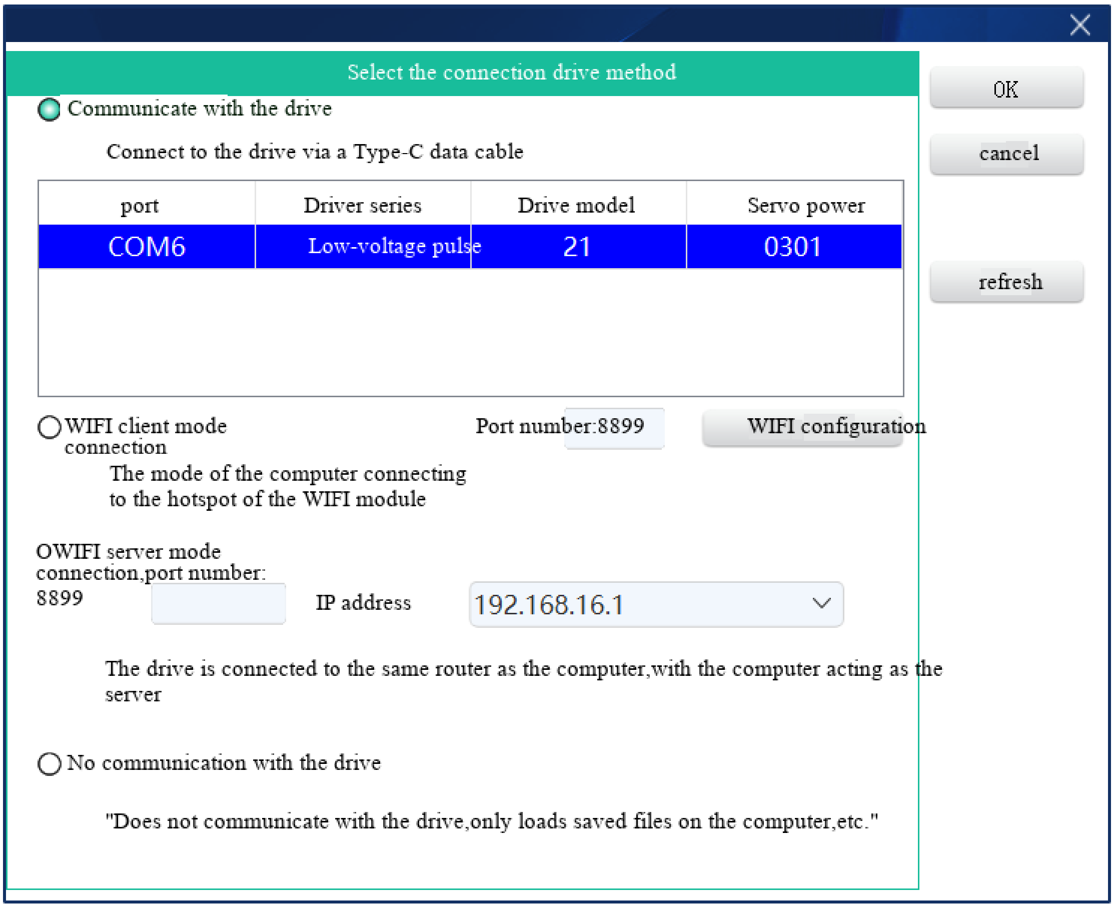
2. Establish communication

（1）. Double-click Master.exe;

(2) Click the "Connect" button , then click "Refresh" to update the USB COM port, and finally click "OK" to establish communication;

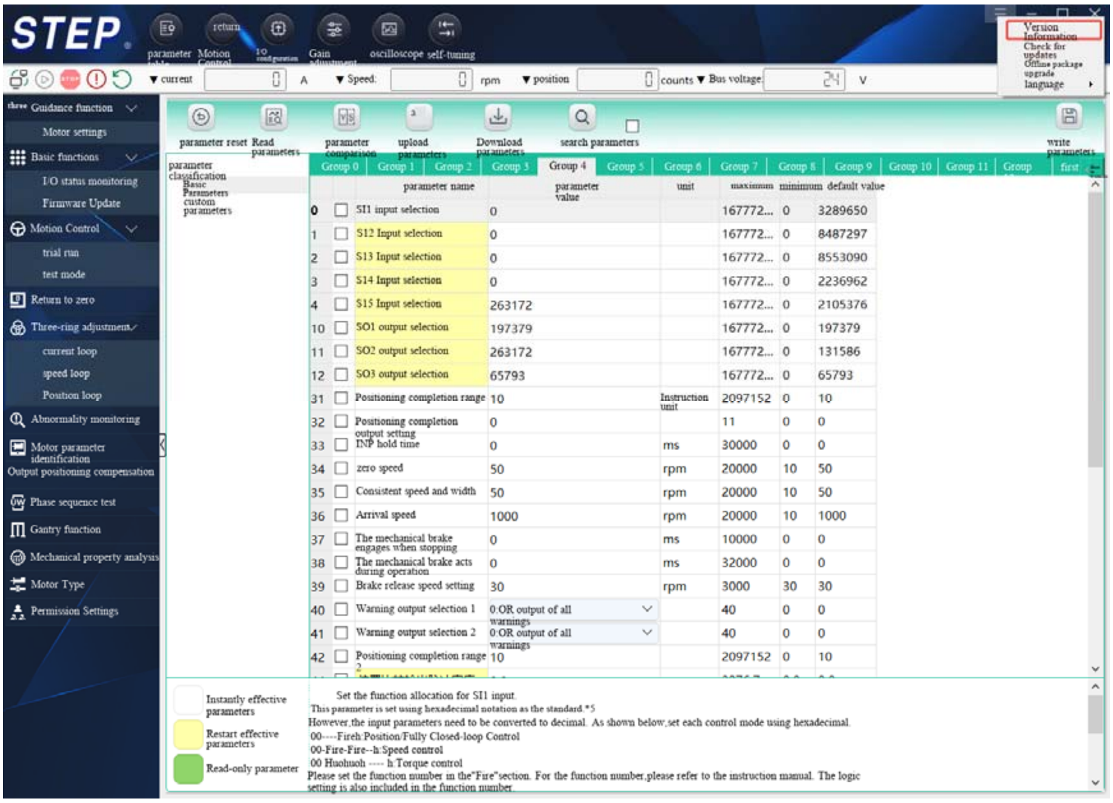
If the USB port fails to refresh at this time, it is necessary to confirm whether the USB driver is installed properly (manual installation is required for Windows 7);

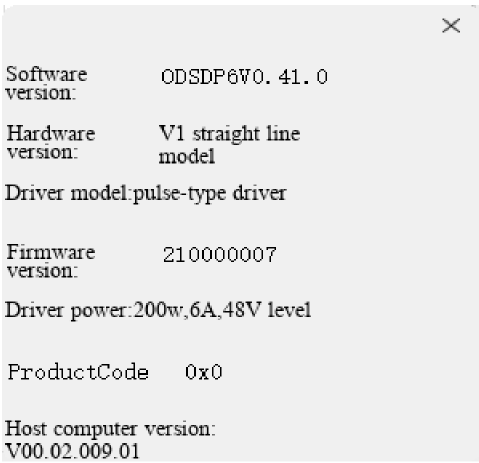
If the driver is already installed, it is recommended to reseat the USB cable or power off and restart the servo, and then try refreshing again;



3. Confirm the servo firmware version

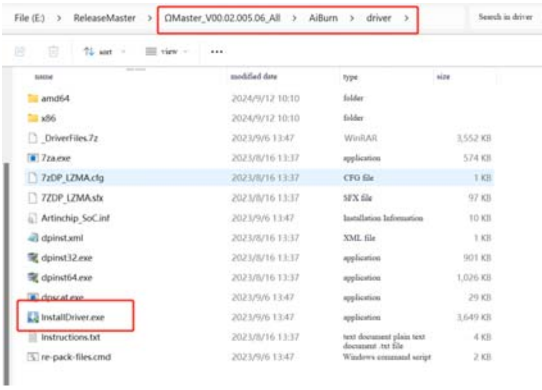
Click on the "Version Information" button on the right to view the current servo software version, firmware version, hardware version, host computer version, XML file version, and other information.
When a servo abnormal fault occurs, relevant information at this point needs to be provided to the servo technical support personnel.

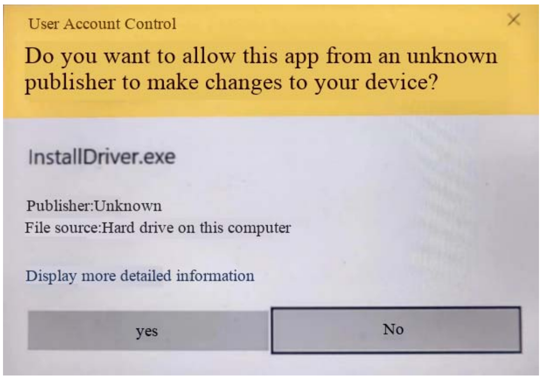


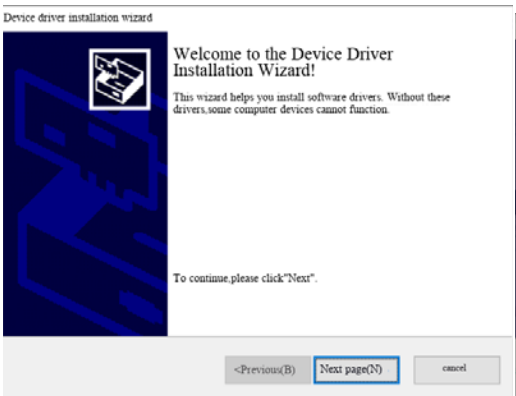


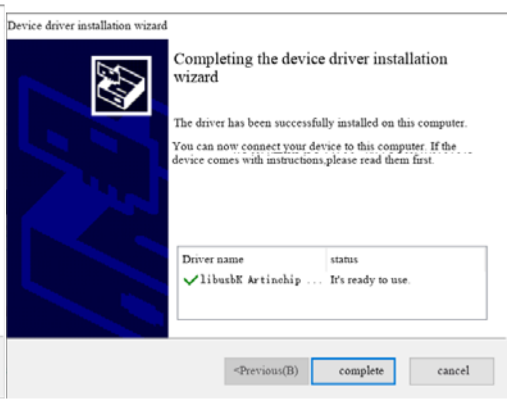
4. Firmware Upgrade

(1) In the unzipped file of the servo debugging software Ω Master, locate ΩMaster_V00.02.005.06_All The USB driver file "InstallDriver.exe" corresponding to \AiBurn\driver is used to install the USB driver;



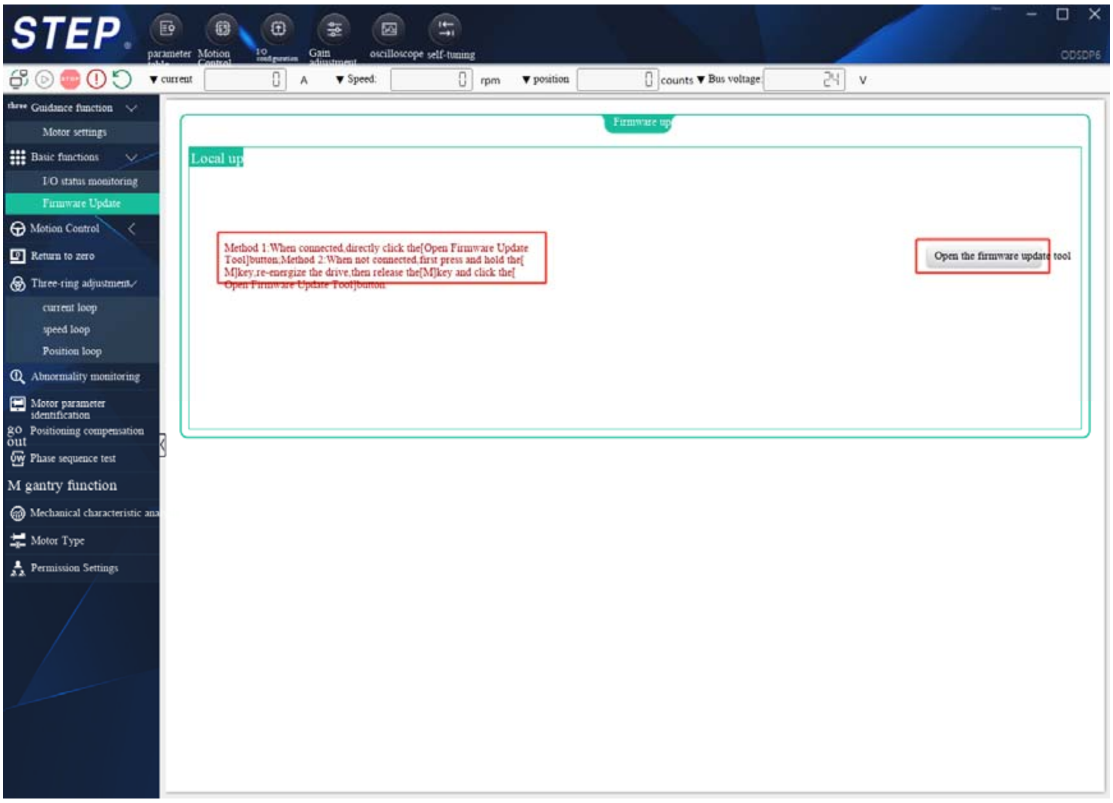


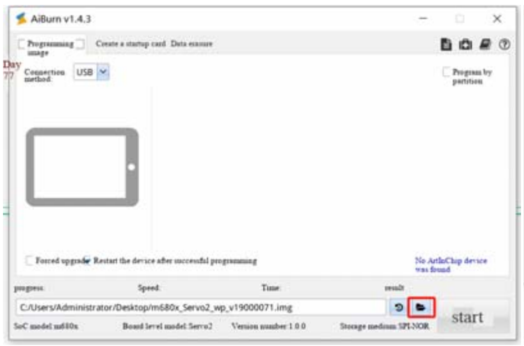


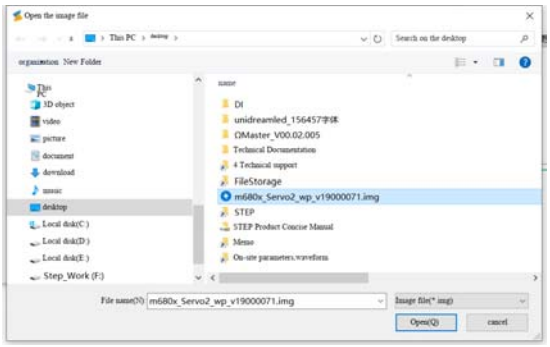


(2) Follow the operation prompts and instructions

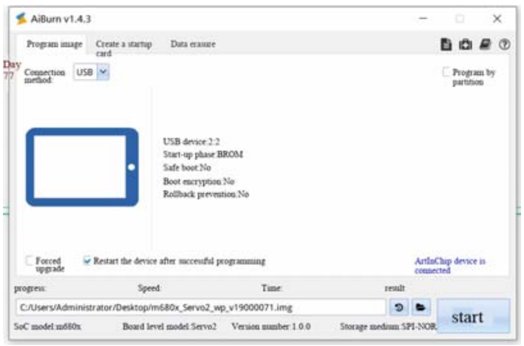
Click "Open Firmware Update Tool" to open the corresponding image file .img;

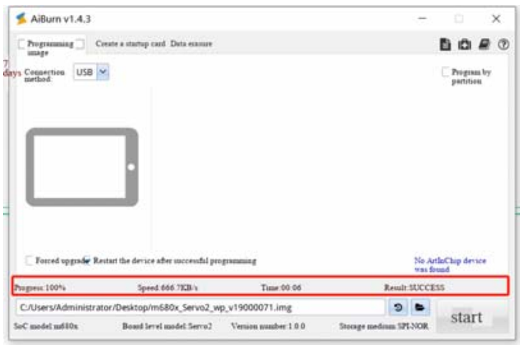






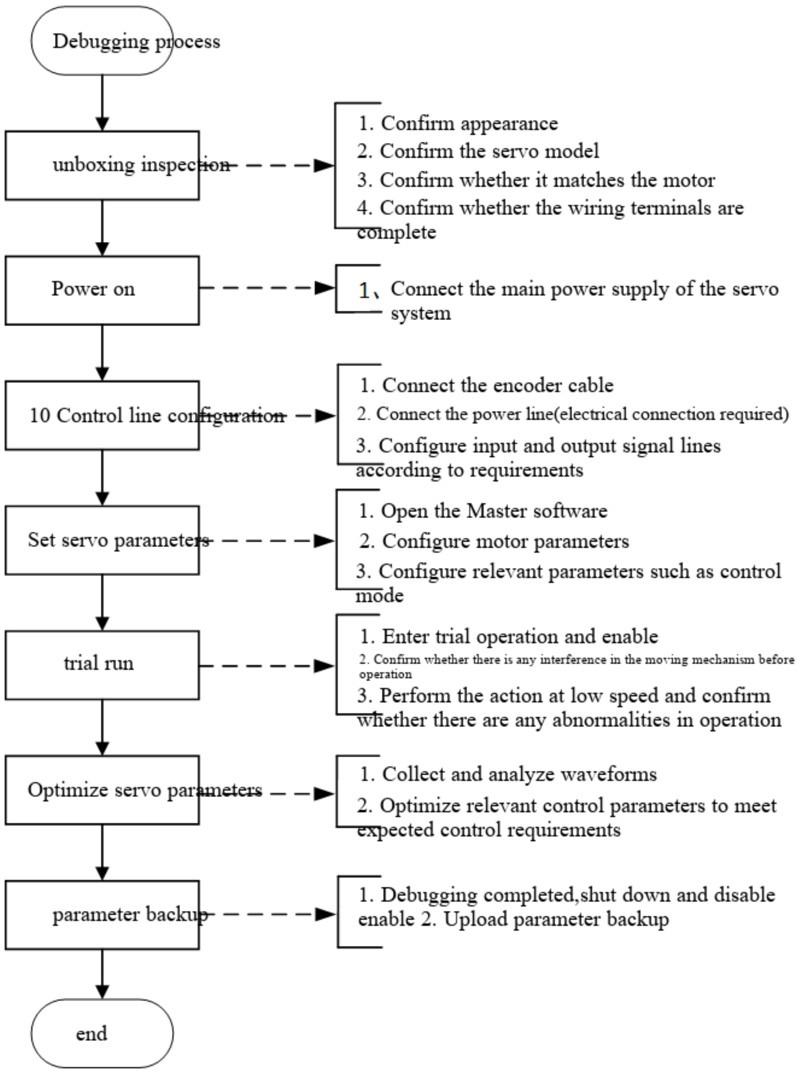
(2) Click "Start", and the servo will automatically restart after the programming is completed;





3.2 Trial operation

3.2.1 Debugging process



3.2.2 Inspection before trial operation

1. Confirm whether the main power supply, control power supply, and input voltage are within the required range of the product;

2. Confirm whether the motor power line is properly connected, the phase sequence is normal, and the motor resistance is within normal range;

3. Confirm whether the brake wiring is normal, and whether the brake can operate normally when switching the enable status between ON and OFF;

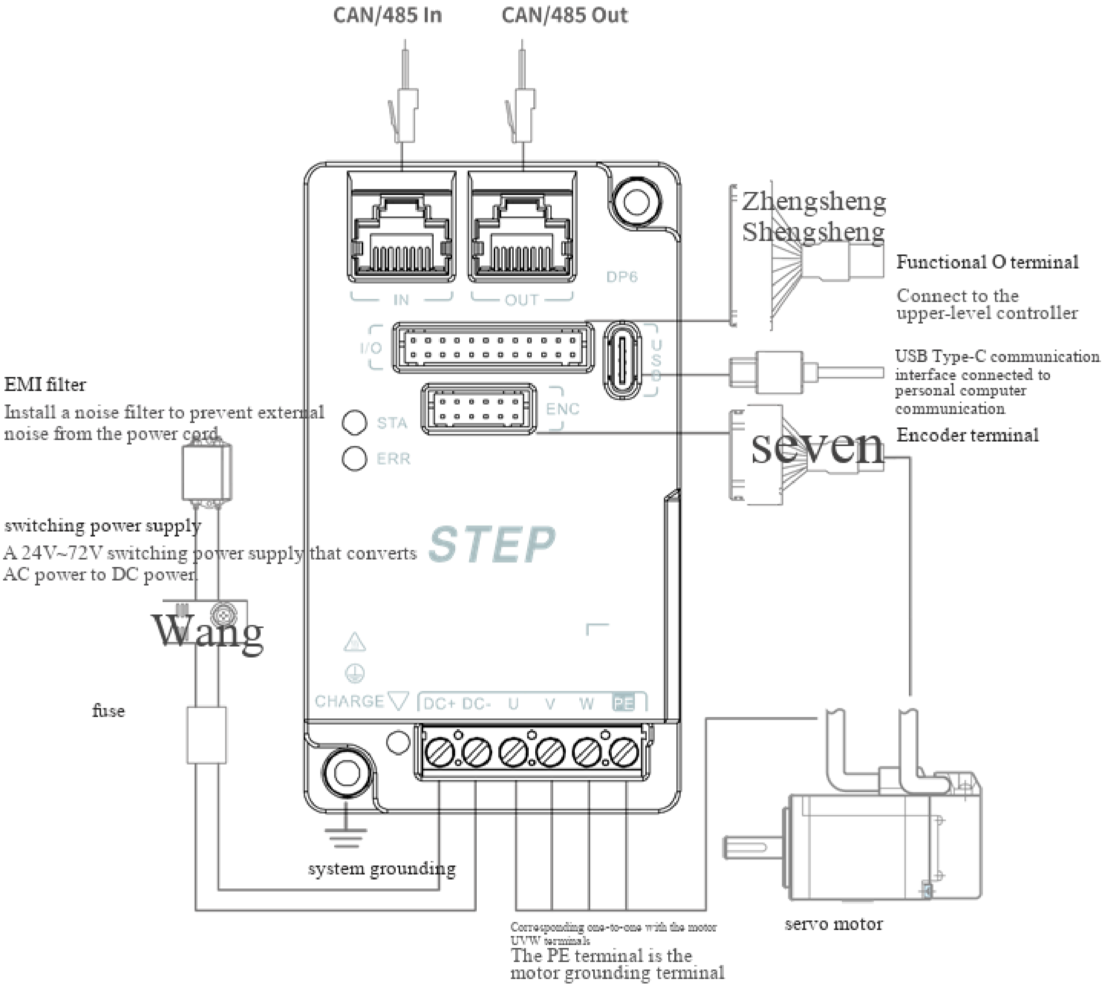
4. Confirm whether the encoder cable is properly connected and whether the encoder signal feedback is normal;

5. Confirm whether the motor parameter settings are correct, such as motor current, pole pairs, encoder type, resolution, etc;

6. Confirm whether the servo grounding system meets the requirements;

7. Confirm that the load mechanism is securely connected and free from abnormal interference;

8. Confirm that there are no other personnel in the surrounding area within the movable range of the load to prevent accidental injury accidents;



3.2.3 Setting parameters

1 Position control mode

In position mode, the servo will control the motor shaft to move a corresponding distance according to the received pulse commands, thus achieving position control of the load.

The following provides an explanation of the basic settings for position control.

(1) Command pulse input processing

The position command (pulse train) corresponds to the following three types of inputs.

A&B phase pulse

・CW/CCW

Pulse train + direction

According to the specifications of the upper-level controller and the servo settings, determine the pulse shape and pulse counting method.

● Associated parameters

Parameter No	parameter name	set the scope	function
Pr0.06	Command pulse rotation direction setting	0~1	Set the direction for counting the input of command pulses.
Pr0.07	Command pulse input mode setting	0~3	Set command pulse input mode

(2) Electronic gear function

The value obtained by multiplying the pulse command input from the upper controller by the preset frequency division ratio is given to the position loop as the position command for position control. Through this function, the motor rotation and movement amount per unit input command pulse can be arbitrarily set.

When the pulse output capability of the upper-level controller is insufficient, resulting in the motor failing to reach the desired speed, this function can be used to increase the pulse command frequency.

● Associated parameters

Parameter No	parameter name	set the scope	function
Pr0.08	Number of command pulses for one rotation	0 to 16777216	Set the number of command pulses per rotation of the motor.
Pr0.09	The first instruction is to divide the frequency of the molecule by a certain factor	0~1073741824	Set the molecule for frequency division processing corresponding to the input of command pulses.
Pr0.10	Instruction frequency division denominator	1~1073741824	Set the denominator for the frequency division processing corresponding to the input of the command pulse.

(3) Position command filter function

Increasing the value of the command filter can make the position command after frequency division (electronic gear) smoother.

● Associated parameters

Parameter No	parameter name	set the scope	unit	Functionality
Pr2.22	Command	0 to 1000	ms	Set the time constant of the first-order delay filter

	smoothing filter			corresponding to the position command.
Pr2.23	Command FIR filter	0 to 1000	ms	Set the time constant of the FIR filter corresponding to the position instruction.

(4) Pulse output function

The movement amount of the servo axis can be transmitted from the servo driver to the upper controller using AB-phase pulse mode.

Z believes that the signal is output once for every revolution of the motor.

The output resolution and B-phase logic parameters can be set.

● Associated parameters

Parameter No	parameter name	set the scope	unit	function
Pr0.11	Number of output pulses per revolution	1~2097152	P/r	The pulse output resolution is set based on the number of pulses output per rotation of each of OA and OB.
Pr0.12	Pulse output logic inversion/output source selection	0~3	—	Set the B-phase logic and output source for pulse output. Based on this parameter, the phase relationship between the A-phase pulse and the B-phase pulse can be reversed by inverting the B-phase pulse.
Pr5.03	Pulse output frequency division denominator	0 to 16777216	—	When the number of output pulses per rotation is not an integer, please set it to a value other than 0, and use Pr0.11 as the frequency division numerator and Pr5.03 as the frequency division denominator to set the frequency division ratio.
Pr5.33	Effective setting of pulse regeneration output limit	0~1	—	Set the validity/invalidity of error detection (Err28.0 "Pulse Regeneration Output Limit Protection").

(5) Deviation counter reset function

This function clears the value of the position deviation counter in position control by resetting the input (CL) through the deviation counter.

● Associated parameters

Parameter No	parameter name	set the scope	function
Pr5.17	Counter reset input mode	0 to 4	Set the condition for clearing the deviation counter reset input signal.

(6) Positioning completion output (INP) function

The output (INP) is completed through positioning, confirming the positioning completion status. Under position control, when the absolute value of the position deviation count is below the positioning completion range set by parameters, it becomes ON. In addition, the presence or absence of a position command can be added to the determination conditions.

● Associated parameters

Parameter No	parameter name	set the scope	unit	Functionality
Pr4.31	Positioning completion range	0~2097152	Command unit	Set the time for outputting the position deviation of the positioning completion signal (INP1).
Pr4.32	Positioning completion output setting	0 to 10	—	Select the output condition for the positioning completion signal (INP1).
Pr4.33	INP hold time	0 to 30000	1ms	Set the holding time when Pr4.32 "Positioning completion output setting" is set to 3.
Pr4.42	Positioning completion range 2	0~2097152	Instruction unit	Set the dynamics of the positional deviation of the output positioning completion signal 2 (INP2).

(7) Instruction pulse inhibit (INH) function

The command pulse inhibit input signal (INH) enables the command pulse counter to handle forced stops.

When the INH input is ON, the servo driver disregards the command pulse input and does not perform pulse counting.

This function is disabled in the factory default state. When using it, please change the setting of Pr5.18 "Command pulse inhibit input disabled".

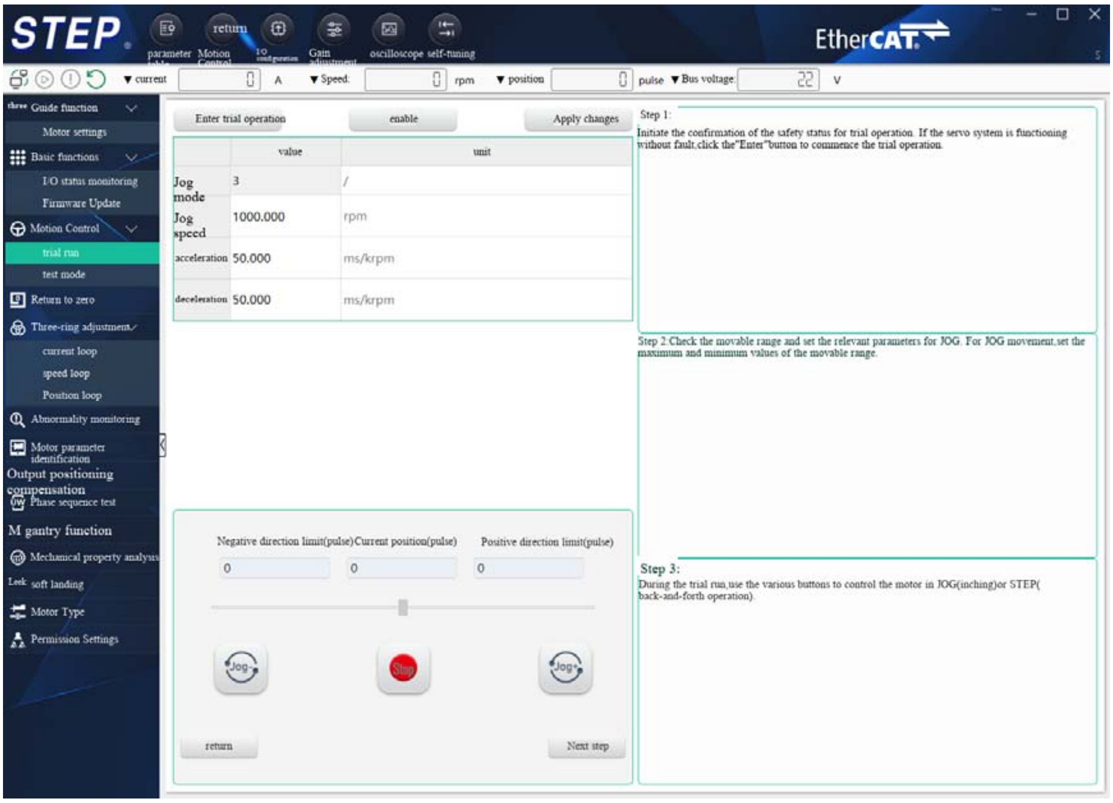
● Associated parameters

Parameter No	parameter name	set the scope	function
Pr5.18	Invalid setting of command pulse inhibit input	0~1	Set the validity/invalidity of command pulse input prohibition.
Pr5.19	Command pulse input and read prohibition setting	0 to 5	Select the signal read cycle where command pulse input is prohibited. When the signal state matches the number of times set for the read cycle, update the signal state.

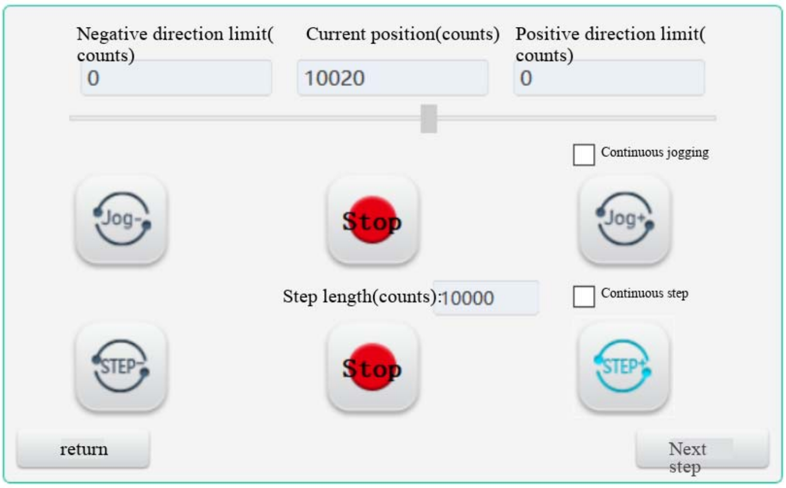
3.2.4 Servo system test run

Conduct a trial run through the upper computer debugging software Ω Master

3.2.4.1 Trial operation



(1) Set the JOG mode to 3, then set the speed, acceleration, and deceleration, and click "Apply Changes";
(2) Click "Enable", then click "JOG+", "JOG-", to jog the axis for forward and reverse rotation;
(3) To move a fixed step distance, click "Next", set the step distance, and then click "STEP+" or "STEP-" as appropriate;

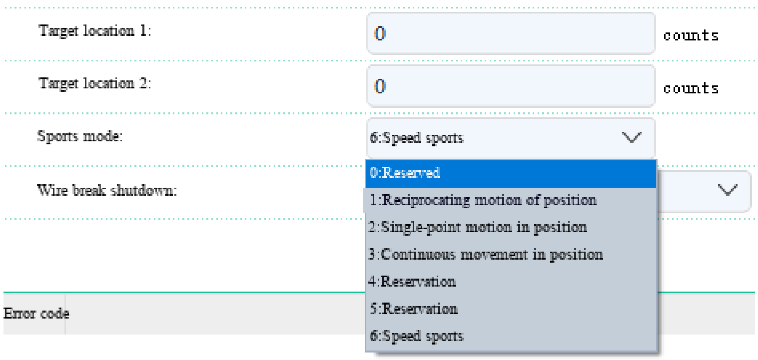


3.2.4.2 Test mode

Test mode:

In the test mode interface, functions such as encoder position angle self-learning, fault reset, motion mode switching, and point-to-point trial operation can be completed;

(1) Set motion mode: 1 (position reciprocating operation);



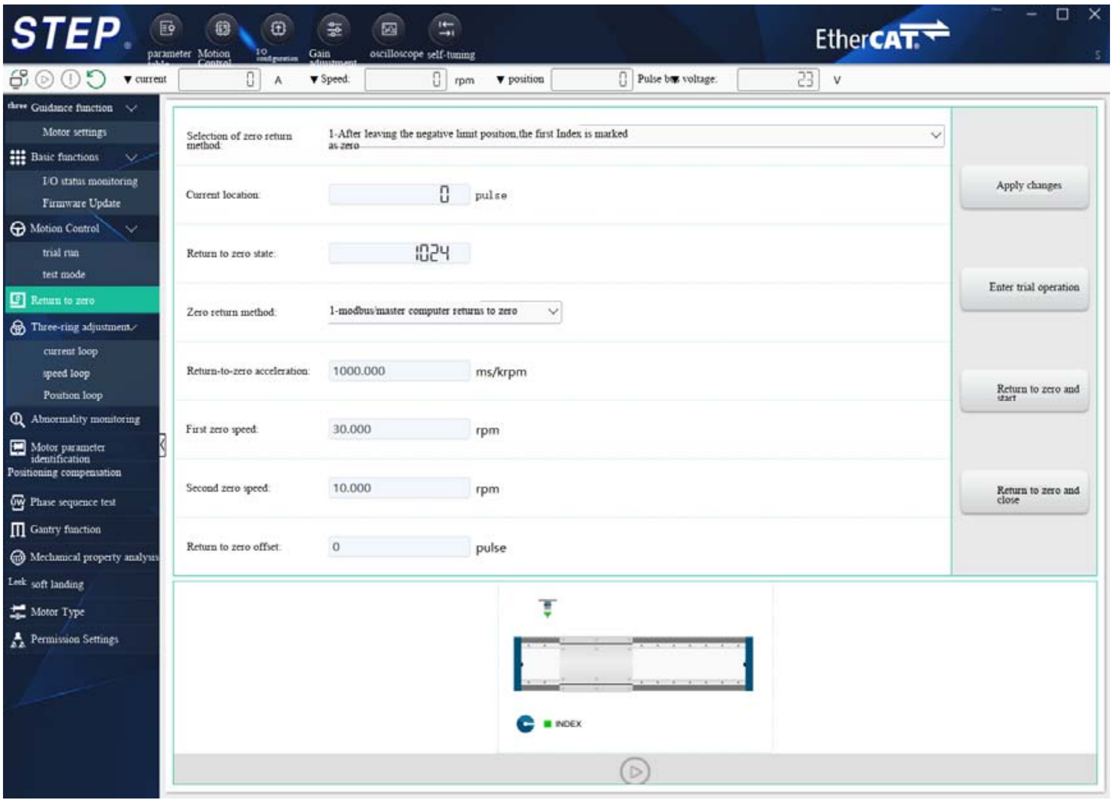
(2) Set the speed, acceleration, deceleration, and set two target points for relative displacement, then click "Apply Changes";

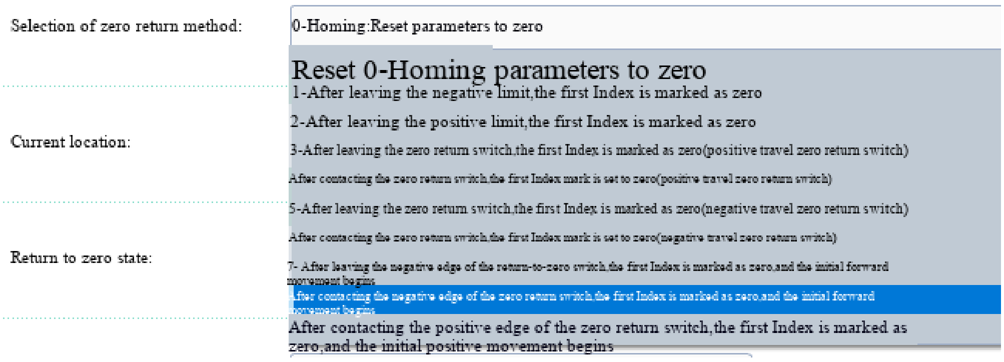
(3) Click "Enter Trial Run", then click "Enable", and finally click "Run" to perform reciprocating motion between two points;

3.2.4.3 Return to zero

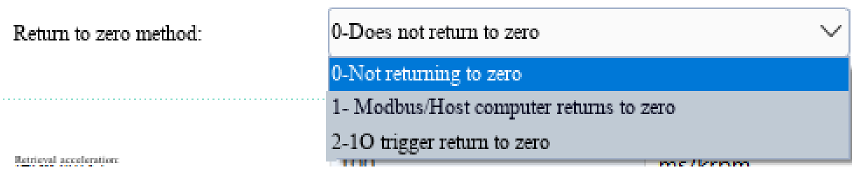
On the homing interface, you can set the homing mode and utilize the servo's internal homing function to conduct an axis homing test;

(1) Set homing method selection: (Choose a suitable homing method based on the characteristics of the equipment);





(2) Set the zero return mode to: 1 or 2;



(3) Set the zero return acceleration, the first zero return speed, the second zero return speed, etc;

(4) Click "Apply Changes", then click "Zero Return Start", and wait for the zero return to complete;

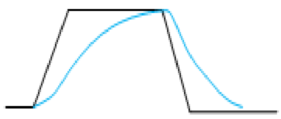
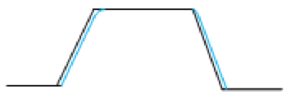
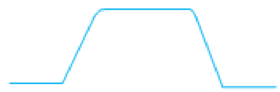
4 Adjustments

4.1 Overview

Adjustment refers to the function of optimizing responsiveness by adjusting the servo gain of the servo unit.For instructions issued from the controller, the driver needs to ensure that the motor operates accurately and without delay according to the instructions.In order to make the motor action closer to the command and maximize the performance of the machinery, gain adjustment is necessary.

The servo gain is set through a combination of multiple parameters (position loop gain, velocity loop gain, velocity loop integration time constant, filter, velocity feedforward, load inertia ratio, etc.), which will affect each other. Therefore, the balance between the set values of each parameter must be considered when setting.The factory setting for servo gain is a stable setting.Please use various adjustment functions based on the user's mechanical condition to further improve responsiveness.

Adjustment example:

Gain setting: low	Gain setting: high	Gain setting: high+feedforward setting
		
Position loop gain: 20.0	Position loop gain: 100.0	Position loop gain: 100.0
Speed loop gain: 100.0	Speed loop gain: 50.0	Speed loop gain: 50.0
Speed loop integral time constant: 50.0	Speed loop integral time constant: 50.0	Speed loop integral time constant: 50.0
Speed feedforward: 0	Speed feedforward: 0	Speed feedforward: 100
Inertia ratio: 250	Inertia ratio: 250	Inertia ratio: 250

Adjustment function:

function		Instructions	Refer to chapter
Automatic gain adjustment	One click self-tuning	An offline gain adjustment function that automatically adjusts the gain parameters of the servo after setting the curve trajectory and response requirements parameters through a wizard.	7.2
	inertia	Divided into offline identification and online identification, it can	7.2

	identification	identify the load inertia ratio	
	Motor parameter identification	Can identify the resistance and inductance parameters of the motor	7.2
	Real time gain tuning	An online gain adjustment function that can identify the inertia ratio and friction force in real time, automatically configure the notch filter, and manually adjust the rigidity to automatically adjust the gain parameters.	7.2
	Adaptive notch filter	In the actual operating state, the resonance frequency is inferred based on the vibration component in the motor speed, and the parameters of the notch filter that removes the resonance component are automatically set to reduce the vibration at the resonance point.	7.2
Manual gain adjustment	Position instruction filtering	Can smooth position instructions	7.3
	Servo gain adjustment	Can achieve optimal servo performance	7.3
	Feedforward function	When controlling the position, the speed control command required for the action is calculated from the internal position command, and the speed command calculated by comparing it with the position feedback is added to obtain the speed feedforward. Compared with feedback control, it can better reduce position deviation and improve responsiveness.	7.3
	Gain switching	By using internal data or switching gain through external signals, it is possible to achieve effects such as reducing vibration during stopping, shortening setting time, and improving command responsiveness.	7.3
	3rd gain switching	Increasing the gain during the stopping process within a certain period of time can shorten the positioning and setting time	7.3
	Two degree of freedom control	Can improve location responsiveness	7.3
	Pseudo differential feedforward control	Pseudo differential feedforward control enhances the anti-interference ability of the speed loop and improves its ability to follow speed commands by adjusting the speed loop control method.	7.3
	Pseudo differential feedback control	Can enhance anti-interference ability and reduce overshoot	7.3
	friction	Three types of torque compensation: offset torque compensation and	7.3

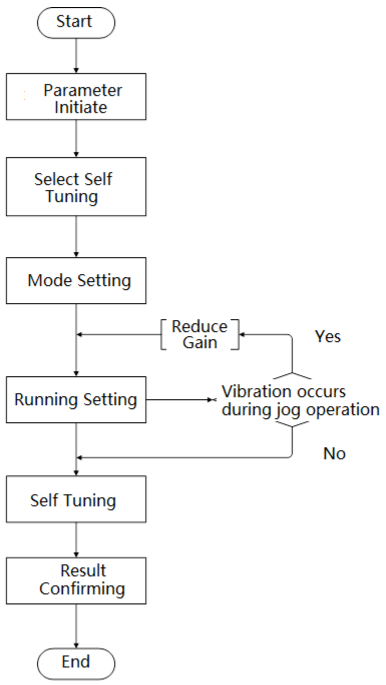
	compensation	offset load compensation that maintain a fixed action, dynamic friction compensation that changes direction according to the action direction, and viscous friction compensation that changes according to the command speed	
	Torque observation	In non torque control mode, disturbance observation function can be used	7.3
	Suppression of over quadrant protrusions	Can eliminate quadrant patterns	7.3
vibration suppression	Mechanical resonance suppression	By using notch filters to suppress resonance points, higher gains or reduced vibrations can be set	7.4
	End vibration suppression	In response to the vibration at the end of the device and the overall shaking of the device, it is necessary to eliminate the vibration frequency components from the position command in order to achieve the function of reducing vibration.This product provides 4 damping filters that can simultaneously suppress 4 frequency points.	7.4
Mechanical characteristic analysis		By scanning the frequency of the machine and drawing a Bode plot, the inherent characteristics of the machine can be obtained	7.5

When in a vibration state (abnormal noise or vibration), please quickly cut off the power or turn off the servo enable, and pay attention to safety.

4.2 Automatic gain adjustment

4.2.1 One click self-tuning

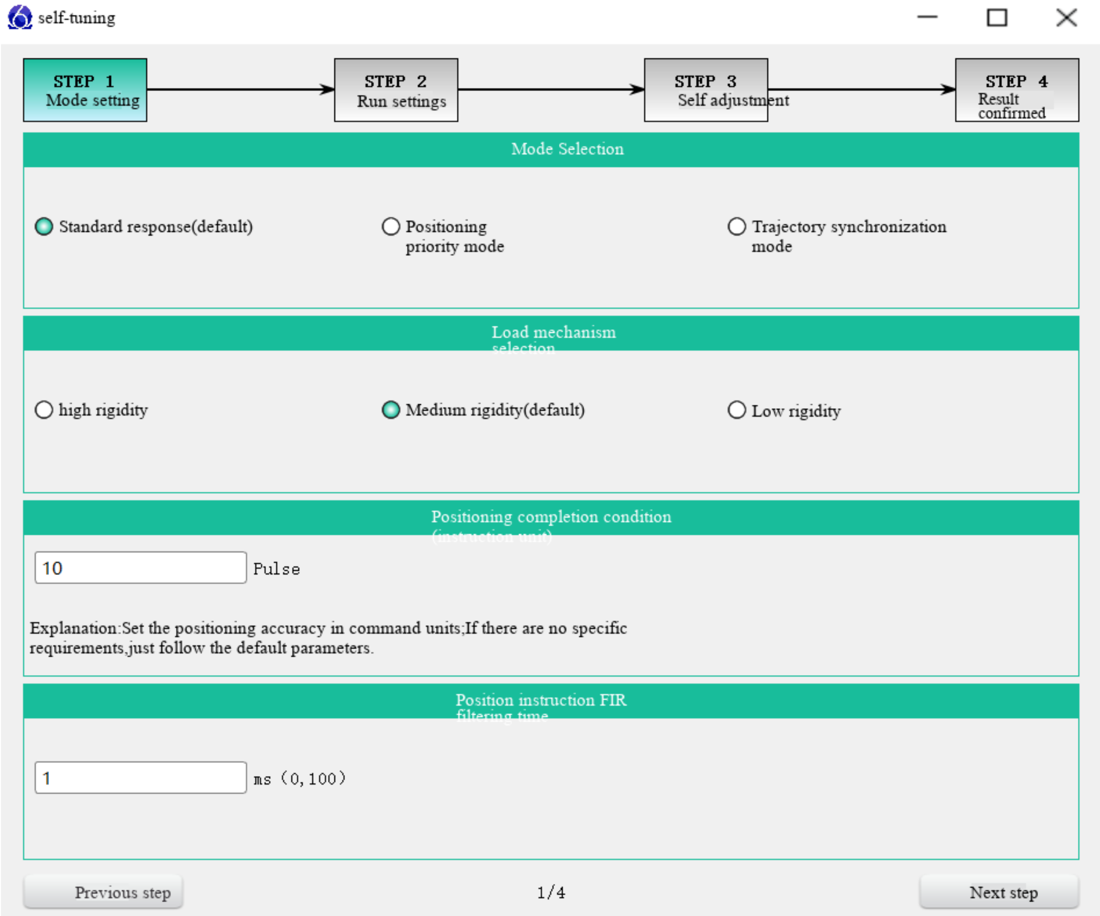
The self-tuning function is an offline gain adjustment function. After setting the curve trajectory and response requirements parameters through a wizard, the servo will automatically adjust the gain parameters. The one click self-tuning adjustment parameter flowchart is shown below.



Operation steps:

By clicking the 'self-tuning' button on the upper computer, you can enter the self-tuning operation interface, as shown in the following figure. The self-tuning function is divided into the following four steps:

STEP1 mode setting



There are three modes to choose from, namely standard response, positioning priority mode, and trajectory synchronization mode. The default mode is standard response mode.

- Standard response mode: suitable for the vast majority of application scenarios.
- Positioning priority mode: suitable for applications with fast positioning.
- Trajectory synchronization mode: suitable for applications with high trajectory tracking requirements.

2. There are three types of load mechanisms to choose from, namely high rigidity, medium rigidity, and low rigidity, with the default being medium rigidity.

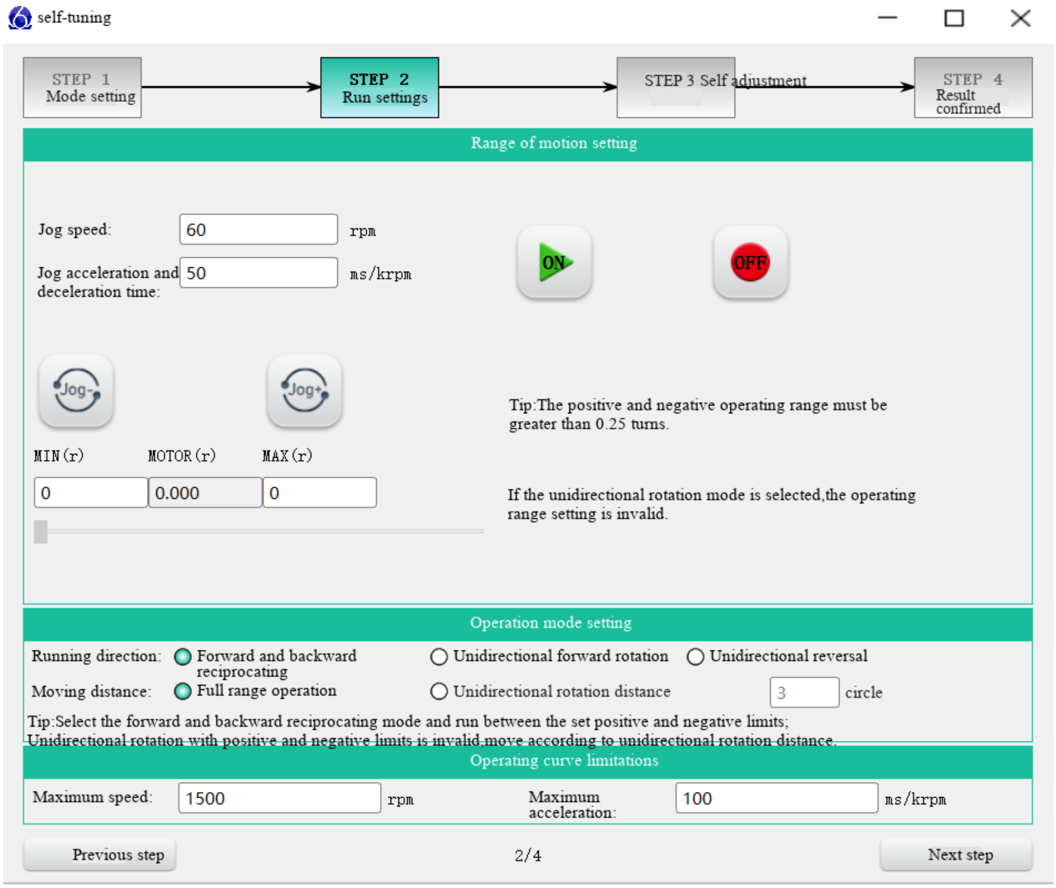
- High rigidity: After the tuning is completed, the system has high response performance.
- Medium rigidity: After the tuning is completed, the system response performance is at a moderate level.
- Low rigidity: After the tuning is completed, the system response performance is relatively low.

3. Positioning completion condition: When the error between the actual position and the instruction position stabilizes at the set value of instruction units, the positioning is considered complete, with a default of 10 instruction units.

4. Position instruction FIR filtering time: Position instruction FIR filtering time constant, unit: ms, value range: 1-100ms, default is 1ms.

After setting the above options and parameters, click "Next" to enter the STEP 2 operation setting interface.

STEP2 mode setting



1. Set the motion range, mainly including the Jog speed, Jog acceleration and deceleration time, and motion range.

- Jog speed: The maximum speed at which the motor operates in Jog mode, measured in r/min. The default Jog speed is 60r/min.
- Jog acceleration and deceleration time: In Jog mode, the acceleration and deceleration time is measured in ms/(1000r/min), and the default Jog acceleration and deceleration time is 50 ms/(1000r/min).

After setting the Jog speed and Jog acceleration/deceleration time parameters, click the "ON" button to enter Jog mode, and set the operating range through the "Jog -" and "Jog+" buttons.After setting the operating range, click the "OFF" button to exit Jog mode.

[Note 1]: If the unidirectional rotation mode is selected, the operating range setting is invalid.

[Note 2]:The positive and negative operating range must be greater than 0.25 turns

2. Set the running direction, default to forward and backward reciprocating mode.

- Forward and backward reciprocating: The motor will reciprocate within the set positive and negative operating range.
- Unidirectional forward rotation: When rotating in a unidirectional direction, the positive and negative operating ranges are invalid, and it will rotate forward according to the set unidirectional

rotation distance.

- Unidirectional reversal: When reversing in one direction, the positive and negative operating ranges are invalid, and the rotation will be reversed according to the set one-way rotation distance.

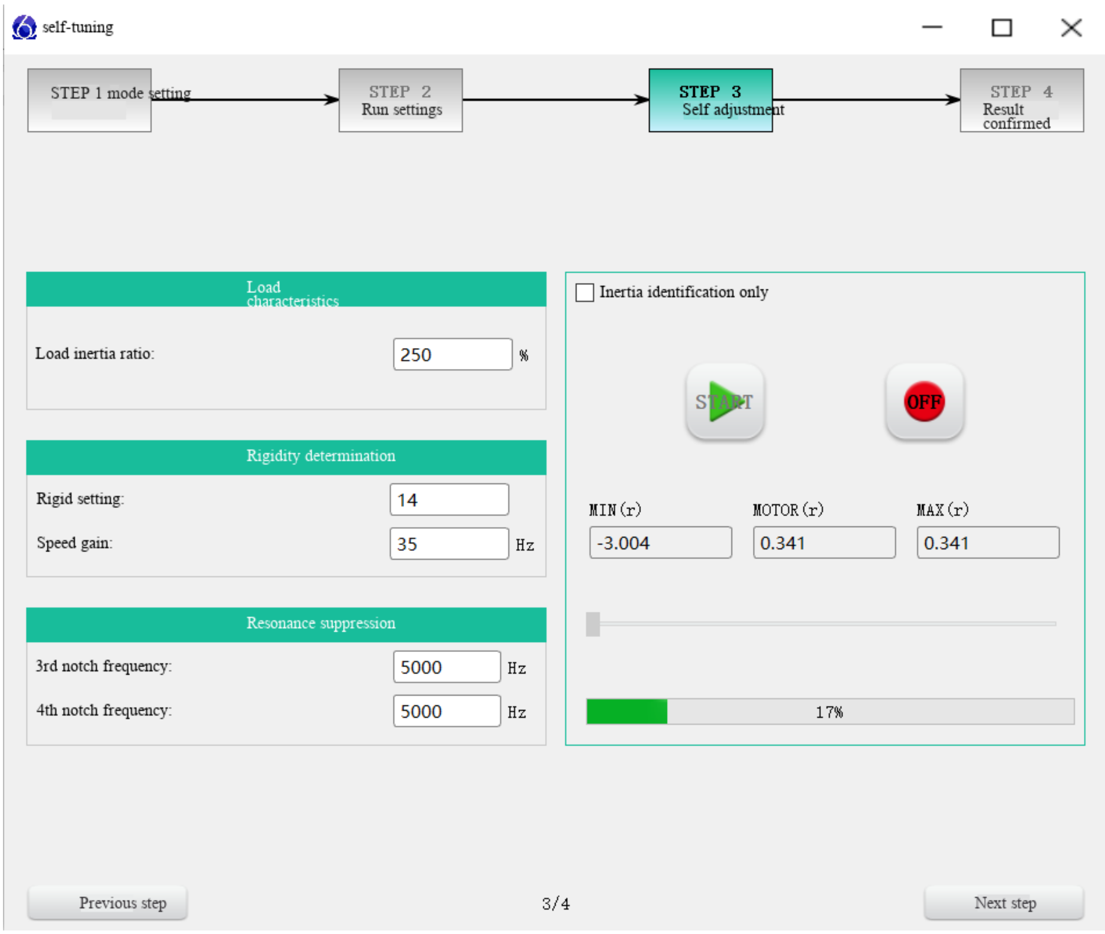
3. Set the movement distance, default to full range operation.

- Full range operation: Only when in forward and reverse reciprocating mode, full range operation is effective, and the motor will reciprocate within the positive and negative operating ranges.
- Unidirectional rotation distance: The unidirectional rotation distance is only effective when in unidirectional forward/reverse mode, and the motor will rotate forward/backward according to the set unidirectional rotation distance.

4. Set operating curve limits.

- Maximum speed: The maximum operating speed within the set range of motion, measured in r/min, with a default maximum speed of 1500r/min.
- Maximum acceleration: Within the set range of motion, the maximum acceleration is measured in ms/(1000r/min), with a default maximum acceleration of 100 ms/(1000r/min).
- After setting the above options and parameters, click "Next" to enter the STEP 3 self-adjusting interface

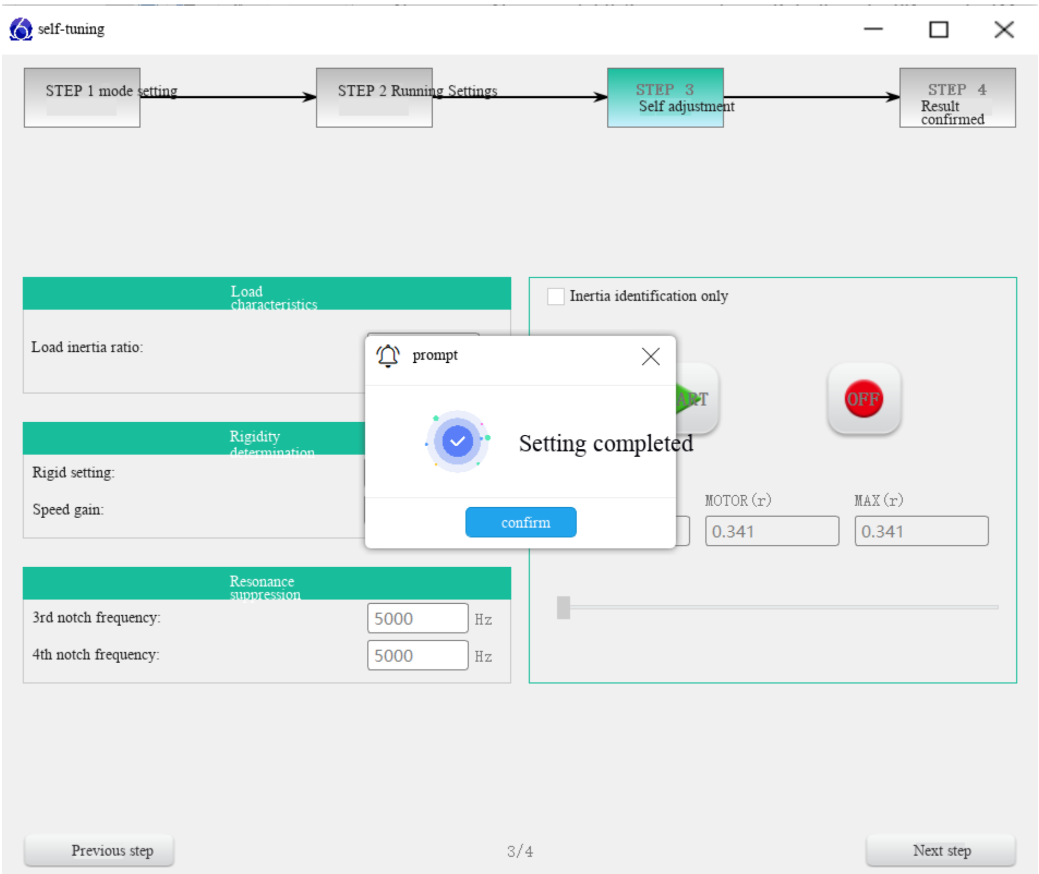
STEP3 self-adjusting



1. Click the "START" button in the interface to enable the self-tuning function, and the progress bar below

will display the self-tuning process.If only the inertia needs to be identified, the "inertia identification only" option can be checked.The left interface will display the identification results of load inertia ratio, setting rigidity and speed loop gain, and adaptive notch configuration results. When the third and fourth notch frequencies are both 5000Hz, it indicates that no resonance point has been detected in the system.

After the self-tuning is completed, a prompt box will pop up saying "self-tuning completed".Once the tuning is completed, the servo enable will automatically turn off and save the tuning parameters.



3. Click the "OK" button and then click the "Next" button to enter the STEP 4 result confirmation interface.

STEP 4 Result Determination

1. This interface will display the values of relevant parameters before and after tuning.

	parameter number	parameter name	Before the change	after the change	unit
1	Pr0.03	Real time automatic adjustment of rigidity settings	12	18	
2	Pr0.04	Inertia ratio	252	251	%
3	Pr1.00	Position 1 loop gain	39	120	1/s
4	Pr1.01	1st speed proportional gain	22	75	Hz
5	Pr1.02	The first speed integration time constant	25	10.6	ms
6	Pr1.04	The first torque filter	1.03	0.3	ms
7	Pr1.05	2nd position loop gain	39	120	1/s
8	Pr1.06	Second speed proportional gain	22	75	Hz
9	Pr1.07	Second speed integration time constant	25	10.6	ms
10	Pr1.09	Second torque filter	1.03	0.3	ms
11	Pr2.22	Instruction smoothing filter	11.3	3.1	ms
12	Pr6.48	Adjust the filter	1.3	0.4	ms

One click self-tuning update parameters:

parameter	Name of parameter
Pr0.03	Real time automatic adjustment of rigidity settings
Pr0.04	Inertia ratio
Pr1.00	Position 1 loop gain
Pr1.01	1st speed proportional gain
Pr1.02	The first speed integration time constant
Pr1.04	The first torque filter
Pr1.05	2nd position loop gain
Pr1.06	Second speed proportional gain
Pr1.07	Second speed integration time constant
Pr1.09	Second torque filter
Pr2.07	3rd notch frequency
Pr2.08	Third notch width
Pr2.09	Depth of the third notch
Pr2.10	4th notch frequency
Pr2.11	4th notch width
Pr2.12	4th notch depth
Pr2.22	Instruction smoothing filter
Pr6.48	Adjust the filter

4.2.2 Inertia identification

As an important parameter of the servo system, the accuracy of the moment of inertia seriously affects the performance of the speed loop, which in turn affects the overall performance of the servo system.In general, the inertia of the motor shaft is known, and only the load inertia needs to be identified. The load inertia ratio is defined as follows:

$$Load\ inertia\ ratio = \frac{Load\ inertia}{Motor\ shaft\ inertia}$$

If the load inertia ratio is known, it can be manually set;In most cases, the load inertia ratio is unknown and needs to be identified. Identification methods include offline inertia identification and online inertia identification.

4.2.2.1 Offline inertia identification

Offline inertia identification refers to the trajectory generated by a pre-set trajectory generator within the servo system, which can set speed and acceleration limits according to user needs.

Applicable conditions:

(1) The motor can run for more than 0.2r;

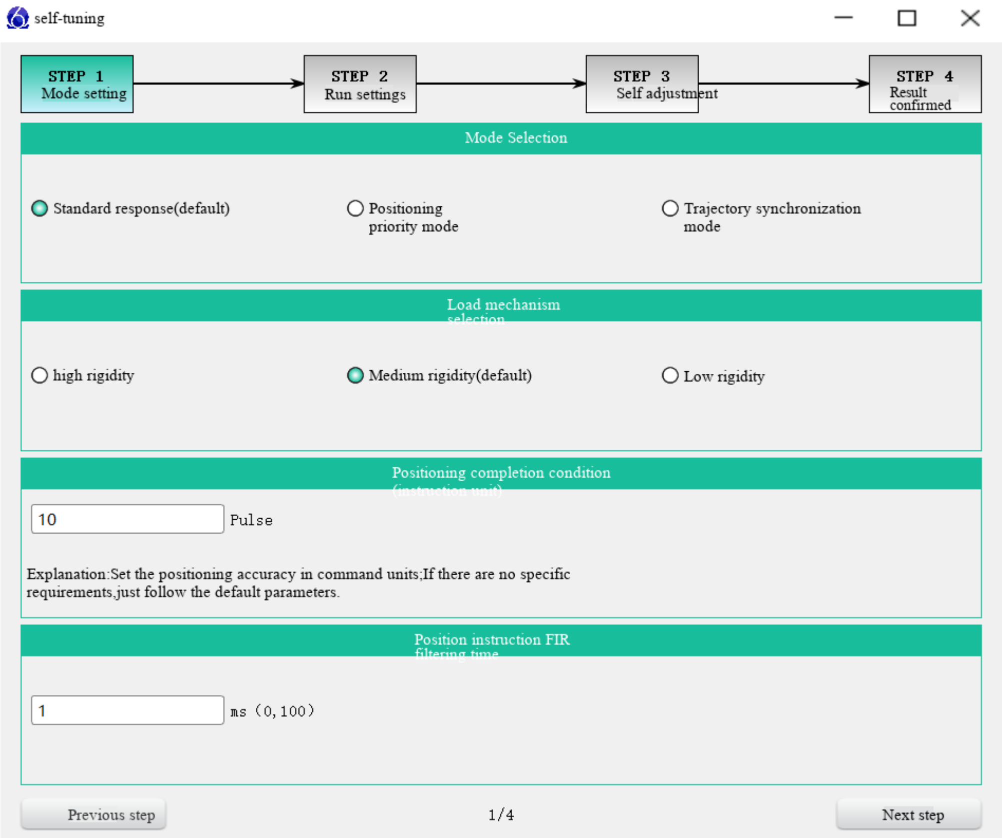
(2) Friction torque or load torque exceeding acceleration torque may result in significant inertia identification errors;

Operation steps:

By clicking the 'self-tuning' button on the upper computer, you can enter the self-tuning operation interface, as shown in the following figure. The self-tuning function is divided into the following

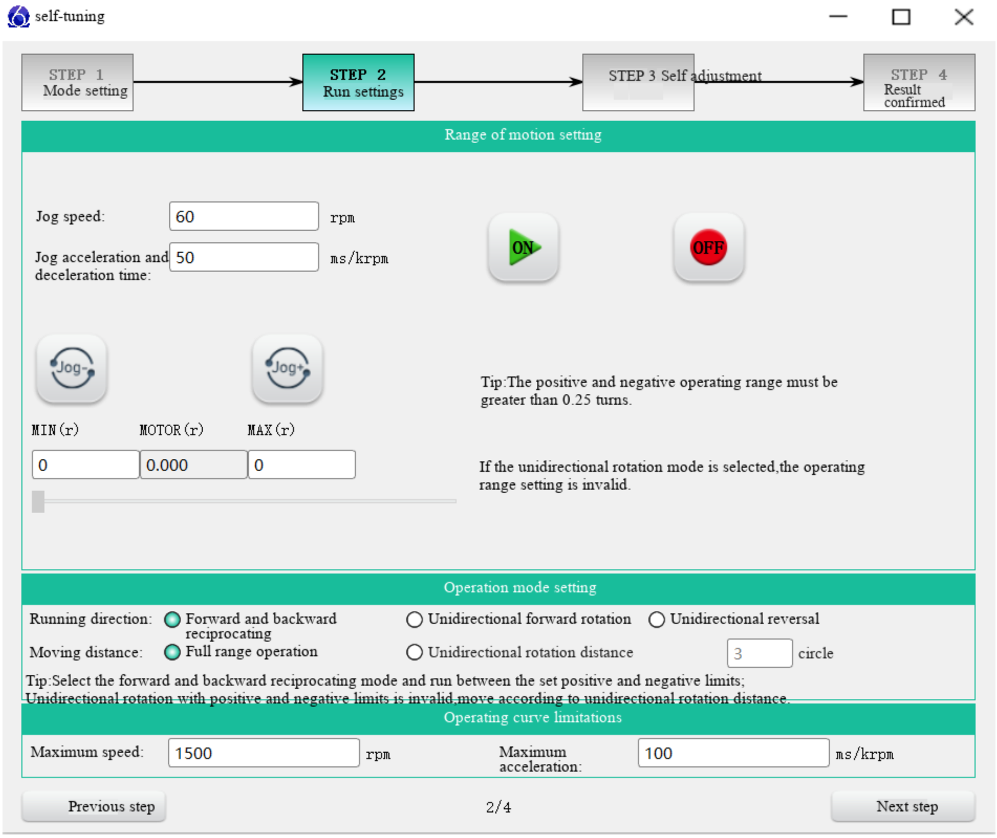
Four steps:

STEP1 mode setting



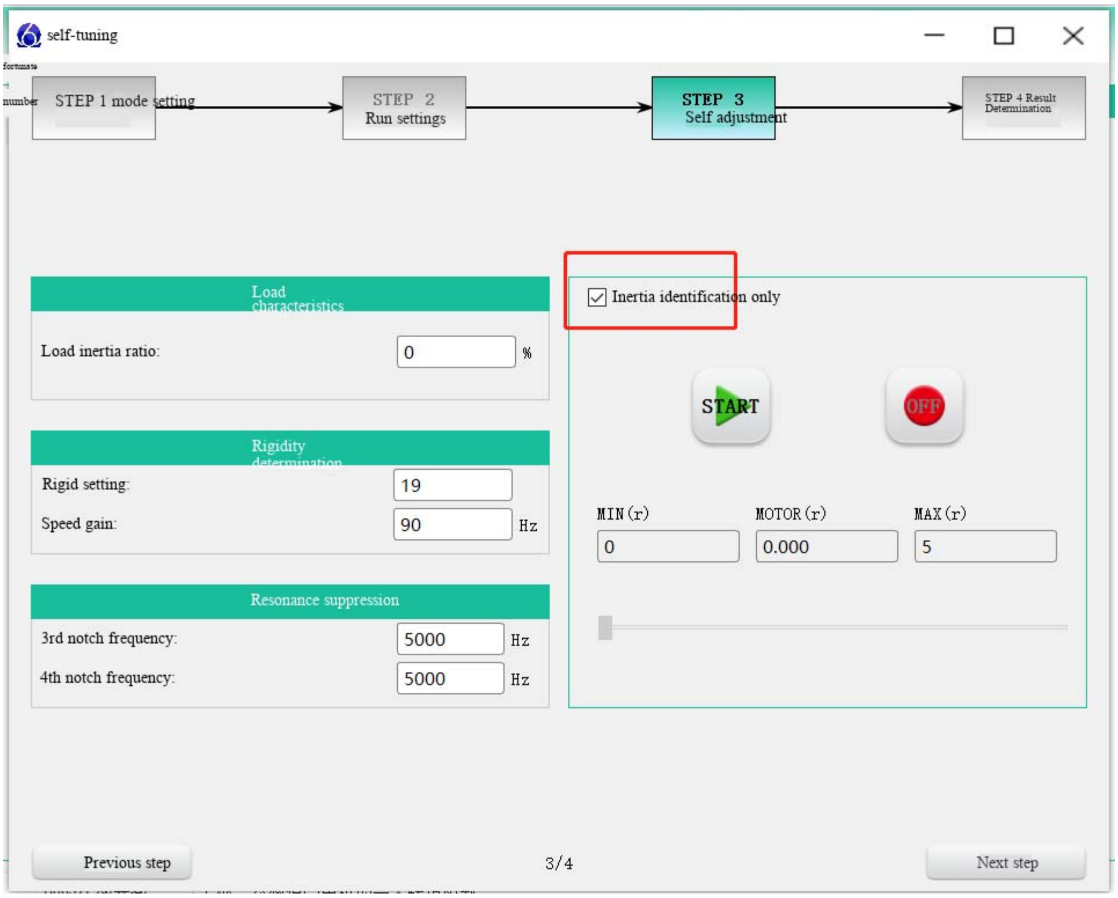
Detailed explanation is the same as the one click self-tuning chapter in 4.2.

STEP2 mode setting



Detailed explanation is the same as the one click self-tuning chapter in 4.2.

STEP3 self-adjusting



Select 'Inertia Identification Only' as shown in the diagram, and the motor START button will start inertia identification.The inertia identification result will be displayed on the left side after the inertia identification is completed.

4.2.2.2 Online Inertia Identification

Online inertia identification refers to the process where the operating trajectory is arbitrarily set by the user without prior knowledge of the trajectory. It can be controlled by a controller or by generating position commands internally within the servo system, and the load inertia ratio is updated in real-time according to a certain update strategy.

Applicable conditions:

(1) Operating speed greater than 250rpm;

(2) Friction torque or load torque exceeding acceleration torque may result in significant inertia identification errors;

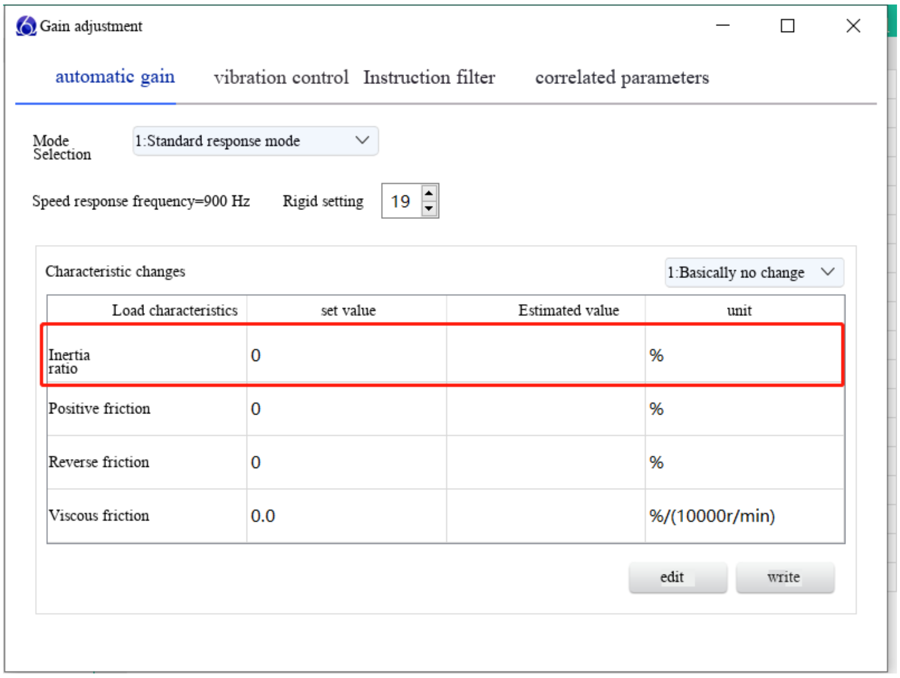
Operation steps:

By clicking the 'Gain Adjustment' button on the upper computer, you can enter the real-time gain adjustment operation interface, as shown in the following figure:

Set the mode selection to 1: standard response mode;

The running trajectory can be generated by Ω Master or by the controller.As long as the online identification update conditions are met, the load inertia identification results will be displayed in real-time in the red box in the following figure.

If there is abnormal noise during operation, the rigidity setting value can be reduced until no abnormal noise occurs.

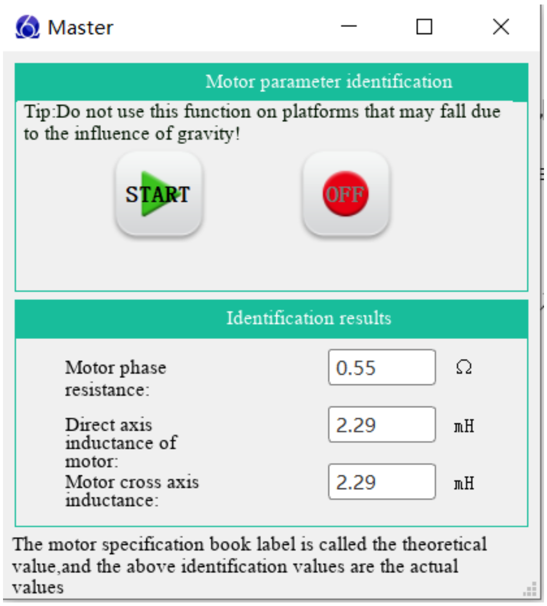


4.2.3 Motor parameter identification

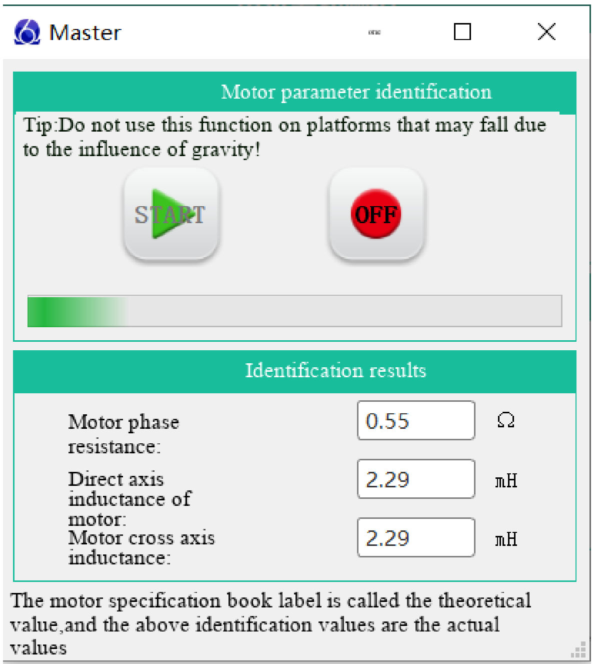
When the resistance and inductance parameters of the motor are unknown, or when the actual resistance and inductance deviate significantly from the theoretical design values, especially for linear motors, the motor parameter identification function can be used to identify the resistance and inductance parameters of the motor.The servo matched rotating motor does not require motor parameter identification.

Operation process:

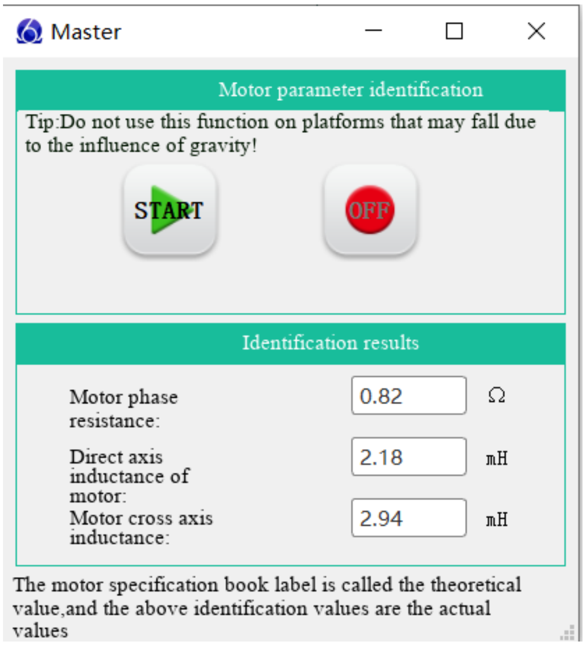
(1) Click the 'Motor Parameter Identification' button on the upper computer to enter the motor parameter identification operation interface, as shown in the following figure:



(2) Click the 【START】 button in the above figure to perform parameter identification, as shown in the following figure:



(3) The identification process will end in about 1 minute, and the identification results will be displayed as shown in the following figure:



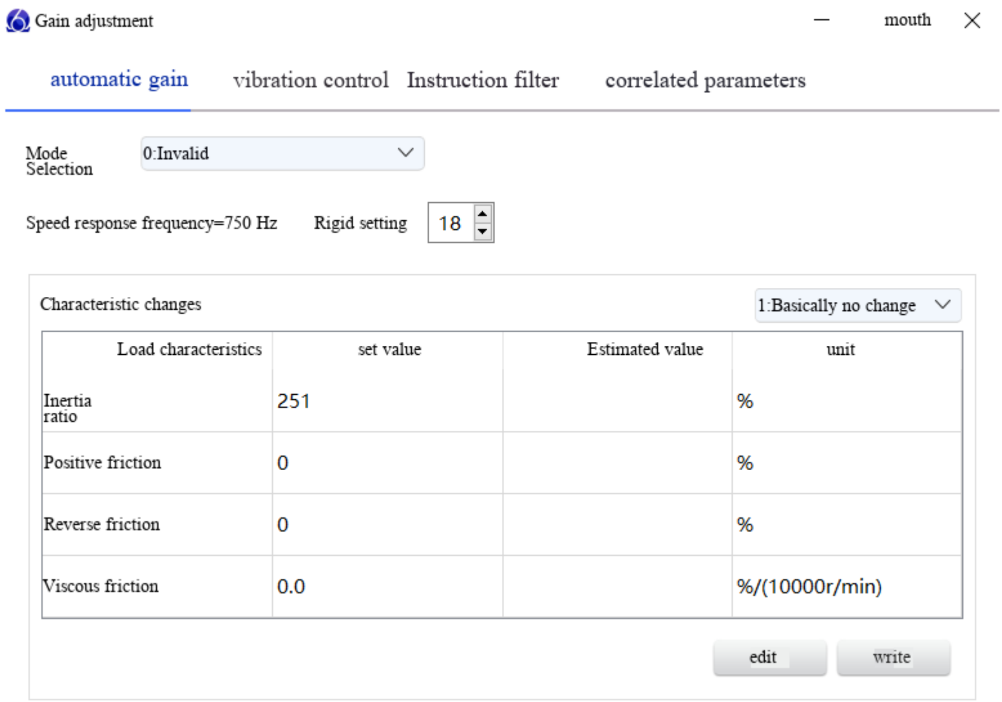
[Note] Do not use this function on platforms that may fall due to the influence of gravity.

4.2.4 Real time automatic gain adjustment

The real-time gain adjustment function is an online gain adjustment function that can identify the inertia ratio and friction force in real time, automatically configure the notch filter, and manually adjust the rigidity to automatically adjust the gain parameters.

Operation steps:

By clicking the 'Gain Adjustment' button on the upper computer, you can enter the real-time gain adjustment operation interface, as shown in the following figure:



When the servo is enabled to be turned off, there are 5 modes to choose from: invalid, standard response mode, high response mode, high response mode 2, and high response mode 3.It can also be set by modifying the parameter Pr0.02- real-time automatic adjustment setting.

(1) Invalid: The real-time gain function is invalid.

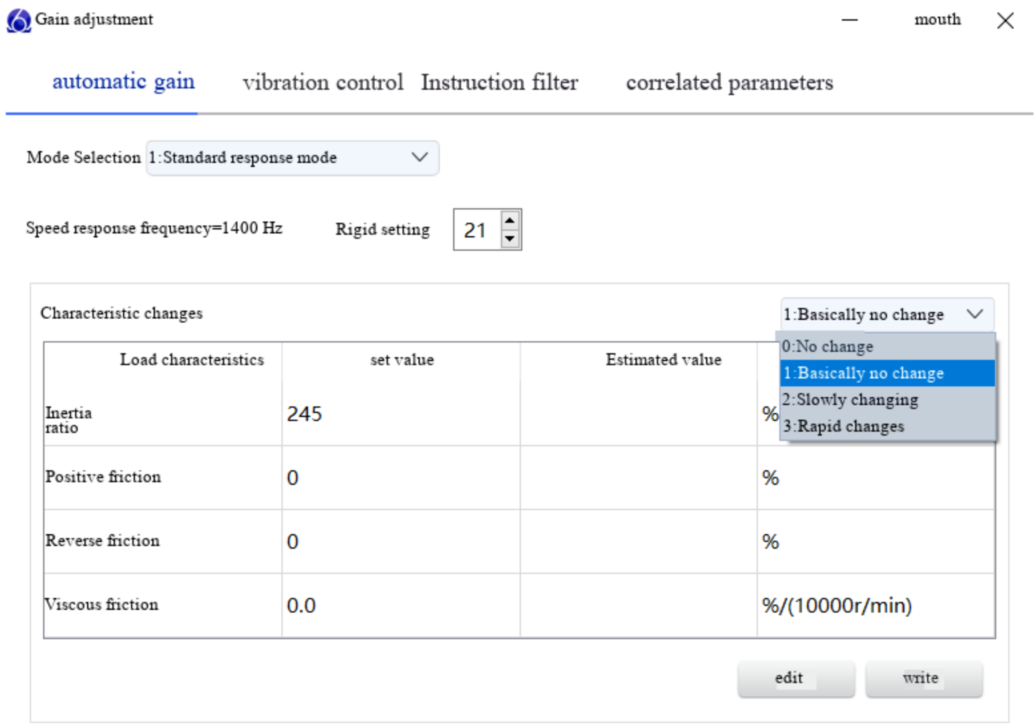
(2) Standard response mode: a mode that emphasizes stability.No offset load friction compensation or gain switching is applicable.

(3) High response mode: a mode that emphasizes positioning.Used for horizontal unbiased load, low friction screw driven machines, etc.Speed and torque control are the same as standard mode.

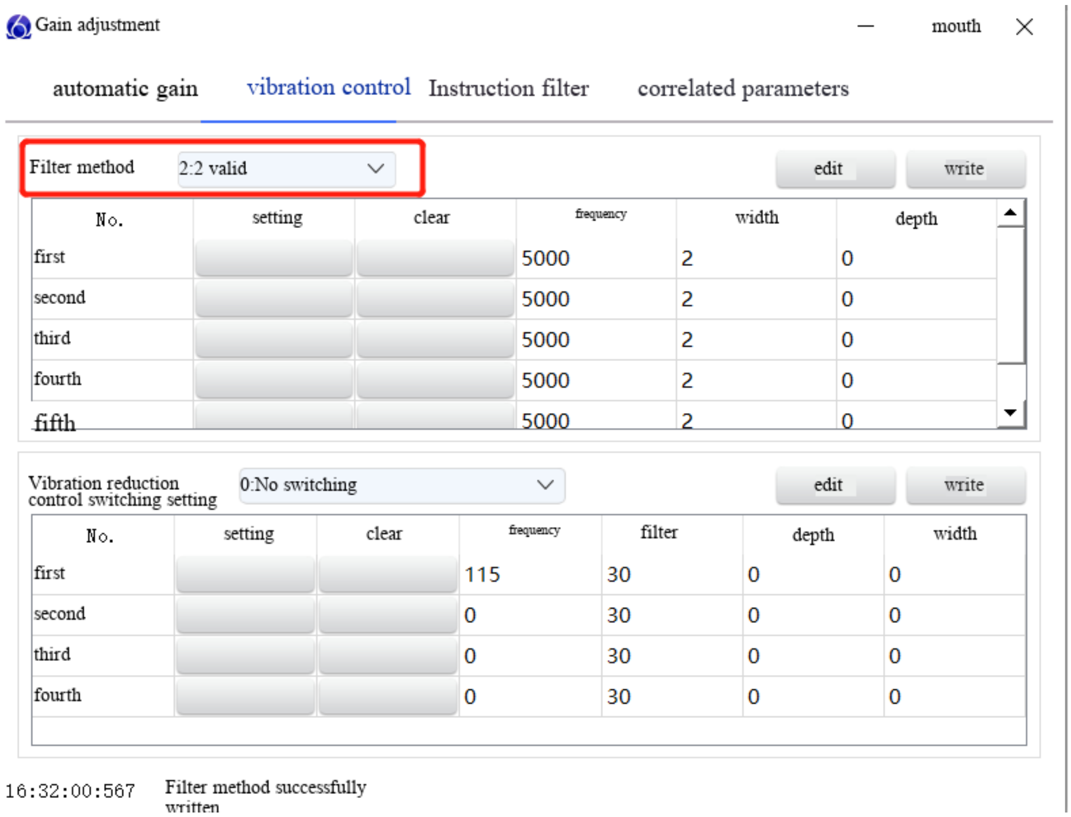
(4) High response mode 2: Based on the high response mode, the deviation of positioning and setting time can be suppressed by using offset load compensation and the third gain.Torque control is the same as standard mode.

(5) High response mode 3: Based on high response mode 2, it shortens the positioning and setting time under high friction loads.Under speed control, it is the same as the vertical axis mode, and under torque control, it is the same as the standard mode.

1. According to the actual load characteristics, the "Characteristic Change" option can be pre selected, with a total of 4 options: no change, basically no change, slow change, and rapid change. The default selection is no change.



2. Click the "Vibration Control" button to set the filter mode to 2 valid modes, or set it through parameter Pr2.00.

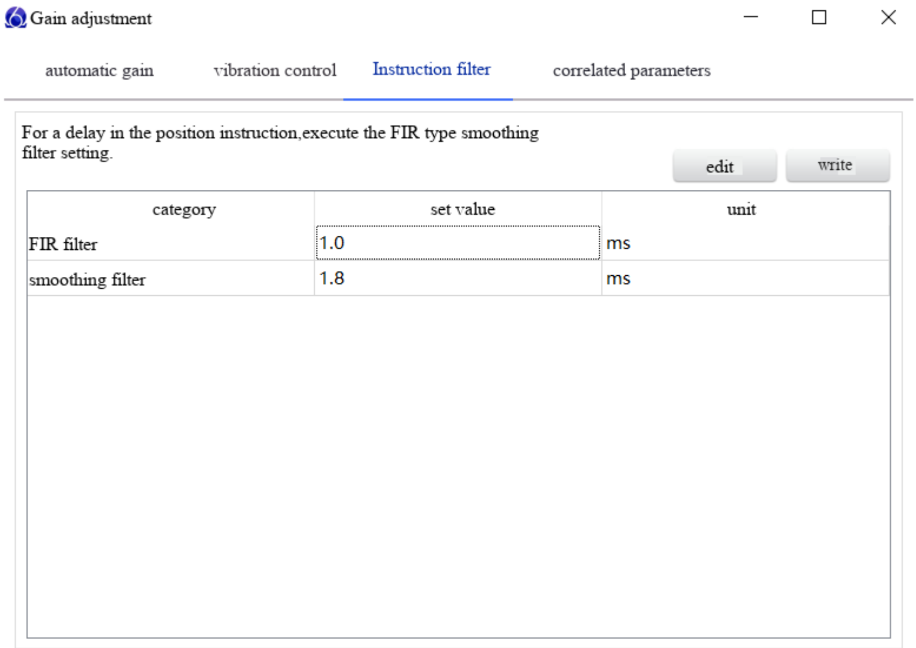


3. Activate the servo and operate the machine as usual to begin identifying the load characteristics.

After the identification of load characteristics is completed, the Pr0.04 inertia ratio will be updated.In addition, according to the mode setting, Pr6.07- torque command added value, Pr6.08- positive direction torque compensation value, and Pr6.09- negative direction torque compensation value will also change accordingly.

If there is a resonance point in the system, the third and fourth traps will be automatically configured to suppress resonance.

6. In the "Automatic Gain" interface, adjust the rigidity by clicking "" or "", or improve the rigidity by setting the parameter Pr0.03- Real time automatic adjustment of rigidity.When adjusting the rigidity, the parameters in the interface corresponding to the "instruction filter" option will change with the rigidity.



1. Click the "" button to increase rigidity, observe the running waveform, and adjust to the most suitable value.

After adjusting to the appropriate value, the result will be automatically saved.

3. Note 1: After starting, after the first servo enable is turned on, or when increasing Pr0.03- real-time automatic adjustment of mechanical rigidity setting, abnormal noise or vibration may occur before the load characteristics are estimated to be stable. If it can be stabilized immediately, it is not an abnormal situation.If the vibration or action is repeated more than 3 times and there is still abnormal noise, please take the following measures.

4. Reduce Pr0.03- Real time automatic adjustment of rigidity setting.

5. Set Pr0.02- real-time automatic adjustment to 0 to render real-time automatic adjustment ineffective.

6. Pr0.04 inertia ratio is set as the identification value, and Pr6.07 torque command added value, Pr6.08 positive direction torque compensation value, Pr6.09 negative direction torque compensation value, and Pr6.50 viscous compensation gain are set to 0.

7. Invalidate the load fluctuation suppression function.(Pr6.10 bit4=0 followed by bit=0).

8. [Note 2] After abnormal noise or vibration occurs, Pr0.04 inertia ratio is set as the identification value. The values of Pr6.07 torque command added value, Pr6.08 positive direction torque compensation value, Pr6.09

negative direction torque compensation value, and Pr6.50 viscous compensation gain will become extreme values.If the above situation occurs, please implement the countermeasures mentioned in 3) above.

9. [Note 3] In the real-time automatic adjustment results, Pr0.04 inertia ratio, Pr6.07 torque command added value, Pr6.08 positive direction torque compensation value, Pr6.09 negative direction torque compensation value, and Pr6.50 viscosity compensation gain are written to EEPROM every 30 minutes.When the power is reconnected, this data is used as the initial value for real-time automatic adjustment.If the power is turned off within 30 minutes, the real-time automatic adjustment results cannot be saved. Please take note.At this point, please manually write the parameters to EEPROM before turning off the power.

10. [Note 4] The control gain is updated when it stops, and in cases where the gain is extremely low or when instructions are continuously given in one direction, the setting value of Pr0.03- real-time automatic adjustment of mechanical rigidity may not take effect when the motor is not stopped.In this case, according to the rigidity setting reflected after stopping, abnormal noise or vibration may occur.When changing the rigidity, please stop the motor and confirm that the changed rigidity setting has indeed taken effect before proceeding to the next step.

11. Real time gain adjustment updated parameters:

<table>
<tr><th>parameter</th><th>Name of parameter</th><th>function</th></tr>
<tr><td>Pr0.04</td><td>Inertia ratio</td><td>When real-time gain adjustment is effective (Pr0.02=1-4), update this parameter</td></tr>
<tr><td>Pr6.07</td><td>Torque command added value</td><td>Update this parameter when real-time gain adjustment is in high response modes 2 and 3 (Pr0.02=3,4)</td></tr>
<tr><td>Pr6.08</td><td>Positive direction torque compensation value</td><td rowspan="2">Update this parameter when real-time automatic adjustment of high response mode (Pr0.02=4)</td></tr>
<tr><td>Pr6.09</td><td>Negative direction torque compensation value</td></tr>
</table>

Parameters updated based on rigid settings:

<table>
<tr><th>parameter</th><th>Name of parameter</th><th>function</th></tr>
<tr><td>Pr1.00</td><td>Position 1 loop gain</td><td rowspan="8">When real-time gain adjustment is effective (Pr0.02=1-4), update the set value according to rigidity</td></tr>
<tr><td>Pr1.01</td><td>1st speed loop gain</td></tr>
<tr><td>Pr1.02</td><td>The first speed integration time constant</td></tr>
<tr><td>Pr1.04</td><td>The first torque filter</td></tr>
<tr><td>Pr1.05</td><td>2nd position loop gain</td></tr>
<tr><td>Pr1.06</td><td>Second speed loop gain</td></tr>
<tr><td>Pr1.07</td><td>Second speed integration time constant</td></tr>
<tr><td>Pr1.09</td><td>Second torque filter</td></tr>
</table>

Pr2.22	Instruction smoothing filter	When real-time gain adjustment takes effect (Pr0.02=1-4), update the set value according to rigidity. [Note] The primary filter is fixed under speed control.
Pr6.48	Adjust the filter	When real-time gain adjustment takes effect (Pr0.02=1-4), update the set value according to rigidity. [Note] The primary filter is fixed under speed control.

Parameters set to fixed values:

parameter	Name of parameter	function
Pr1.03	First speed detection filter	0
Pr1.08	Second speed detection filter	
Pr1.10	Speed feedback gain	1000(100%)
Pr1.11	Speed feedforward filter	0
Pr1.12	Torque feedforward gain	1000(100%)
Pr1.13	Torque feedforward filter	0
Pr6.10	Function extension settings	bit4=1
Pr6.49	Instruction response filter/adjust filter attenuation setting	15

Parameters set based on gain switching settings:

parameter	Name of parameter	function
Pr1.14	2nd gain setting	When real-time gain adjustment is effective, (Pr0.02=1-4) is set to 1.
Pr1.15	Position control switching mode	Set to 0 in standard response mode (Pr0.02=1).When high response mode 1-3 (Pr0.02=2-4) is set to 7.
Pr1.16	Delay time for switching position control	When real-time gain adjustment is effective, (Pr0.02=1-4) is set to 10.
Pr1.17	Position control switching level	When real-time gain adjustment is effective, (Pr0.02=1-4) is set to 0.
Pr1.18	Position control switching timing	
Pr1.19	Position gain switching time	When real-time gain adjustment is effective, (Pr0.02=1-4) is set to 10.
Pr1.20	Speed control switching mode	When real-time gain adjustment is effective, (Pr0.02=1-4) is set to 0.
Pr1.21	Speed control switching time	
Pr1.22	Speed control switching level	When real-time gain adjustment is effective, (Pr0.02=1-4) is set to 10.
Pr1.23	Delay during speed control	When real-time gain adjustment is effective, (Pr0.02=1-

	switching	4) is set to 0.
Pr1.24	Torque control switching mode	
Pr1.25	Torque control switching time	When real-time gain adjustment is effective, (Pr0.02=1-4) is set to 10.
Pr1.26	Torque control switching level	When real-time gain adjustment is effective, (Pr0.02=1-4) is set to 0.
Pr1.27	Delay during torque control switching	
Pr6.05	Position 3 gain effective time	When in standard response mode and high response mode (Pr0.02=1,2), set to 0 (invalid). High response modes 2 and 3 are set to (Pr0.02=3,4) and Pr2.20 × 20. (However, the maximum value must be limited to within 10000.)
Pr6.06	Position 3 gain multiplier	When in standard response mode and high response mode (Pr0.02=1,2), set to 100 (100%).At high response modes 2 and 3 (Pr0.02=3,4), set to 200 (200%).

Usually set as invalid parameters:

parameter	Name of parameter	function
Pr6.10	Function extension settings	Enable bit1 for load fluctuation suppression function and enable bit3 for inertia ratio switching function are invalid internally
Pr6.13	Second inertia ratio	Although the parameter settings can be changed, the inertia ratio switching function is set to be invalid.

4.2.5 Adaptive notch filter

4.2.5.1 Overview

In the actual operating state, the resonance frequency is inferred based on the vibration component in the motor speed, and the parameters of the notch filter that removes the resonance component are automatically set to reduce the vibration at the resonance point.

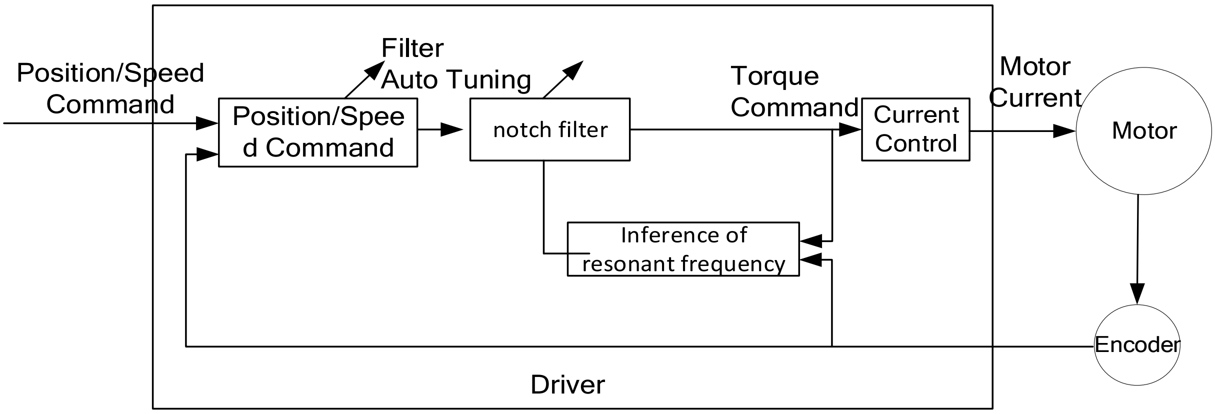


Figure 4.2.5.1 Adaptive Filter Block Diagram

4.2.5.2 Scope of Application

	Action conditions of adaptive filter
control mode	Can be applied to modes other than torque control.
other	It needs to be in a servo enabled open state. Properly set the deviation counter reset command input prohibition, torque limitation, and other elements beyond control parameters to ensure that the motor rotates normally without obstacles.

4.2.5.3 Precautions

	Conditions affecting the action of adaptive filters
resonance point	When the resonance frequency is lower than three times the speed response frequency. When the resonance peak is low or the control gain is low, and the impact on motor speed cannot be manifested. When there are three or more resonance points.
load	When the motor speed changes with high-frequency components due to nonlinear factors such as backlash.

4.2.5.4 Usage

Please input the action command when Pr2.00 'Adaptive Filter Mode Setting' is set to a value other than 0.When the resonance point affects the motor speed, the parameters of the third notch filter or the fourth notch filter will be automatically set according to the number of adaptive filters.

Please use the following parameters to set the corresponding action of the adaptive filter.

When changing the mode, please temporarily set it to 0 (invalid) or 4 (clear).

Classification	No.	parameter name	set value	function
2	00	Adaptive filter mode	0	<Invalid adaptive filter> The adaptive filter is invalid. The parameters associated with the third and fourth notch filters remain at their current values.
			1	<1 adaptive filter is effective> One adaptive filter is effective. Update the associated parameters of the third notch filter based on the adaptation results.
			2	<2 adaptive filters are effective> Two adaptive filters are effective. Update the associated parameters of the 3rd and 4th notch filters based on the adaptation results.
			3	Resonance frequency measurement mode Measure the resonance frequency.The measurement results can be confirmed by Ω Master. The parameters associated with the third and fourth notch filters remain at their current values.
			4	<Adaptive result clearing> The associated parameters of the third and fourth notch filters are invalid, And clear the adaptation results.

At the same time, automatically set the following parameters.

Classification	No.	parameter name	set value
2	07	3rd notch frequency	Set to 5000 when no resonance point is found.
2	08	Third notch width	The adaptive filter is automatically set when it is effective.
2	09	Depth of the third notch	
2	10	4th notch frequency	Automatically set the second resonance frequency inferred by the adaptive filter, and set it to 5000 when no resonance point is found.
2	11	4th notch width	Two effective adaptive filters are automatically set.
2	12	4th notch depth	

【 Precautions 】

1. After the first servo enable is activated, there is a possibility of abnormal noise or vibration before the adaptive filter stabilizes. If it can be stabilized immediately, it is not an abnormal situation when the real-time automatic adjustment is effective and the rigidity setting is improved.If there is still abnormal noise after continuous vibration or repeated action for more than 3 times, please take the following measures.

(1) Write the parameters during normal operation into EEPROM.

(2) Reduce Pr0.03 'real-time automatic adjustment of rigidity setting'.

(3) Set Pr2.00 'Adaptive Filter Mode Setting' to 0 to disable the adaptive filter.

(4) Manually set the notch filter.

After emitting abnormal noise or vibration, the values of the third and fourth notch filters will become very extreme.In this case, following the method described in (3) above, set the adaptive filter to invalid, i.e., set the values of Pr2.07 "3rd notch frequency" and Pr2.10 "4th notch frequency" to 5000 (invalid), and then reset the adaptive filter to valid.

3. The third notch filter (Pr2.07-Pr2.09) and the fourth notch filter (Pr2.10-Pr2.12) are written to the EEPROM every 30 minutes. When the power is turned on again, this data is used as the initial value for automatic adjustment.

4.3 Manual gain adjustment

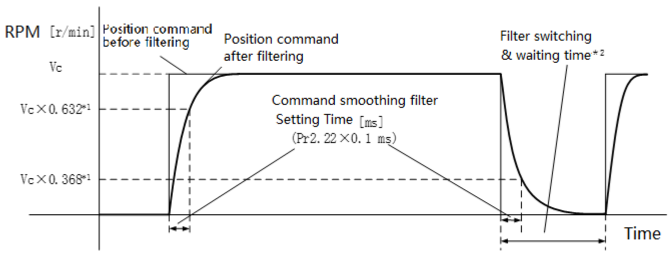
4.3.1 Position instruction filtering

4.3.1.2 Instruction smoothing filter

During position control

Set the time constant of the first-order delay filter corresponding to the position instruction.

(1) The actual filter constant for (set value x 0.1ms) has a maximum absolute error of 0.4ms if it is less than 100ms, and a maximum relative error of 0.2% if it exceeds 20ms.



(2) The switching of Pr2.22 "instruction smoothing filter" is performed when the instruction pulse transitions from 0 state to a state other than 0 at regular intervals (0.1 ms) during the positioning completion output.If the filtering time constant is small and the positioning completion range is large, there will be accumulated pulse residues in the filter at the above time (the difference between the position command before filtering and the position command after filtering, and the area is calculated by time integration). After switching, it will quickly return to its original position, so the motor will operate at a higher speed than the previous command. Please note.

(3) Change Pr2.22 'Instruction Smoothing Filter' until it is suitable for situations where internal calculations may experience delays. During this period, there is a possibility that the change will be retained when the switching time reaches * 2.

(4) When in 2-degree-of-freedom control mode (Pr6.47 bit0=1), Pr2.22 is the time constant of the 2-degree-of-freedom instruction response filter.The maximum value is limited to 2000 (=200.0 ms)

4.3.1.2 Instruction FIR Filter

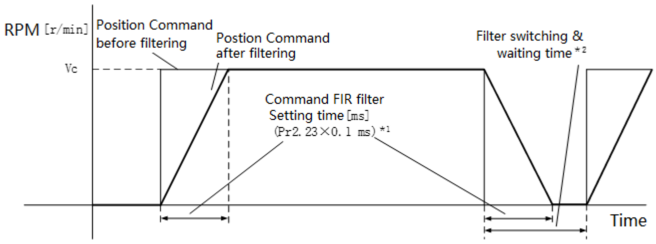
During position control

Set the FIR filter time constant for the corresponding instruction.

During speed control

When in the degree of freedom control mode (P6.47 bit0=1), set the corresponding FIR filter time constant.

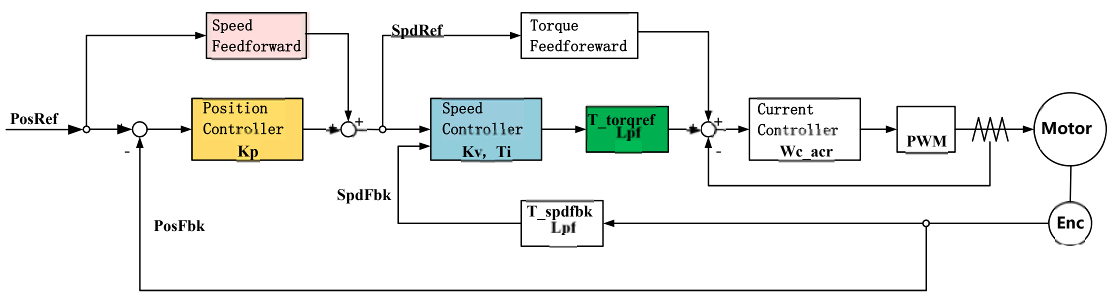
Set the arrival time of Vc according to the square wave command corresponding to the target speed Vc, as shown in the following figure.



For the actual moving average time (set value x 0.1 ms), if it is less than 10 ms, the maximum absolute error is 0.2 ms, and if it exceeds 10 ms, the maximum relative error is 1.6%.Please make the change to Pr2.23 'Instruction FIR Filter' after the instruction pulse has stopped, that is, after the filter waiting for switching time.When the waiting switching time of the filter is below 10 ms, it is (set value x 0.1 ms+0.25 ms), and when it is above 10 ms, it is (set value x 0.1 ms x 1.05).When changing Pr2.23 'Instruction FIR Filter' during instruction pulse input, the change content cannot be immediately reflected, and the subsequent no instruction pulse state is updated after the filter waiting for switching time to continue.

4.3.2 Servo gain adjustment

The servo drive includes three closed-loop control components: position loop, speed loop, and current loop.The response speed of the innermost loop (current loop) is the fastest, and the response speed of the intermediate loop (velocity loop) must be higher than that of the outermost loop (position loop).If this principle is not followed, it will cause vibration or poor response during motor operation.The default design of the servo drive ensures that the current loop has good response performance as much as possible, so users only need to adjust the gains of the position loop and speed loop.



When manually adjusting the servo gain, please adjust each servo gain one by one based on understanding the composition and characteristics of the servo unit.In most cases, if a parameter undergoes significant changes, other parameters must be adjusted again.In order to confirm the response characteristics, it is necessary to prepare for monitoring the output waveform using servo upper computer software.

1. Overview

By manually adjusting the servo gain of the servo unit, the response characteristics of the servo unit can be improved.For example, in position control, the positioning time can be shortened.Please use manual adjustment in the following situations.When one click self-tuning cannot proceed smoothly,
Compared with the results of one key self-tuning, when the customer still needs to decide the ratio of servo gain to moment of inertia, manual gain is recommended to start from the default parameters of the servo factory or the gain setting state at the end of one key self-tuning.

2. Precautions

Sometimes vibration and abnormal noise may occur when adjusting the servo gain.It is recommended to set the Pn2.00 adaptive filter mode to 1 or 2. Please refer to the following content for the adaptive filter mode setting

<table>
<tr><td rowspan="2">serial number Pr2.00</td><td>name</td><td colspan="3">Adaptive filter mode setting</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>0~6</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td>-</td><td>Related modes</td><td>P/S</td><td>factory settings</td><td>1</td></tr>
<tr><td colspan="9">Set the resonance frequency estimated by the adaptive filter and the estimated action.</td></tr>
</table>

set value	content	
0	Adaptive Filter: Invalid	The associated parameters of the third and fourth filters remain at their current values
1	Adaptive filter: 1 effective	One adaptive filter is effective, and the associated parameters of the third notch filter are updated based on the adaptation result
2	Adaptive filters: 2 effective	Two adaptive filters are effective, and the associated parameters of the third and fourth notch filters are updated based on the adaptation results
3	Resonance frequency measurement mode	Measure the resonance frequency, and the measurement results can be confirmed by the upper computer. The associated parameters of the third and fourth notch filters remain at their current values
4	Adaptation result clearance	The associated parameters of the third and fourth notch filters are invalid, and the adaptation results are cleared
5	Manufacturer's use	reserve

6	Manufacturer's use	reserve

When adaptive filtering cannot suppress vibration and abnormal noise, refer to the adaptive notch section for the operation method when adaptive notch cannot suppress abnormal noise and vibration.

3. Example of adjustment steps (for position control and speed control)

step	content
1	Adjust the time constant of the first torque filter (Pr1.04) and set it to prevent vibration.
2	Try to increase the velocity loop gain (Pr1.01) as much as possible within the range where mechanical vibration does not occur, while reducing the velocity loop integration time parameter (Pr1.02).
3	Repeat steps 1 and 2 to restore the changed values by 10% to 20%.
4	During position control, increase the position loop gain (Pr1.00) within the range where mechanical vibration does not occur

Supplementary Notes:

In servo gain, if one parameter is changed, other parameters also need to be readjusted.Please do not make significant changes to only one parameter.Please adjust the gain of each servo slightly based on a rough standard of around 5%.Regarding the steps for changing servo parameters, please generally follow the following instructions.

When improving response:

1. Reduce the time parameter of the torque command filter
2. Increase the speed loop gain
3. Reduce the integration time parameter of the speed loop
4. Increase the position loop gain

When reducing response, prevent vibration and overshoot:

1. Reduce the position loop gain
2. Increase the integration time parameter of the speed loop
3. Reduce the speed loop gain
4. Increase the time parameter of the torque filter

The servo gain to be adjusted can be adjusted by setting the following servo gains to modify the response characteristics of the servo unit.

Pr1.00: Position loop gain
Pr1.01: Speed loop gain
Pr1.02: Speed loop integration time parameter
Pr1.04: Time constant of the first torque filter

position loop gain

The responsiveness of the servo unit position loop is determined by the gain of the position loop.The higher the setting of the position loop gain, the higher the responsiveness and the shorter the positioning time.Generally speaking, the gain of the position loop cannot be increased beyond the natural frequency range of the mechanical system.Therefore, to set the position loop gain to a larger value, it is necessary to increase the rigidity of the machine and increase its natural frequency.

<table>
<tr><td rowspan="2">serial number Pr1.00</td><td>name</td><td colspan="3">Position 1 loop gain</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>0~30000</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td>0.1/s</td><td>Related modes</td><td>P/S</td><td>factory settings</td><td>480</td></tr>
<tr><td colspan="9">Determine the responsiveness of the position control system.
Increasing the position loop gain can shorten the positioning time.However, please note that setting too high a value can cause vibration.</td></tr>
</table>

Additional note: Machinery with a position loop gain (Pr1.00) that cannot be set too large may generate overflow alarms during high-speed operation.At this point, if the values of the following parameters are increased, the detection of alarms will become difficult.As a rough standard for setting values, please refer to the following conditions.

$$Pr0.14 \geq \frac{\text{最大进给速度[指令单位/s]}}{Pr1.00/10[1/s]} \times 2.0$$

When using a position instruction filter, the dynamic tracking error will increase based on the filter time parameter.

<table>
<tr><td rowspan="2">serial number Pr0.14</td><td>name</td><td colspan="3">Setting for excessive positional deviation</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>1~1073741824</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td></td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>100000</td></tr>
<tr><td colspan="9">Set the position deviation range to be too large through the instruction unit (default value).
Change the setting unit to encoder unit through Pr5.20 (position setting unit selection).In this case, please set the number of encoder feedback pulses under position control and the number of external displacement sensor pulses under full closed-loop control.
When this parameter is 0, Err24.0 (position deviation protection) is invalid.
Notice: Please refer to parameter "Pr5.20" for instructions on "instruction unit" and "encoder unit".</td></tr>
</table>

speed loop gain

Determine the parameters of speed loop responsiveness.Due to the responsiveness of the velocity loop constraining the response of the position loop, a lower velocity loop gain can cause overshoot or oscillation of the velocity command.Therefore, within the range where the mechanical system does not vibrate, the larger the set value, the more stable and responsive the servo system is.

<table>
<tr><td rowspan="2">serial number Pr1.01</td><td>name</td><td colspan="3">1st speed loop gain</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>1~32767</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td>0.1Hz</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>270</td></tr>
<tr><td colspan="9">Determine the responsiveness of the speed loop.In order to improve the position loop gain and enhance the overall responsiveness of the servo system, it is necessary to increase the speed loop gain value.However, please note that setting too high a value can cause vibration.
Note: When the inertia ratio of Pr0.04 is set correctly, the setting unit of Pr1.01 is Hz.</td></tr>
</table>

$$Pr\,0.04\ setting\ value = \frac{Converted\ load\ moment\ of\ inertia\ of\ motor\ shaft\ (J_L)}{Rotational\ inertia\ of\ the\ rotor\ of\ a\ servo\ motor\ (J_M)} \times 100$$

The factory set value for Pr0.04 (moment of inertia ratio) is "250".Please use the above formula to calculate the moment of inertia ratio before performing servo adjustment, and set it in Pr0.04.

<table>
<tr><td rowspan="2">serial number Pr0.04</td><td>name</td><td colspan="3">Inertia ratio</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>0~20000</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td>%</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>250</td></tr>
<tr><td colspan="9">When the real-time automatic adjustment is effective, the inertia ratio is estimated in real-time and saved in EEPROM approximately every 30 minutes.
TIPS Note:
The setting unit for Pr1.01 and Pr1.06 is (Hz) when the inertia ratio is set correctly.When the Pr0.04 inertia ratio is larger than the actual value, the setting unit of the velocity loop gain will increase, while when the Pr0.04 inertia ratio is smaller, the setting unit of the velocity loop gain will decrease.</td></tr>
</table>

Speed loop integral time constant

In order to respond to small inputs, the velocity loop contains integral elements.Due to the fact that this integral element is a delay element for the servo system, when the time parameter is set too large, overshoot may occur or the positioning time may be extended, resulting in poor responsiveness.

<table>
<tr><td rowspan="2">serial number Pr1.02</td><td>name</td><td colspan="3">Integration time constant of the first speed loop</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>1~10000</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td>0.1ms</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>210</td></tr>
<tr><td colspan="9">Set the integration time constant for the speed loop.mS
The smaller the set value, the faster the deviation approaches zero when stopping.
Set to '9999' to maintain points.
If set to "10000", there will be no integration effect.</td></tr>
</table>

Torque command filter

Configure the first torque filter in the torque command filter. Please refer to the following content for the configuration of the torque command filter mode:

serial number Pr1.04	name	Time constant of the first torque filter			Set effective	Effective immediately	data range	0~2500
	accessibility	RW	unit	0.01ms	Related modes	ALL	factory settings	40
Set the time constant of the delay filter that has been added to the torque command section. Can suppress vibrations caused by torsional resonance.								

4.3.3 Gain Switching

Switching gain based on internal data or external signals will achieve the following effects:

Reduce the gain during stop (servo lock) to suppress vibration.

Increase the gain when stopping (setting time) and shorten the setting time.

Increase the gain during actions and improve command responsiveness.

Switch gain using external signals based on machine status.

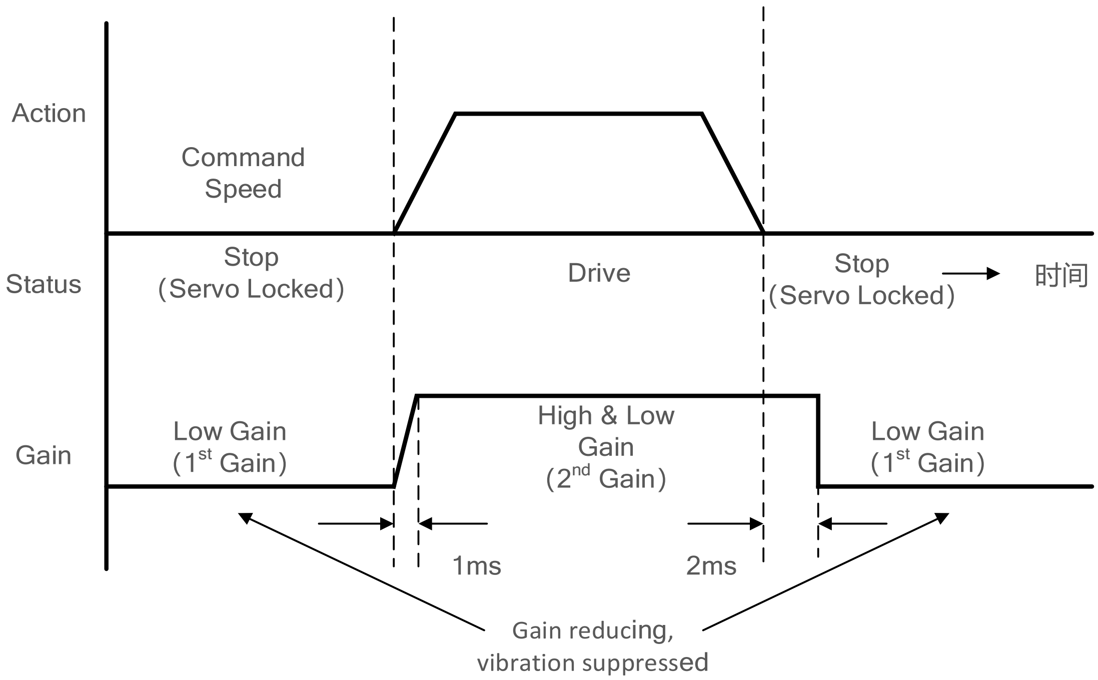


Figure 4.3.3-1 Timing Chart for Gain Switching

<Usage Example>

If it is necessary to reduce the abnormal noise caused by motor stop (servo lock), low gain can be switched to reduce the abnormal noise.

parameter No.	Name of parameter	No gain switching, manual gain adjustment.	➡	Pr1.05-Pr1.09 (Second gain) and Pr1.00-Pr1.04 Set the same value for the first gain	➡	Set Pr1.14 to Pr1.19 (Gain switching condition) .	➡	When stopped, Adjust (1st gain) Pr1.01 and Pr1.04.
1.00	Position 1 loop gain	63						
1.01	1st speed loop gain	35						27
1.02	The first speed integration time constant	16						
1.03	First speed detection filter	0						
1.04	The first torque filter	0.65						0.84
1.10	Speed feedforward gain	30						
1.11	Speed feedforward filter	0.5						
1.05	2nd position loop gain			63				
1.06	Second speed loop gain			35				
1.07	Second speed integration time constant			16				
1.08	Second speed detection filter			0				
1.09	Second torque filter			0.65				
1.14	2nd gain setting	0				1		
1.15	Position control switching mode					7		

1.16	Delay time for switching position control					30		
1.17	Position control switching level					0		
1.18	Position control switching delay					0		
1.19	Position gain switching time					0		

0.04	Inertia ratio	·Input numerical values when load calculation is known. ·By debugging the software, the inertia ratio can be automatically measured. ·The factory value is 250.			

Setting of gain switching conditions

● Position control mode, fully closed-loop control mode (○: parameter valid, -: invalid)

			Parameters set for position control mode and fully closed-loop control mode		
Pr1.15	Second gain switching condition	image	Delay time *1	level	Delay *2
			Pr1.16	Pr1.17	Pr1.18
0	The first gain is fixed	—	—	—	—
1	The second gain is fixed	—	—	—	
2	Gain switching input	—	—	—	
3	torque command	A	○	○ [%]	○ [%]
4	Invalid (fixed first gain)		—	—	—
5	Speed command	C	○	○ [r/min]	○ [r/min]
6	position bias	D	○	○ *3 [pulse]	○ *3 [pulse]
7	There is a location command	E	○	—	—
8	Positioning not completed	F	○	—	—
9	actual speed	C	○	○ [r/min]	○ [r/min]
10	Position	G	○	○ [r/min] *5	○ [r/min] *5

	command+actual speed				

● Speed control mode

Setting of gain switching conditions			Parameters set for speed control mode		
Pr1.20	Second gain switching condition	image	Delay time *1	level	Delay *2
			Pr1.16, 1.21	Pr1.17, 1.22	Pr1.18, 1.23
0	The first gain is fixed		—	—	—
1	The second gain is fixed		—	—	—
2	Gain switching input		—	—	—
3	torque command	A	○	○ [%]	○ [%]
4	Change in speed command	B	—	○*4 [10 (r/min)/s]	○*4 [10 (r/min)/s]
5	Speed command	C	○	○ [r/min]	○ [r/min]

● Torque control mode

Setting of gain switching conditions			Parameters set for torque control mode		
Pr1.24	Second gain switching condition	image	Delay time *1	level	Delay *2
			Pr1.16, 1.25	Pr1.17, 1.26	Pr1.18, 1.27
0	The first gain is fixed		—	—	—
1	The second gain is fixed		—	—	—
2	Gain switch input GAIN turned on		—	—	—
3	torque command	A	○	○ [%]	○ [%]

Note: The delay time (Pr1.16, 1.21, 1.25) is only valid when returning from the second gain to the first gain.

The definition of hysteresis (Pr1.18, 1.23, 1.27) is shown in the following figure.

3. Specify the resolution of the encoder or external displacement sensor according to the control mode.

When there is a speed change of 10r/min within 4.1s as a condition, please set the set value to 1.

When Pr1.15=10, the meaning of delay time, level, and lag is different from usual.

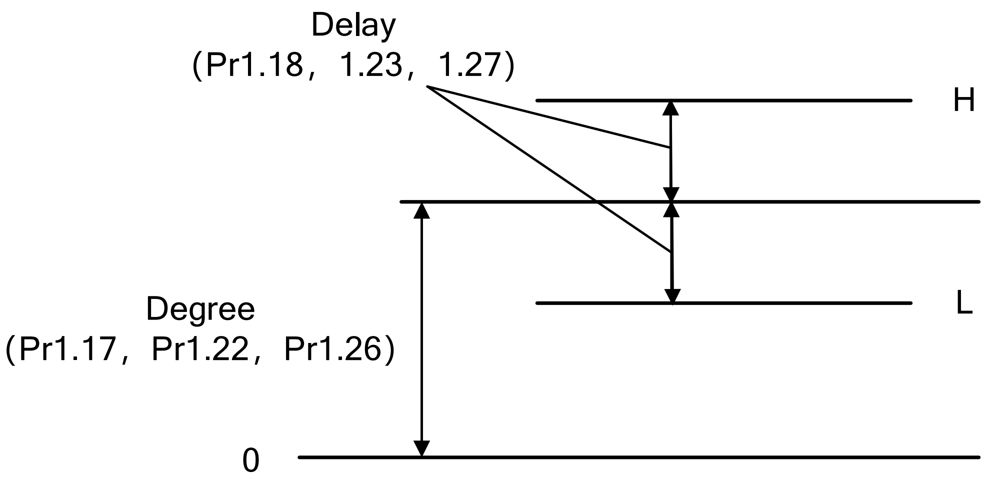


Figure 4.3.3-2 Definition of hysteresis

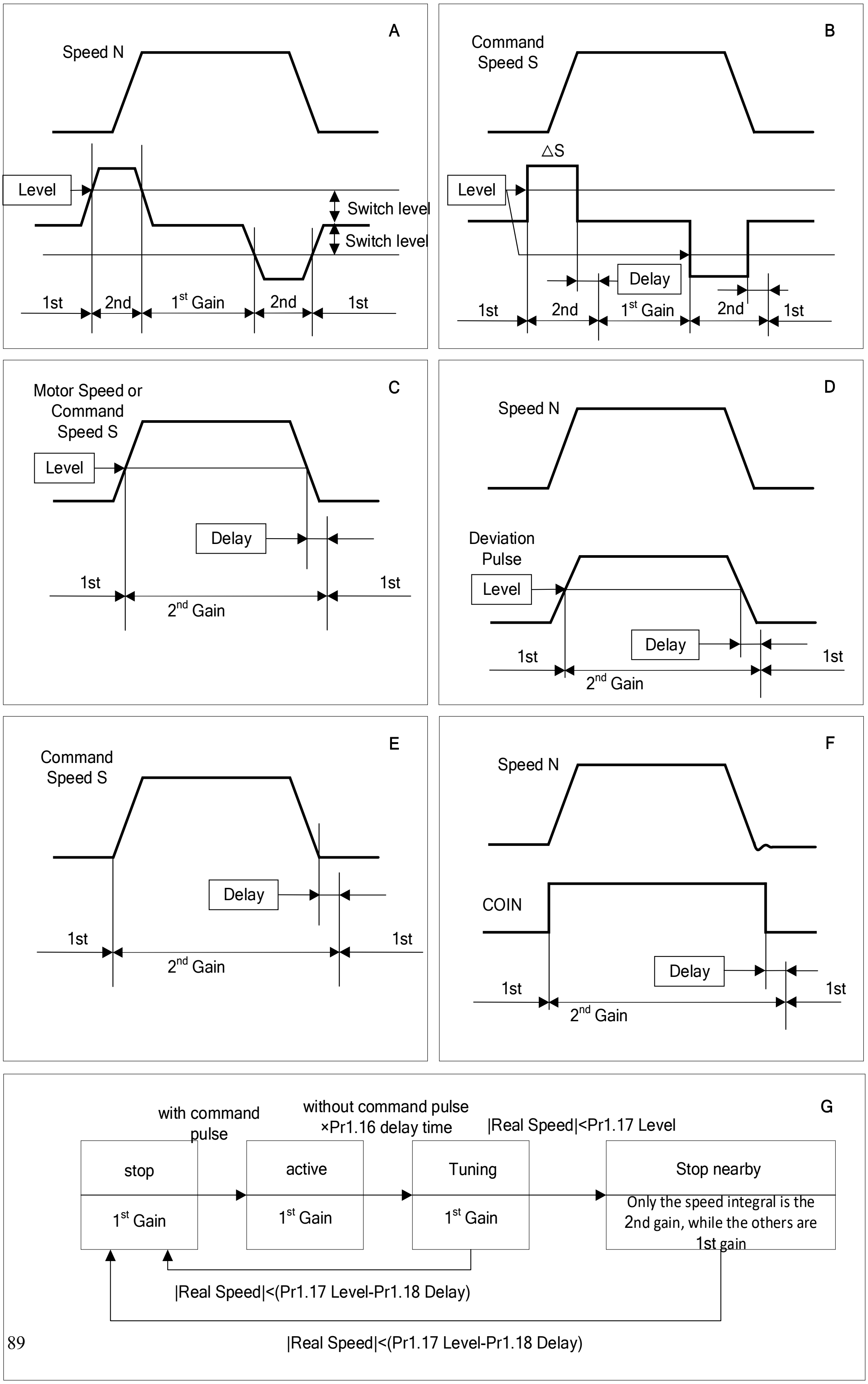

A
Speed N
Level
Switch level
Switch level
1st
2nd
1st Gain
2nd
1st
B
Command Speed S
△S
Level
Delay
1st
2nd
1st Gain
2nd
1st
C
Motor Speed or Command Speed S
Level
Delay
1st
2nd Gain
1st
D
Speed N
Deviation Pulse
Level
Delay
1st
2nd Gain
1st
E
Command Speed S
Delay
1st
2nd Gain
1st
F
Speed N
COIN
Delay
1st
2nd Gain
1st
G
with command pulse
without command pulse ×Pr1.16 delay time
|Real Speed|<Pr1.17 Level
stop
1st Gain
active
1st Gain
Tuning
1st Gain
Stop nearby
Only the speed integral is the 2nd gain, while the others are 1st gain
|Real Speed|<(Pr1.17 Level-Pr1.18 Delay)
|Real Speed|<(Pr1.17 Level-Pr1.18 Delay)

Figure 4.3.3-3 Timing Chart for Gain Switching

Note: The above figure does not reflect the offset of gain switching timing caused by hysteresis (Pr1.18, 1.23, 1.27).

4.3.3.1 Third gain switching

In addition to the usual gain switching function shown in P.5-30, a third gain switching during the stopping process can also be set to increase the gain during the stopping process for a certain period of time, which can shorten the positioning and setting time.Scope of adaptation (if the following conditions are not met, this function cannot be used)

	Action conditions for the third gain switching function
control mode	Position control. Pr0.01=0: Position control Pr0.01=3: The first control mode for position and speed control Pr0.01=4: The first control mode of position and torque control
other	The servo needs to be in the enabled on state. Properly set conditions beyond control parameters, such as input prohibition of deviation count reset command, torque limitation, etc. The motor needs to be in a normal rotating and fault free state.

correlated parameters

Classification	No.	parameter name	function
6	5	Position 3 gain effective time	Set the effective time for the third gain.
6	6	Position 3 gain multiplier	Set the third gain with a multiplier for the first gain. The third gain is equal to the first gain multiplied by Pr6.06/100

Instructions for use

In the normal operation of the gain switching function, set the applicable time of the third gain in Pr6.05 "Position Third Gain Effective Time", and set the multiplier of the third gain for the first gain in Pr6.06 "Position Third Gain Multiplier".

When not using the third gain, please set Pr6.05=0 and Pr6.06=100.

The third gain is only effective during position control.

In the third gain range, only the position loop gain/velocity loop gain is set as the third gain, and other settings are applicable to the first gain.

When the second gain switching condition is met in the third gain interval, switch to the second gain.

When switching from the second gain to the third gain, apply Pr1.19 "Position Gain Switching Time". Please note:

When changing parameters or other situations, if the second gain is switched to the first gain, a third gain interval will also occur. Please note.

For example, Pr1.15 "Position Control Switching Mode"=7 Switching Condition: When there is a position command

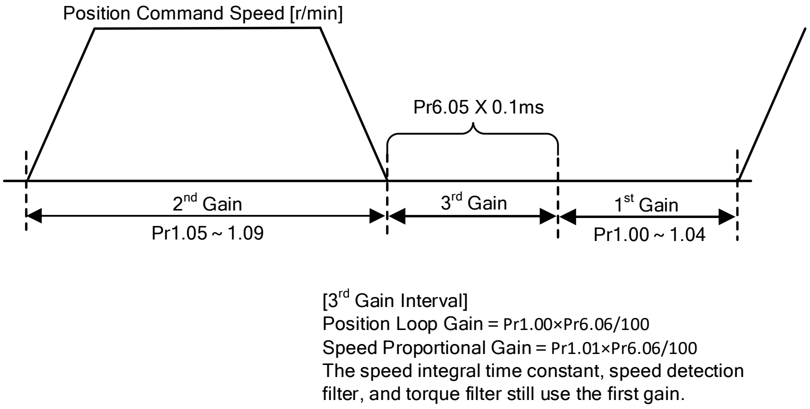


Figure 4.3.3.1 Third gain switching function

4.3.4 Feedforward control

In position control and fully closed-loop control, the speed control command required for the action is calculated from the internal position command, and the speed command is added to the speed feedback calculated by comparing it with the position feedback. Compared with feedback control, it can better reduce position deviation and improve responsiveness.

In addition, the torque command required for the action is calculated from the speed control command, and the torque feedforward calculated by comparing the torque command with the speed feedback can improve the response of the speed control system.

correlated parameters

Use two types of feedforward functions: speed feedforward and torque feedforward.

Classification	No.	parameter name	function
1	10	Speed feedforward gain	Multiply the speed control command calculated from the internal position command by this parameter The value after the ratio is added to the speed command from the position control processing.
1	11	Speed feedforward filter	Set the time constant of the first-order delay filter required for speed feedforward input.
1	12	Torque feedforward gain	Multiply the torque command calculated from the speed control command by this parameter ratio The value after the rate is added to the torque command from the speed control processing.
1	13	Torque feedforward filter	Set the time constant of the first-order delay filter required for torque feedforward input.
6	0	Simulate torque feedforward	Simulate input gain setting for torque feedforward. 0-9 is invalid.

		Transform gain	
6	10	Function extension settings	Set the bits related to simulated torque feedforward. Bit5 0: Invalid simulated torque FF 1: Valid simulated torque FF The lowest bit is bit0.

Example of using speed feedforward

By gradually increasing the speed feedforward gain, the speed feedforward becomes effective.At a certain speed, the position deviation during the action can be reduced by adjusting the speed feedforward gain value according to the following formula.

> Position deviation [instruction unit]=instruction speed [instruction unit/s]/position loop gain [1/s]
> × (100- speed feedforward gain [%])/100

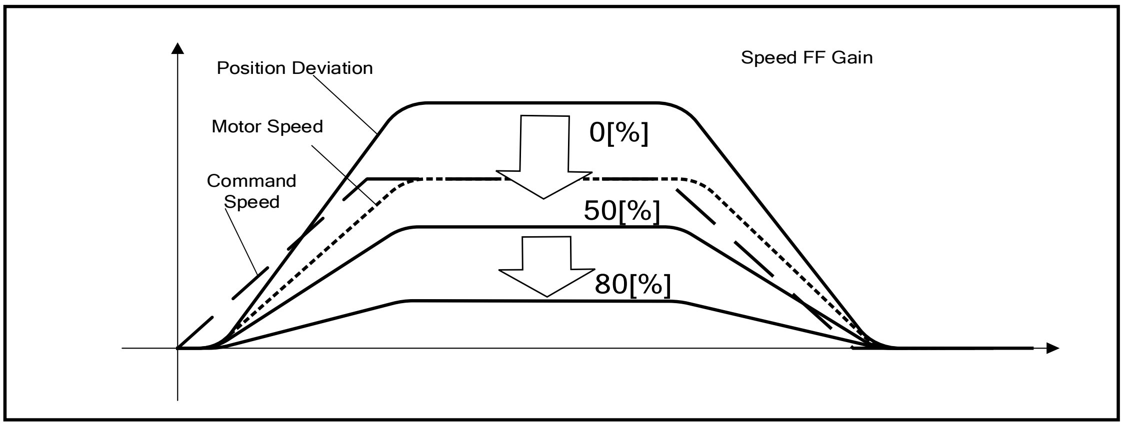


Figure 4.3.4-1 Effect Diagram of Speed Feedforward Action

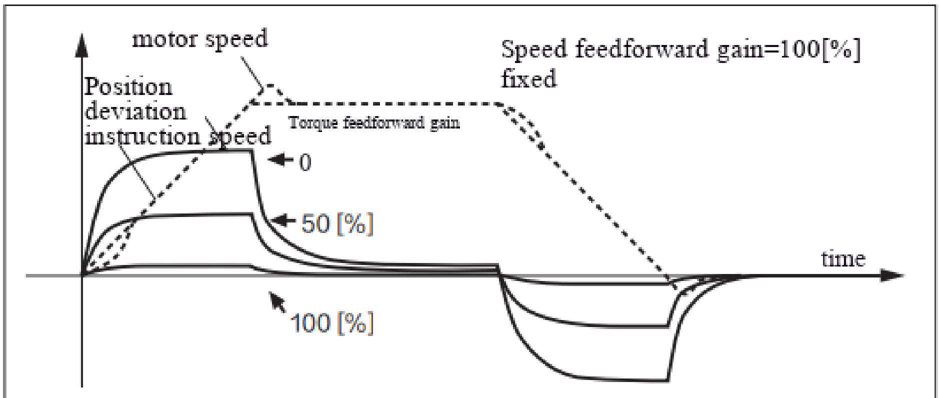
If the feedforward gain is set to 100%, the position deviation will be 0 in calculation, but significant overshoot will occur during acceleration and deceleration.

In addition, when the update cycle of the position command input is longer than the control cycle of the driver, or when the pulse frequency is uneven, the working sound may become louder when the speed feedforward is effective.In this case, please use a position instruction filter (one-time delay/FIR smoothing) or increase the value of the velocity feedforward filter.

Example of using torque feedforward

When using torque feedforward, it is necessary to correctly set the inertia ratio.The torque feedforward filter, set at around 0.5 ms, gradually increases the torque feedforward gain to make the torque feedforward effective.By increasing the torque feedforward gain, the position deviation during fixed acceleration and deceleration can be made close to 0. Therefore, under ideal conditions without interfering torque, the position deviation of all action areas during the driving of the trapezoidal velocity model can be approximately close to 0.In fact, there must be interference torque, so the position deviation cannot be completely reduced to zero.

In addition, similar to speed feedforward, if the time constant of the torque feedforward filter increases, the sound of the action will decrease, but the position deviation of the acceleration change point will increase.



Torque feedforward can reduce the positional deviation within a fixed range of acceleration.

4.3.4.1 2 Degrees of Freedom Control

The 2-degree-of-freedom control independently adjusts the requirements for both target followability and external disturbance rejection dimensions to achieve optimal performance simultaneously, thereby improving the tracking performance of position commands and reducing overshoot.By default, 2-degree-of-freedom control is effective and also applicable to most working conditions.When the delay of speed feedforward or torque feedforward is sensitive in on-site applications, it is necessary to turn off 2-degree-of-freedom control and use 4.3.4 feedforward control for fine adjustment.

Related parameters:

<table>
<tr><td rowspan="2">serial number Pr6.47</td><td>name</td><td colspan="3">Extended Function Setting 2</td><td>Set effective</td><td>Take effect after restart</td><td>data range</td><td>-32768~32768</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td></td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>1</td></tr>
<tr><td colspan="9">Bit0: 0:2 degrees of freedom control is invalid;1: 2. Effective freedom control.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr1.10</td><td>name</td><td colspan="3">Speed feedforward gain</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>0~4000</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td>0.1%</td><td>Related modes</td><td>P</td><td>factory settings</td><td>1000</td></tr>
<tr><td colspan="9">When the 2-degree-of-freedom control is effective, this parameter controls the magnitude of the speed feedforward.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr1.12</td><td>name</td><td colspan="3">Torque feedforward gain</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>0~2000</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td>0.1%</td><td>Related modes</td><td>P/S</td><td>factory settings</td><td>1000</td></tr>
<tr><td colspan="9">When the 2-degree-of-freedom control is effective, this parameter controls the magnitude of torque feedforward</td></tr>
</table>

When the 2-degree-of-freedom control is effective, the Pr1.11 speed feedforward filter and Pr1.13 torque feedforward filter are invalid.

4.3.4.2 Pseudo differential feedforward control

Pseudo Differential Forward Feedback Control (PDFF control) can be used in both position control mode and velocity control mode to adjust the response of the velocity loop, enhance its anti-interference ability, and improve its ability to follow velocity commands.

Related parameters:

<table>
<tr><td rowspan="2">serial number Pr1.20</td><td>name</td><td colspan="3">PDFF control coefficient</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>50.0~500.0</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td>%</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>100.0</td></tr>
<tr><td colspan="9">The factory default parameter is 100.0%, and pseudo differential feedforward control does not work;Pseudo differential feedforward control only works when the PDFF gain is not 100.0%.
Reducing Pr1.20 can reduce the overshoot of the speed loop, but if it is too small, it will slow down the response of the speed loop.</td></tr>
</table>

4.3.5 Pseudo differential feedback control

Pseudo differential feedback control (PDF) has some similarities with conventional PID control, but it overcomes the shortcomings of PID control such as differential mutation and start-up loop, and has the characteristics of fast response and accurate tracking.Its output is relatively smooth, with very little loss of control and oscillation, good anti-interference performance, few parameters that need to be debugged, and for most systems, it is an optimal control.

related parameters

<table>
<tr><td rowspan="2">serial number Pr1.21</td><td>name</td><td colspan="3">External resistance gain coefficient</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>0~1000</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td>%</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">This parameter is used to increase resistance to external forces and reduce overshoot during acceleration and deceleration.The factory default value of this parameter is 0, which indicates that the function is invalid. The larger the value, the stronger the effect.To adjust P1.21, it is recommended to refer to the following rules:
In speed mode, increasing this parameter can reduce speed overshoot.</td></tr>
</table>

2. In position mode, lowering this parameter can reduce position overshoot.

4.3.6 Friction compensation

As a function of reducing the frictional effects of machinery, it has three types of torque compensation: offset torque compensation and offset load compensation that maintain fixed action, dynamic friction compensation that changes direction according to action direction, and viscous friction compensation that changes according to command speed.

Scope of application (If the following conditions are not met, this function cannot be applied.)

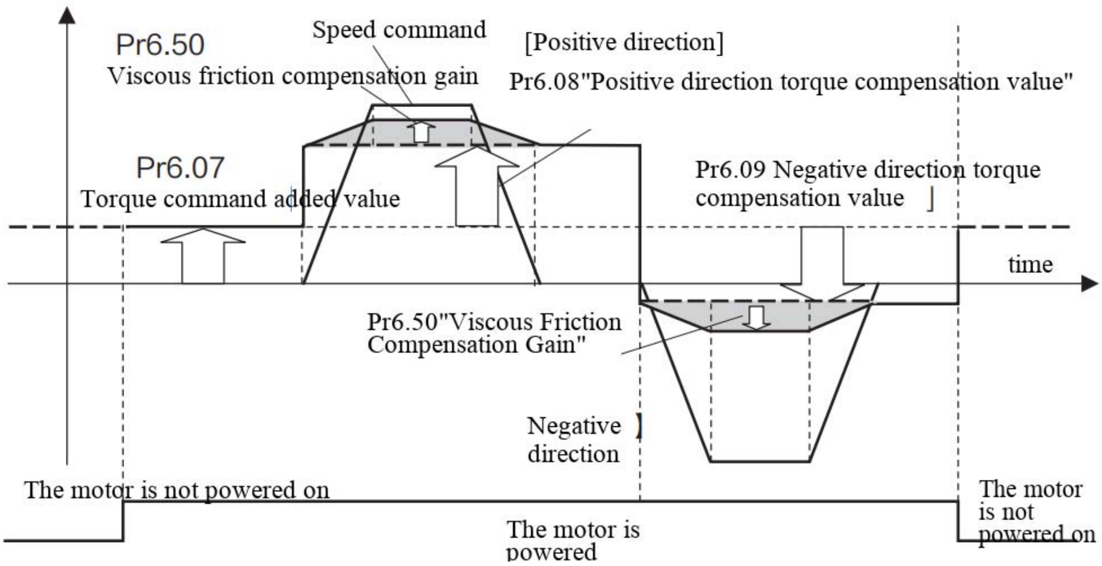
	Action conditions for friction compensation
control mode	Changes occur according to each function, please refer to the following associated parameters
other	The servo needs to be in the enabled on state. Properly set conditions beyond control parameters, such as input prohibition of bias count reset command, torque limitation, etc.The motor needs to be in a normal rotating and fault free state.

correlated parameters

Classification	No.	parameter name	function
6	7	Torque command added value	Set the offset load compensation value added to the torque command using a control mode other than torque control.
6	8	Positive direction torque compensation value	During position control and fully closed-loop control, the dynamic friction compensation value is set to be added to the torque command when receiving positive direction position commands.
6	9	Negative direction torque compensation value	During position control and fully closed-loop control, the dynamic friction compensation value is set to be added to the torque command when receiving negative direction position commands.
6	50	Viscous friction compensation gain	When the 2-degree-of-freedom control mode is effective, the product of the command speed and this set value is added as the viscous friction torque compensation amount to the torque command.By setting the estimated value of the viscous friction coefficient with real-time automatic gain adjustment, the position deviation of the feedback displacement sensor near the tuning area can be improved.

Instructions for use

Friction torque compensation is calculated based on the input position command direction, as shown in the figure below.



The friction compensation torque is the sum of the offset load compensation value set by adding a fixed value to the torque command addition value, the dynamic friction compensation value set by adding the positive or negative torque compensation value based on the last input command speed, and the viscous friction compensation value added based on the speed command.Reset the instruction speed direction when the power is turned on and the motor is not powered on.

When a continuous and constant bias torque is applied to the motor, such as the gravity acting on the vertical axis, the positioning deviation caused by different moving directions can be reduced by setting Pr6.07 "torque command added value".

For example, for track drive shafts, due to radial loads, a large amount of dynamic friction torque is required. By setting Pr6.08 "positive direction torque compensation" and Pr6.09 "negative direction torque compensation value", the deterioration and deviation of positioning time caused by dynamic friction can be reduced.

The torque command value for viscous loads can be set using Pr6.50 "Viscous Friction Compensation Gain" to reduce response delay during acceleration.In terms of nature, the compensation value is proportional to the speed command value.

Attention: Partial load compensation and dynamic friction compensation can be used in combination or separately, but please note that there are usage restrictions based on the control mode.

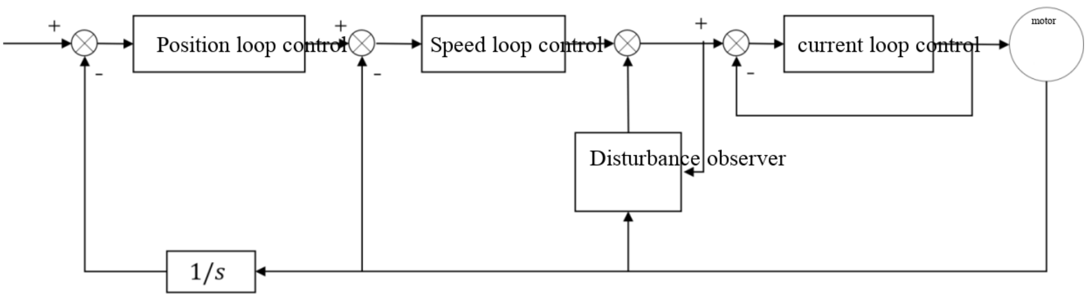
During torque control, regardless of parameter settings, the offset load compensation and dynamic friction compensation are set to 0.

When speed control and servo enable are turned off: the offset load compensation is effective according to Pr6.07, and the dynamic friction compensation is independent of parameter settings and is set to 0.

When the servo is enabled under position control and full closed-loop control, maintain the offset load compensation and dynamic friction compensation values until the initial position command is input.When there is a change from no position command to a position command, the offset load compensation is updated according to Pr6.07.Additionally, corresponding to the instruction direction, update the dynamic friction compensation value based on Pr6.08 or Pr6.09.

4.3.7 Load torque disturbance compensation

The load torque disturbance observer can observe disturbances in real-time online and perform feedforward compensation, which is beneficial for improving the system's disturbance resistance performance.The disturbance observer can be used for both position control mode and speed control mode.
The functional block diagram of the disturbance observer is shown in the following figure:

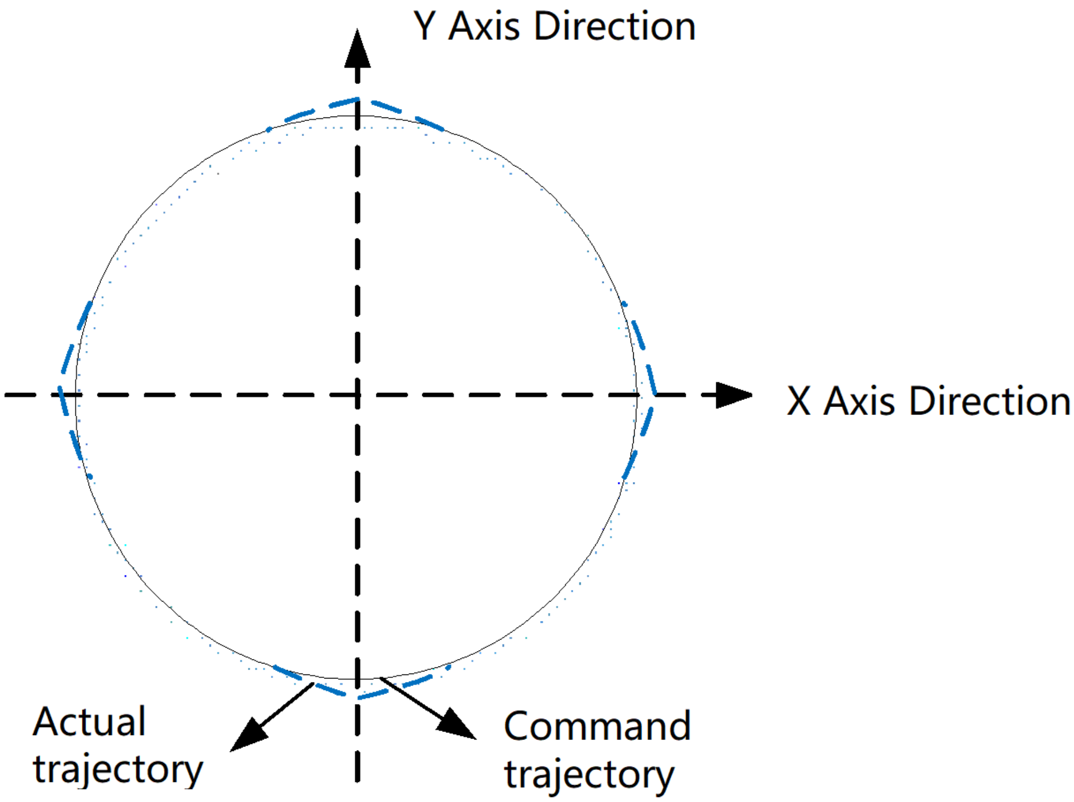


Related parameters:

serial number Pr8.03	name	Observation of Load Torque Disturbance Enable			Set effective	Effective immediately	data range	0~32767
	accessibility	RW	unit		Related modes	ALL	factory settings	0
Bit0: 0- Invalid observation of load torque disturbance;1- Enable observation of load torque disturbance.								
serial number Pr6.24	name	Load variation compensation filter			Set effective	Effective immediately	data range	0.10~25.00
	accessibility	RW	unit	Ms	Related modes	ALL	factory settings	0．53
Used to set the responsiveness of the load torque disturbance observer, the smaller the value, the faster the response, but if it is too small, it may cause system instability. The recommended calculation formula is as follows: $\mathrm{Pr6.24} = \frac{1000}{6.28*\mathrm{Pr1.01}\ (\text{1st−order velocity proportional gain})}\ 4$								

4.3.8 Suppression of Quadrant Bulges

The quadrant protrusion suppression function can effectively suppress the "quadrant pattern" caused by cross quadrant interpolation motion of two or more axes, especially in working conditions such as metal arc cutting, as shown in the following figure (taking circular machining as an example).



Scope of Application

	Action conditions for quadrant protrusion inhibition function
operation mode	In position mode and fully closed-loop mode
other	The servo is in the enabled open state The servo motor needs to be in a normal rotatable state without any other faults

Notes:

When using the quadrant protrusion suppression function in practice, the friction compensation function needs to be set to invalid first (Pr6.08 and Pr6.09 parameters are both set to 0), and the corresponding parameters are as follows:

serial number	name	Positive direction torque compensation value	Set effective	Effective immediately	data range	-100~100

Pr6.08	accessibility	RW	unit	%	Related modes	P	factory settings	0
During position control, the dynamic friction compensation value is set to be added to the torque command when receiving positive position commands. When the friction compensation mode with automatic adjustment is effective, update this parameter. When using the quadrant bulge suppression function, please set it to 0.								

serial number Pr6.09	name	Negative direction torque compensation value			Set effective	Effective immediately	data range	-100~100
	accessibility	RW	unit	%	Related modes	P	factory settings	0
During position control, the dynamic friction compensation value is set to be added to the torque command when receiving negative direction position commands. When the real-time automatic adjustment friction compensation mode is effective, update this parameter. When using the quadrant bulge suppression function, please set it to 0.								

Associated parameters:

serial number Pr5.45	name	Positive interpolation value of quadrant bulge			Set effective	Effective immediately-	data range	-100%~100%
	accessibility	RW	unit	%	Related modes	-	factory settings	0
Quadrant protrusion positive interpolation value, percentage of rated current.								

serial number Pr5.46	name	Negative interpolation value of quadrant bulge			Set effective	Effective immediately-	data range	-100%~100%
	accessibility	RW	unit	%	Related modes	-	factory settings	0
Quadrant convex negative interpolation value, percentage of rated current.								

serial number Pr5.47	name	Quadrant bulge compensation delay time			Set effective	Effective immediately-	data range	0~1000
	accessibility	RW	unit	ms	Related modes	-	factory settings	0
Quadrant bulge compensation delay time, unit: ms. This parameter is currently invalid and does not need to be set.								

serial number	name	Quadrant bulge compensation filter setting L	Set effective	Effective immediately-	data range	0~10000

Pr5.48	accessibility	RW	unit	ms	Related modes	-	factory settings	0
Quadrant bulge compensation filter setting, unit: ms, this parameter is currently invalid and does not need to be set.								

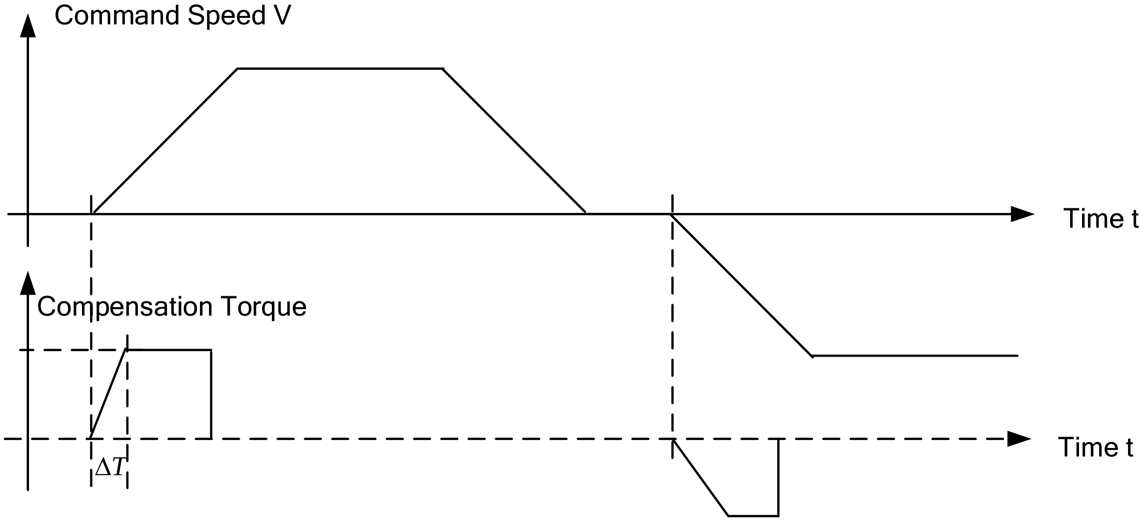
serial number Pr5.49	name	Quadrant bulge compensation filter setting H		Set effective	Effective immediately-	data range	0~10000
	accessibility	RW	unit ms	Related modes	-	factory settings	0
Quadrant bulge compensation filter setting, unit: ms, this parameter is currently invalid and does not need to be set.							

serial number Pr5.50	name	Establishment time of quadrant bulge compensation			Set effective	Effective immediately-	data range	0~1000
	accessibility	RW	unit	ms	Related modes	-	factory settings	0
The establishment time of quadrant bulge compensation is the time required for the current to rise to the compensation value								

serial number Pr5.51	name	Quadrant bulge compensation holding time			Set effective	Effective immediately-	data range	0~1000
	accessibility	RW	unit	ms	Related modes	-	factory settings	0
Quadrant bulge compensation holding time, unit: ms, which is the time to maintain the compensation value								

Usage:

The usage method of the modified function is shown in the following figure:


Command Speed V
Time t
Compensation Torque
Time t
ΔT

4.4 Vibration Suppression

4.4.1 Mechanical resonance suppression

When the mechanical rigidity is low, vibrations and abnormal noises may occur due to resonance caused by shaft torsion, and sometimes the gain setting value cannot be increased.In this case, by suppressing the resonance point with a notch filter, higher gain or reduced vibration can be set.

1. Torque command filter (Pr1.04, 1.09)

Set the filter time constant to attenuate the gain near the resonance frequency.

The cut-off frequency of the torque command filter can be calculated using the following formula.

Cut off frequency (Hz) fc=1/(2 π x set parameter value x 0.00001)

2. Notch filter

Adaptive filter (Pr2.00, Pr2.07-2.12)

By using adaptive filters, automatic suppression of vibrations caused by resonance can be controlled.Please set Pr2.00 "Adaptive Filter Mode Setting" to a parameter other than 0.When the resonance point affects the motor speed, the parameters of the third and fourth notch filters are automatically set according to the corresponding number of adaptive filters.

Pr2.00	Adaptive filter mode	1: One effective adaptive filter 2: Two effective adaptive filters
Pr2.07	3rd notch frequency	When no resonance point is found, set to 5000.
Pr2.08	Third notch width	Automatically set when the adaptive filter is effective.
Pr2.09	Depth of the third notch	
Pr2.10	4th notch frequency	Automatically set the second resonance frequency estimated by the adaptive filter. When no resonance point is found, set to 5000.
Pr2.11	4th notch width	Automatically set when 2 adaptive filters are effective.
Pr2.12	4th notch depth	

● Notch filter (Pr2.01-2.12, 2.24-2.26)

Equipped with 5 notch filters, the parameters of frequency, width, and depth can be manually adjusted.

Pr2.01	First notch frequency	Set the center frequency of the first notch filter. *1
Pr2.02	First notch width	Set the frequency width of the first notch filter.
Pr2.03	First notch depth	Set the depth of the center frequency of the first notch filter.
Pr2.04	Second notch frequency	Set the center frequency of the second notch filter. *1
Pr2.05	Second notch width	Set the frequency width of the second notch filter.
Pr2.06	Second notch depth	Set the depth of the center frequency of the second notch filter.
Pr2.07	3rd notch frequency	Set the center frequency of the third notch filter. *1
Pr2.08	Third notch width	Set the frequency width of the third notch filter.

Pr2.09	Depth of the third notch	Set the depth of the center frequency of the third notch filter.
Pr2.10	4th notch frequency	Set the center frequency of the fourth notch filter. * 1
Pr2.11	4th notch width	Set the frequency width of the fourth notch filter.
Pr2.12	4th notch depth	Set the depth of the center frequency of the fourth notch filter.
Pr2.24	5th notch frequency	Set the center frequency of the 5th notch filter. * 1
Pr2.25	5th notch width	Set the frequency width of the 5th notch filter.
Pr2.26	5th notch depth	Set the depth of the center frequency of the 5th notch filter.

*When the set value is 5000, the notch filter is invalid.

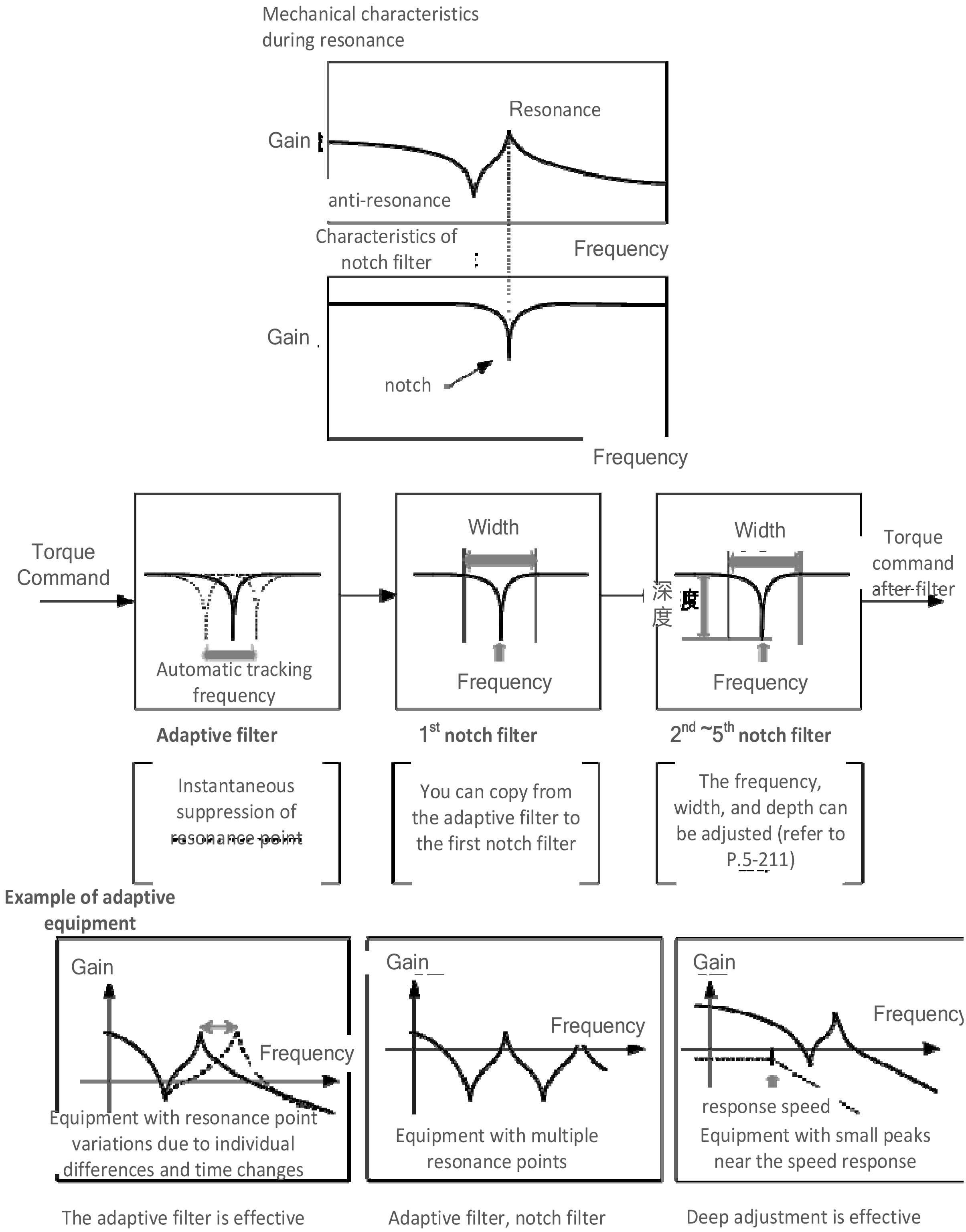


Figure 4.4.1-1 Filter Function and Example

3. Regarding notch width and depth

The ratio of the width of the notch filter, the notch center frequency at depth 0, and the frequency bandwidth with an attenuation rate of -3 [dB] is shown on the left side of the table below.

The depth of a notch filter represents the ratio of the input that completely cuts off the center frequency when set to 0 and the output input that completely passes when set to 100.When represented as [dB], the values on the right side of the table are formed.

Notch width	Frequency bandwidth/center frequency
0	0.5
1	0.59
2	0.71
3	0.84
4	1
5	1.19
6	1.41
7	1.68
8	2
9	2.38
10	2.83
11	3.36
12	4
13	4.76
14	5.66
15	6.73
16	8
17	9.51
18	11.31
19	13.45
20	16

Notch depth	Input-output ratio	［dB］ express
0	0	－∞
1	0.01	－40
2	0.02	－34
3	0.03	－30.5
4	0.04	－28
5	0.05	－26
6	0.06	－24.4
7	0.07	－23.1
8	0.08	－21.9
9	0.09	－20.9
10	0.1	－20
15	0.15	－16.5
20	0.2	－14
25	0.25	－12
30	0.3	－10.5
35	0.35	－9.1
40	0.4	－8
45	0.45	－6.9
50	0.5	－6
60	0.6	－4.4
70	0.7	－3.1
80	0.8	－1.9
90	0.9	－0.9
100	1	0

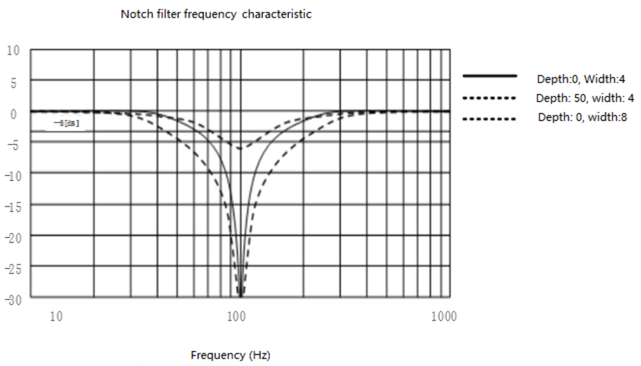


Figure 4.4.1-2 Frequency characteristics of notch filter

4. The relationship between gain adjustment and mechanical rigidity

To improve mechanical rigidity

(1) The machinery should be firmly placed on the ground to prevent any shaking.

(2) High rigidity servo couplings should be used.

(3) Use a wide synchronous belt.In addition, the tension should be set within the allowable axial overload range of the motor.

(4) Use gears with small backlash.

The inherent vibration (resonance frequency) of machinery can greatly affect the gain adjustment of servo machinery.

Machinery with low resonance frequency (=low mechanical rigidity) should not set the responsiveness of the servo system too high.

Notice: To install and debug the software "Ω Master", please contact the relevant personnel of our company.

4.4.2 End vibration suppression

In certain industrial applications, mechanical devices may experience overall shaking during operation or end shaking after reaching a designated position, which can affect equipment performance.In response to the vibration at the end of the device and the overall shaking of the device, it is necessary to eliminate the vibration frequency components from the position command in order to achieve the function of reducing vibration.This product provides 4 damping filters that can simultaneously suppress 4 frequency points.

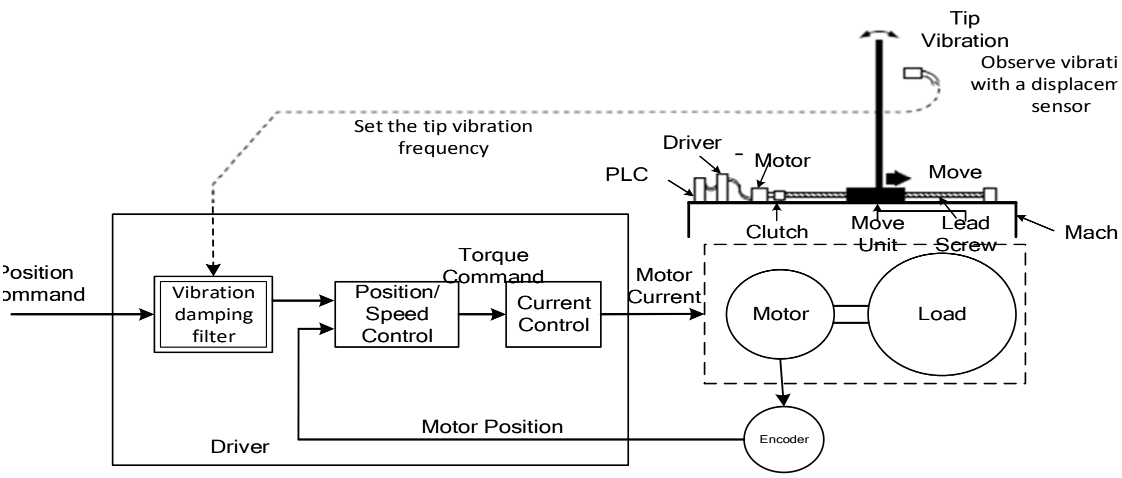


Figure 4.4.2-1 Vibration Control Block Diagram

Scope of Application

If the following conditions are not met, this function cannot be used

	Vibration control action conditions
control mode	Position control or fully closed-loop control. Pr0.01=0: Position control

	Pr0.01=3: The first control mode for position and speed control Pr0.01=4: The first control mode of position and torque control Pr0.01=6: Fully closed-loop control

Precautions

Under the following conditions, sometimes it cannot operate normally or the damping effect is not significant

	Factors affecting the effectiveness of vibration control
load	Vibration caused by reasons other than instructions (external forces, etc.). When the ratio of resonance frequency to anti resonance frequency is large. When the vibration frequency is outside the range of 1-300 Hz.

Instructions for use

1. Vibration frequency setting (Pr2.14, Pr2.16, Pr2.18, Pr2.20)

Measure the vibration frequency at the end of the measuring device.The laser locator can be used for direct measurement, and the vibration frequency (Hz) can be read from the measured waveform and input as the damping frequency parameter.

When there is no measuring instrument, use the oscilloscope function of the servo upper computer debugging software, as shown below, to read the frequency (Hz) of the vibration based on the position deviation waveform and set it.

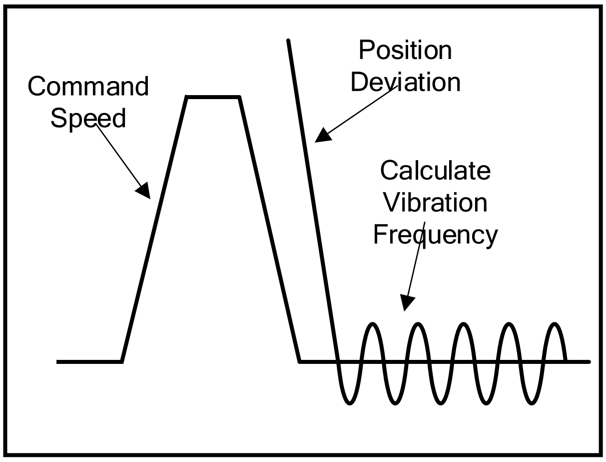


Figure 4.4.2-2 Vibration Frequency Measurement

2. Damping coefficient setting (Pr2.15, Pr2.17, Pr2.19, Pr2.21) The damping coefficient setting range is 0-1, and the smaller the value, the stronger the effect.

3. Switching selection of damping filters (Pr2.13): According to actual needs, switch the 1st to 4th damping filters

Pr2.13	VS-SEL1	VS-SEL2	The first vibration control	Second vibration control	The third vibration control	4th vibration control
0	-	-	O	O		
1	-	OFF	O		O	
	-	ON		O		O
2	OFF	OFF	O			

	OFF	ON		O		
	ON	OFF			O	
	ON	ON				O

Pr2.13	Position instruction direction	The first vibration control	Second vibration control	The third vibration control	4th vibration control
3	positive direction	O		O	
	negative direction		O		O

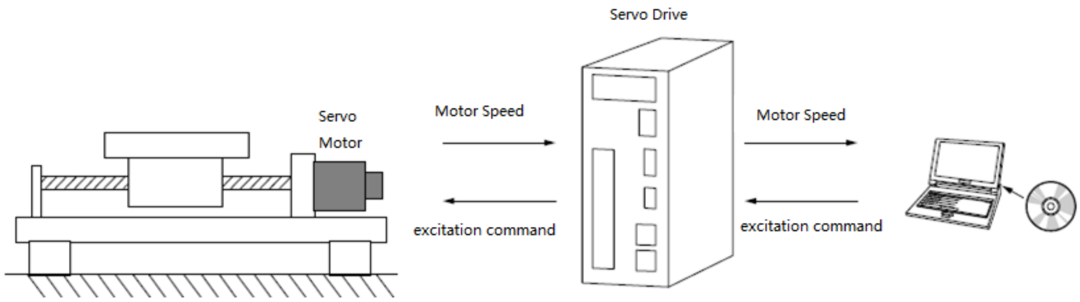
Attention: The switching of vibration control is performed during the positioning completion output, and when the instruction pulse with a fixed time (0.1ms) transitions from a 0 state to a state other than 0 and the instruction is activated.

Especially when switching to high damping frequency or ineffective, if the positioning completion range is too large, there will be accumulated pulse residue in the filter at the above time, and it will quickly return to its original position after switching, so the motor will operate at a higher speed than the previous command. Please be aware.

4.5 Mechanical Characteristics Analysis

1. Function Overview

Connect the servo unit and computer to measure the frequency characteristics of the machinery.Mechanical frequency characteristics can be measured without using measuring devices.



Apply vibration to the machine through a servo motor and measure the frequency characteristics relative to the motor torque and speed.The frequency characteristics measured can reveal the mechanical resonance point.Can master the resonance of machinery and use it as a reference element for adjusting servo and changing machinery.Some mechanical rigidity cannot fully utilize the performance of servo, so it is necessary to consider replacing the machinery.The adjustment of servo refers to the reference values used for adjusting parameters such as servo rigidity and torque filtering time.In addition, it can be used as input values for parameters such as notch filter settings.

2. Frequency characteristics

By applying vibration to the machine through a servo motor and measuring the frequency characteristics from torque to motor speed, the characteristics of the machine can be determined.In general machinery, if the

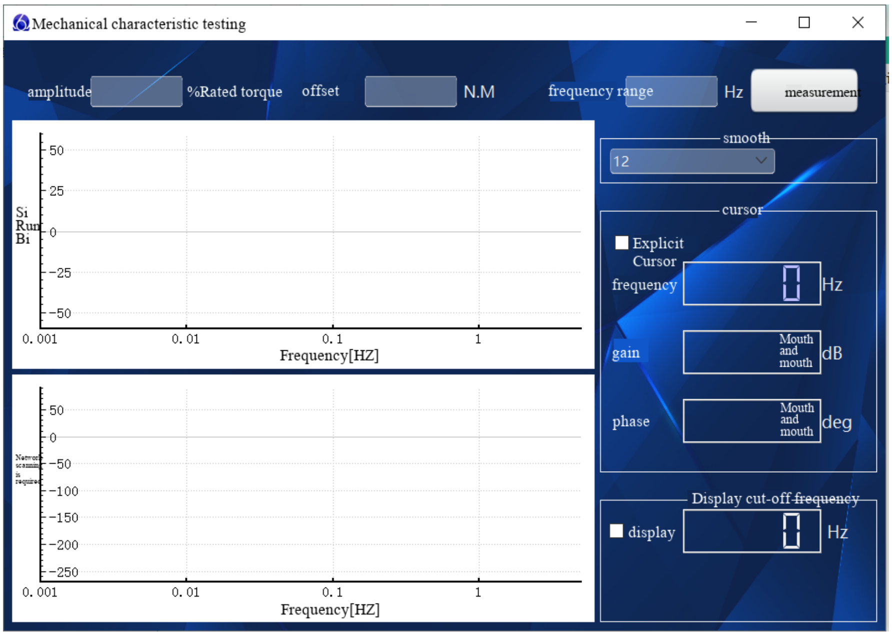
frequency characteristics are plotted as a gain and phase chart (Bode plot) as shown in the figure below, the resonance frequency can be clearly seen.The Bode plot displays the response magnitude (amplitude frequency characteristics) and phase delay (phase frequency characteristics) of the mechanical response, including torque, by frequency.In addition, the frequency and phase delay of the gain troughs (anti resonance points) and peaks (resonance points) can be used to understand the mechanical resonance frequency.
When using servo motor optical axis or high rigid mechanical load, the amplitude frequency characteristics and phase frequency characteristics are slowly changing Bode plots.

Note:

Mechanical analysis will actually drive the machinery for measurement, so there may be danger due to mechanical action.Before executing this function, please follow the instructions and manual provided by Ω Master's operating interface.

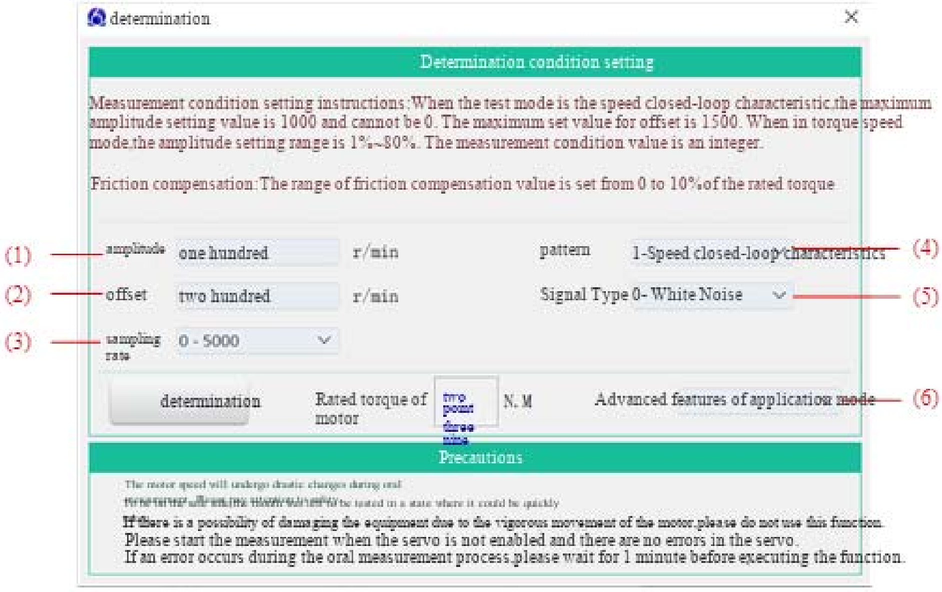
3. Operation steps

1) Click the 'Mechanical Characteristic Analysis' button from the main drawing of Ω Master to the navigation bar, and a dialog box for mechanical characteristic analysis will pop up.



2) Click the 'Measurement' button to bring up the dialog box for setting the conditions for mechanical characteristic analysis and measurement

- Screen display

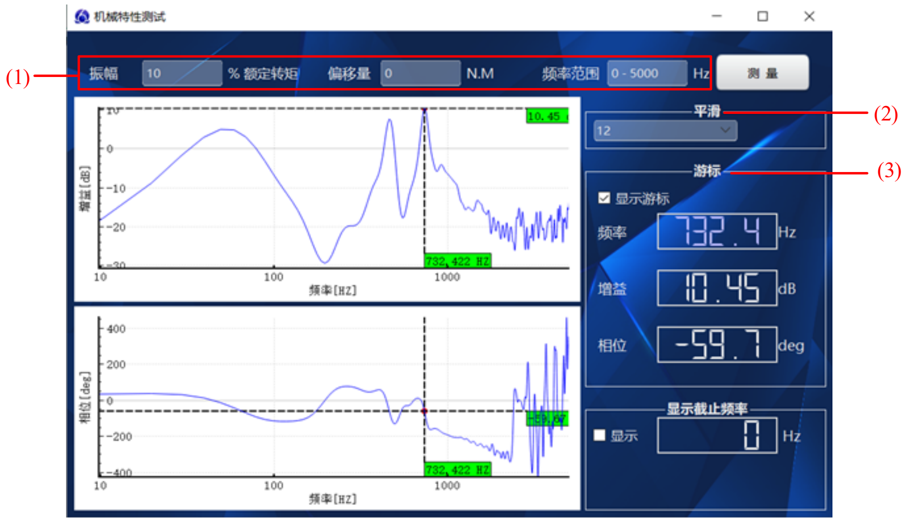


- Display content description

NO.	project	content
(1)	amplitude	When the mode is selected as 1-speed closed-loop characteristic, the maximum amplitude is set to 1000 and cannot be 0, with the amplitude unit being [r/min]; When the mode is selected as 0-torque speed, the amplitude setting range is 1-80, and the amplitude unit is [%];
(2)	offset	When the mode selection is 1-speed closed-loop characteristic, the maximum offset is set to 1500, and the offset unit is [r/min]; When the mode is selected as 0-torque speed (usually), no offset is set;
(3)	sampling rate	The smaller the sampling rate range, the longer the excitation time. Generally, 0-5000 is chosen
(4)	pattern	0-Analyze the mechanical characteristics under open-loop speed analysis 1. Analyze the mechanical characteristics under the speed closed loop
(5)	signal type	0- Use white noise as the excitation signal; 1. Use Chirp signal as the excitation signal;
(6)	application mode	Normal mode: default signal type is white noise Advanced mode: You can choose the type of excitation signal

[Note] The set values for the measurement conditions are all integers

3) Click [Test], Screen display:



Display content description:

NO.	project	content
(1)	Measurement conditions	Display the measurement conditions in step 2
(2)	smooth	Filter the output signal, and the larger the smoothing coefficient, the smoother the output Bode plot, which helps to better locate the resonance point
(3)	cursor	Checking the display cursor allows for manual measurement of frequency gain phase; Checking the display cutoff frequency can automatically display the resonance frequency

5 Basic Functions

5.1 Setting of Instruction Division Frequency Ratio (Electronic Gear Ratio)

The Ω 6-DP series servo drive corresponds to the electronic gear ratio set based on the shaft parameters Pr0.08 (the number of command pulses per motor rotation), Pr0.09 (electronic gear numerator), and Pr0.10 (electronic gear denominator).The relationship between position resolution, movement speed, and instruction multiplication ratio is as follows:

Electronic gear is the function of multiplying the position command input from the upper level by the electronic gear ratio set by the object as the position command for position control.According to the use of this function, the motor rotation/movement amount for each command unit can be set arbitrarily.

5.1.1 Function Description

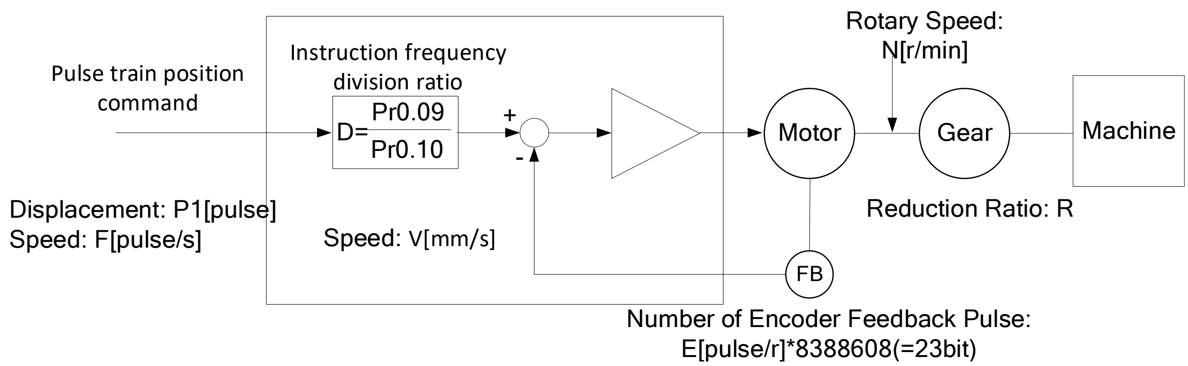


Figure 5.1.1-1 Relationship between Position Resolution, Movement Speed & Instruction Division Frequency Ratio

As an example of a motor, let's take screw drive as a mechanical example.

If the screw pitch is L [mm], the actual screw movement M [mm] of the relative movement command P1 [pulse] is as shown in equation (1).$M = P1 * (D/E) * (1/R) * L$ ——————————(1)

Therefore, the position resolution (equivalent to the movement amount Δ M of instruction 1 pulse) is given by the following formula (2).

2^n	decimal	2^n	decimal
2^0	1	2^{12}	4096
2^1	2	2^{13}	8192
2^2	4	2^{14}	16384
2^3	8	2^{15}	32768
2^4	16	2^{16}	65536
2^5	32	2^{17}	131072
2^6	64	2^{18}	262144
2^7	128	2^{19}	524288
2^8	256	2^{20}	1048576
2^9	512	2^{21}	2097152
2^{10}	1024	222	4194304
2^{11}	2048	2^{23}	8388608
	Instruction multiplication ratio $D=\frac{\Delta M \times E \times R}{L}$		$D=\frac{Pr0.09}{Pr0.10}$
Screw pitch L=10 mm Reduction ratio R=1			Pr0.09=41943040 Pr0.10=100000

Position resolution ΔM=0.0005mm When the encoder is 23 bits (E=223P/r)	$\frac{0.0005\times 2^{23}\times 1}{10}=\frac{5\times 2^{23}}{10\times 10^{4}}=\frac{41943040}{100000}$	

<table>
<tr><td></td><td colspan="3">Motor rotation speed (r/min) $N=F\times\frac{D}{E}\times 60$</td></tr>
<tr><td>Lead screw pitch
L=20mm
Reduction ratio
R=1
Position resolution
ΔM=0.0005 mm
Line driver pulse input 500kpulse/s
When the encoder is 23 bits</td><td colspan="3">$500000\times\frac{0.0005\times 2^{23}}{20}\times\frac{1}{2^{23}}\times 60=750$</td></tr>
<tr><td rowspan="4">Ditto.
To achieve 2000r/min</td><td>Instruction split multiple Frequency ratio</td><td>$D=\frac{N\times E}{F\times 60}$</td><td>$D=\frac{Pr0.09}{Pr0.10}$</td></tr>
<tr><td colspan="2">$D=\frac{2000\times 2^{23}}{500000\times 60}=\frac{2000\times 2^{23}}{2000\times 500\times 30}=\frac{8388608}{15000}$</td><td>Pr0.09=8388608
Pr0.10=15000</td></tr>
<tr><td colspan="3">Movement amount of command pulse (mm)
(Position resolution) $\Delta M=\frac{D}{E}\times\frac{1}{R}\times L$</td></tr>
<tr><td colspan="3">$\frac{2000\times 2^{23}}{500000\times 60}\times\frac{1}{2^{23}}\times\frac{1}{1}\times 20=0.00133mm$</td></tr>
</table>

5.1.2 Relevant parameters

serial number	name	Number of command pulses per revolution of the motor	Effective method	Power on again	data range	0~16777216

Pr0.08*	Modbus address	0x3010	unit	pluse	Related modes	P	factory settings	10000
Set the command pulse for each rotation of the motor. When this setting value is 0, Pr0.09 "first instruction multiplier numerator" and Pr0.10 "instruction multiplier denominator" are valid.								

serial number Pr0.09*	name	The first instruction is divided into multiple frequency molecules			Effective method	Power on again	data range	$0\sim2^{30}$
	Modbus address	0x3012	unit	-	Related modes	P	factory settings	0
The molecule that sets the instruction pulse input for frequency division processing, namely the electronic gear ratio molecule. Pr0.08 is valid when the number of command pulses per revolution of the motor is 0.								

serial number Pr0.10*	name	Instruction multiplier denominator			Effective method	Power on again	data range	$1\sim2^{30}$
	Modbus address	0x3014	unit	-	Related modes	P	factory settings	10000
Set the denominator of the instruction pulse input multiplication processing, which is the denominator of the electronic gear ratio. Pr0.08 is valid when the number of command pulses per revolution of the motor is 0.								

The relationship between Pr0.08, Pr0.09, and Pr0.10 during position control

Pr0.08	Pr0.09	Pr0.10	Instruction division frequency processing
1~8388608	— (No impact)	— (No impact)	Command Pulse Input → $\frac{\text{Encoder Resolution}}{\text{Pr0.08 Setting Value}}$ → Position Command Unrelated to the settings of Pr0.09 and 0.10, the above figure is processed based on the set value of Pr0.08.
0	0	1~1073741824	Command Pulse Input → $\frac{\text{Encoder Resolution}}{\text{Pr0.10 Setting Value}}$ → Position Command When both Pr0.08 and Pr0.09 are 0, perform the above graph processing based on the set value of Pr0.10.
	1~1073741824	1~1073741824	Command Pulse Input → $\frac{\text{Pr0.09 Setting Value}}{\text{Pr0.10 Setting Value}}$ → Position Command When Pr0.08 is 0 and Pr0.09 ≠ 0, perform the above

			graph processing based on the set values of Pr0.09 and 0.10.

Note:

Although the values of the denominator and numerator can be set to any value, their action cannot be guaranteed when extreme division or multiplication ratios are set.Please select a frequency division/multiplication ratio range between 1/1000 and 8000 times.

5.2 Position Control Mode

5.2.1 Overview of Position Control Mode

In position mode, the servo will control the motor shaft to move the corresponding distance based on the received pulse command, achieving position control of the load.The following provides an explanation of the basic settings for position control.

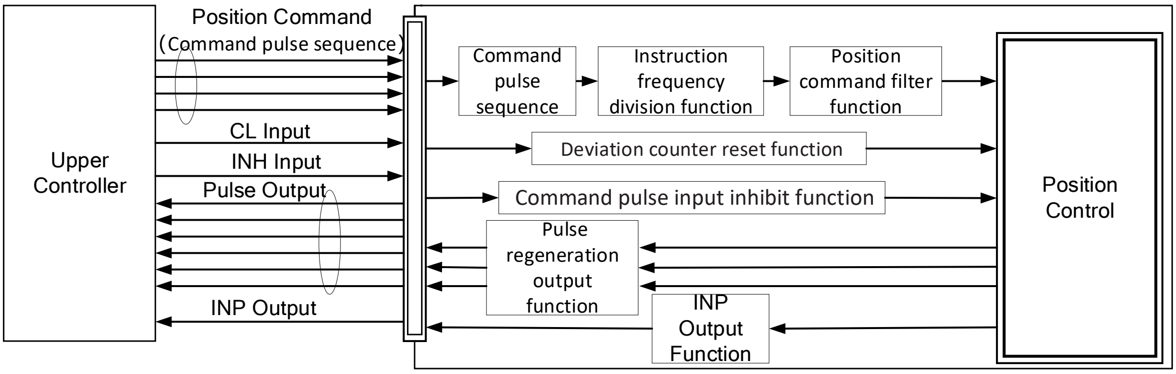


Figure 5.2.1-1 Basic settings of controller input

(1) Instruction pulse input processing

The position command (pulse train) corresponds to the following three forms of input.

A&B phase pulse

・ CW/CCW

Pulse train+direction

According to the specifications of the upper controller and the servo settings, set the pulse shape and pulse counting method.

The pulse input signal is as follows:

Input: "PULSH1, PULSH2, SIGNH1, SIGNH2" differential input (4Mpulse/s)

● Associated parameters

Parameter No	parameter name	set the scope	function
Pr0.06	Command pulse	0~1	Set the direction of instruction pulse input counting.

	rotation direction setting		
Pr0.07	Command pulse input mode setting	0-3	Set command pulse input mode

(2) Electronic gear function

It has the function of multiplying the pulse command input by the upper controller with the ratio of the set multiplier as the position command for position control and giving it to the position loop.Through this function, the motor rotation and movement of the unit input command pulse can be set arbitrarily.When the pulse output capability of the upper controller is insufficient, resulting in the motor not reaching the desired speed, this function can be used to increase the pulse command frequency.

● Associated parameters

Parameter No	parameter name	set the scope	function
Pr0.08	Number of command pulses per revolution	0~16777216	Set the number of command pulses for each revolution of the motor.
Pr0.09	The first instruction is divided into multiple frequency molecules	0~1073741824	Set the molecules for frequency division processing corresponding to the instruction pulse input.
Pr0.10	Instruction multiplier denominator	1~1073741824	Set the denominator for the multiplication processing of the corresponding instruction pulse input.

(3) Position instruction filter function

To smooth the position command after frequency division (electronic gear), a command filter needs to be set.

● Associated parameters

Parameter No	parameter name	set the scope	unit	Function
Pr2.22	Instruction smoothing filter	0~1000	ms	Set the time constant of the first-order delay filter corresponding to the position instruction.
Pr2.23	Instruction FIR filter	0~1000	ms	Set the time constant of the FIR filter corresponding to the position instruction.

(4) Pulse output function

The movement amount can be transmitted from the servo driver to the upper controller using AB phase pulse method.The Z-phase signal is output once every 1 revolution of the motor.Output resolution and B-phase logic can be set using available parameters.

● Associated parameters

Parameter	parameter name	set the scope	unit	function

No				
Pr0.11	Number of output pulses per revolution	1~2097152	P/r	Set the pulse output resolution based on the number of pulses output for each rotation of OA and OB.
Pr0.12	Pulse output logic inversion/output source selection	0-3	—	Set the B-phase logic and output source for pulse output.According to this parameter, the phase relationship between the A-phase pulse and the B-phase pulse can be reversed by reversing the B-phase pulse.
Pr5.03	Pulse output frequency division denominator	0~16777216	—	When the number of output pulses per revolution is not an integer, please set it to a value other than 0, and use Pr0.11 as the division numerator and Pr5.03 as the division denominator to set the division ratio.
Pr5.33	Effective setting of pulse regeneration output limit	0~1	—	Enable/disable error detection (Err28.0 "pulse regeneration output limit protection).

(5) Deviation counter reset function

This function is to reset the value of the position control position deviation counter to zero by resetting the deviation counter input (CL).

● Associated parameters

Parameter No	parameter name	set the scope	function
Pr5.17	Counter reset input mode	0-4	Set the clearing conditions for the bias counter to reset the input signal.

(6) Localization completion output (INP) function

The positioning completion status can be confirmed through the positioning completion output (INP).Under position control, the absolute value of the position deviation count becomes ON when it is below the positioning completion range set by the parameters. In addition, the presence or absence of position commands can be added to the judgment criteria.

● Associated parameters

Parameter No	parameter name	set the scope	unit	Function
Pr4.31	Positioning	0~2097152	Instruction	Set the time for the position deviation of the

	completion range		unit	output positioning completion signal (INP1).
Pr4.32	Positioning completed output setting	0~10	—	Select the output conditions for the positioning completion signal (INP1).
Pr4.33	INP retention time	0-30000	1ms	Set the hold time for Pr4.32 when the "positioning completion output setting" is set to 3.
Pr4.42	Positioning completion range 2	0~2097152	Instruction unit	Set the dynamic position deviation of output positioning completion signal 2 (INP2).

(7) Instruction pulse disable (INH) function

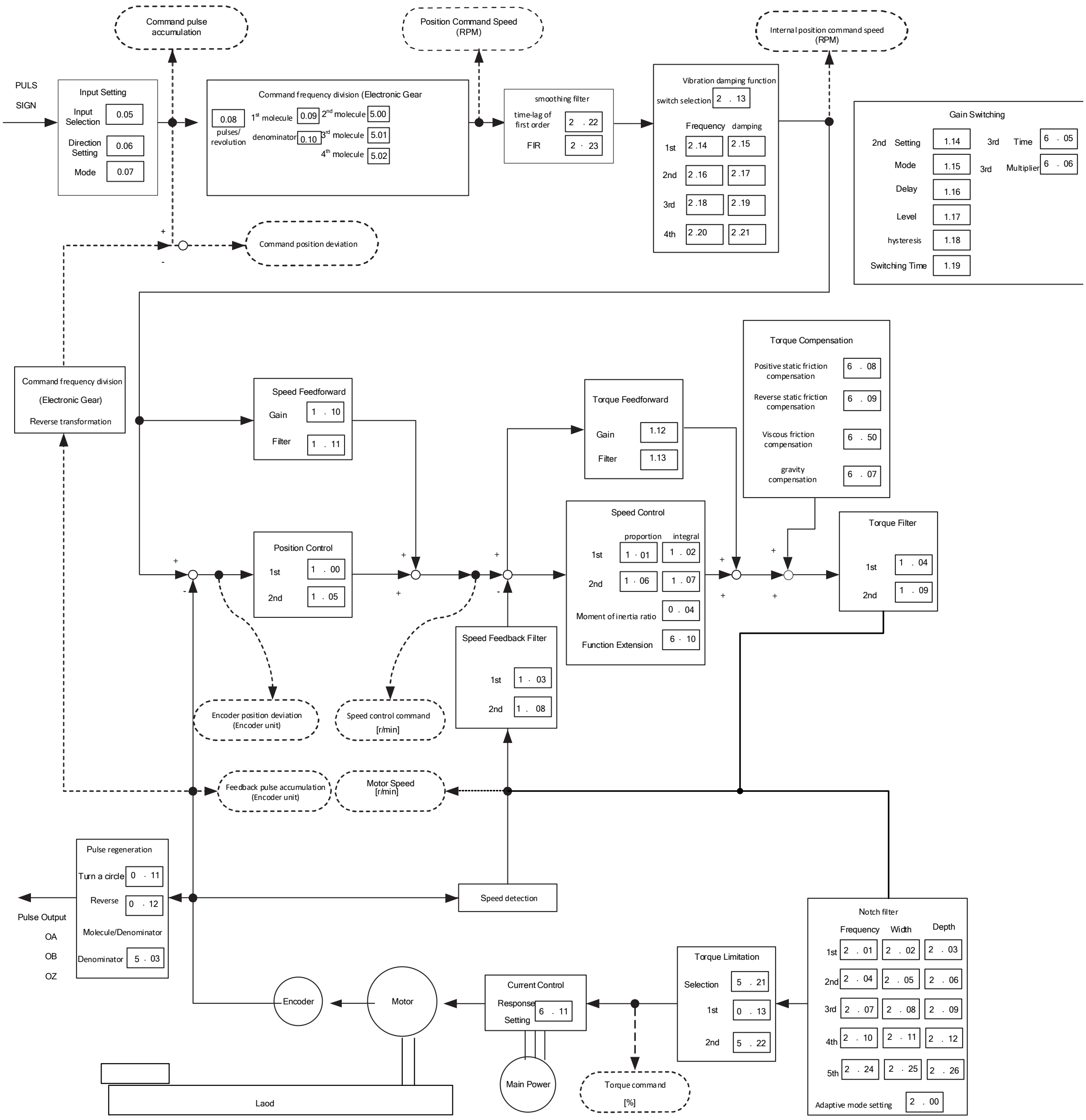
Using the instruction pulse disable input signal (INH) can force the instruction pulse counter to stop processing.When the INH input is ON, the servo driver ignores the instruction pulse input and does not count the pulses.

This function is invalid in the factory state.When using, please change the setting of Pr5.18 'Invalid input of command pulse prohibition'.

● Associated parameters

Parameter No	parameter name	set the scope	function
Pr5.18	Invalid command pulse input prohibition setting	0~1	Set the command pulse to prohibit input of valid/invalid.
Pr5.19	Command pulse prohibition input read setting	0-5	Select the signal reading cycle that prohibits input of instruction pulses.When the signal state with a set reading cycle matches the complex number of times, update the signal state.

5.2.2 Position Control Mode Block Diagram



5.3 Speed Control Mode

5.3.1 Overview of Speed Control Mode

According to the simulated speed command input from the upper controller, or the servo controls the speed based on the internal speed command set by the servo driver.

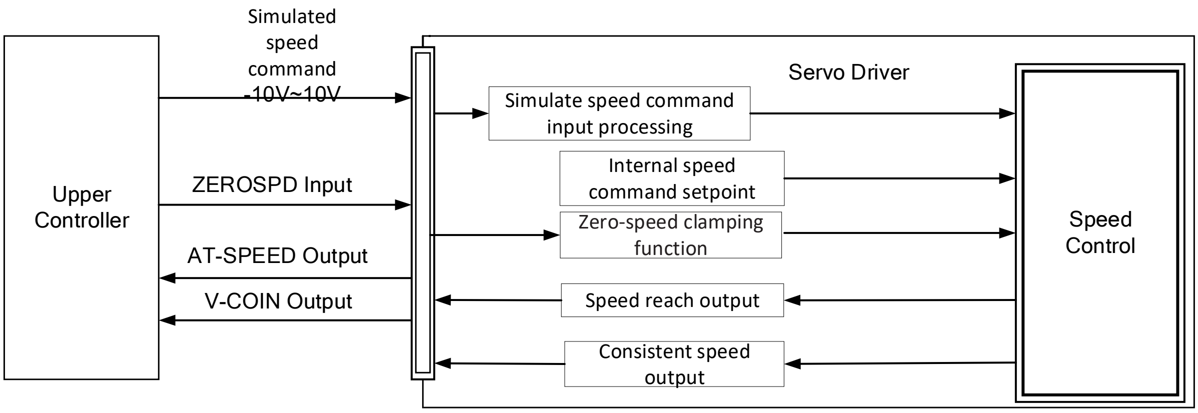


Figure 5.3.1-1 Speed Analog Control Mode

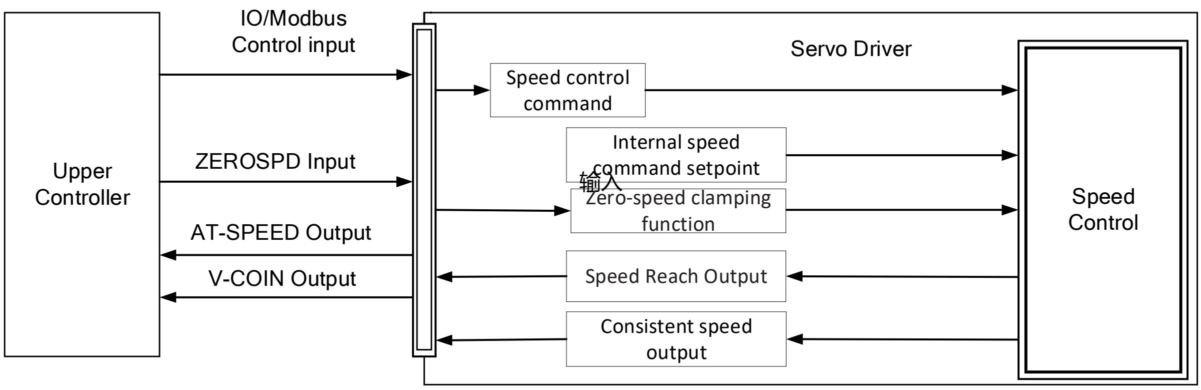


Figure 5.3.1-2 Speed Analog Control Mode

(1) Speed control through analog speed commands

Simulate the speed command input (voltage) for AD conversion to obtain a digital value, which will be converted into the speed command value.To remove instruction noise, a filter can be set and zero drift adjustment can be performed

Parameter No	parameter name	set the scope	unit	function
Pr3.00	Speed setting inside and outside switch	0-3	—	Select the speed command input method in speed control mode
Pr3.01	Speed command direction Specify selection	0~1	—	Method for specifying the positive/negative direction of the speed command selection
Pr3.02	Speed command input gain	10~2000	（r/min）/V	Set the first speed of internal command speed
Pr3.03	Reverse speed command input	0~1	one	Set the second speed for internal command speed
Pr4.22	Analog input 1	-10000~	mv	Set the third speed for internal command

	(AI1) zero drift setting	10000		speed
Pr4.23	Analog input 1 (AI1 zero drift setting)	0~64	ms	Set the 4th speed for internal command speed

(2) Speed control through internal speed commands

Perform speed control based on the internal speed command values set to the servo parameters.By using the internal command speed selection 1-3 (INTSPD1-3), one can choose from a maximum of 8 internal speed command settings.The factory state is simulated speed command setting.Use Pr3.00 to switch between internal and external speed settings.

● Associated parameters

Parameter No	parameter name	set the scope	unit	function
Pr3.00	Speed setting inside and outside switch	0-3	—	Select the speed command input method in speed control mode
Pr3.01	Speed command direction Specify selection	0~1	—	Method for specifying the positive/negative direction of the speed command selection
Pr3.04	Speed setting 1st speed	-20000 to 20000	r/min	Set the first speed of internal command speed
Pr3.05	Speed setting second speed			Set the second speed for internal command speed
Pr3.06	Speed setting 3rd speed			Set the third speed for internal command speed
Pr3.07	Speed setting 4th speed			Set the 4th speed for internal command speed
Pr3.08	Speed setting 5th speed			Set the 5th speed for internal command speed
Pr3.09	Speed setting 6th speed			Set the 6th speed for internal command speed
Pr3.10	Speed setting 7th speed			Set the 7th speed for internal command speed
Pr3.11	Speed setting 8th speed			Set the 8th speed for internal command speed

(3) Zero speed clamping (ZEROPD) function

By using zero speed clamp input, the speed command can be forcibly set to 0.

● Associated parameters

Parameter No	parameter name	set the scope	unit	function
Pr3.15	Zero speed clamping	0-3	—	Set zero speed clamping function.

	function choice			
Pr3.16	Zero speed clamping level	10-20000	r/min	Set the time to switch to position control when Pr3.15 'Zero Speed Clamping Function Selection' is set to 2 or 3.

(4) Speed reaching output (AT-SPEED)

When the motor speed reaches the speed set by Pr4.36 "reaching speed", the output speed reaches the output (AT-SPEED) signal.

● Associated parameters

Parameter No	parameter name	set the scope	unit	Function
Pr4.36	Arrival speed	10-20000	r/min	Set the timing for detecting the speed reaching the output (AT-SPEED).

(5) Consistent speed output (V-COIN)

Output when the speed command (before acceleration and deceleration processing) is consistent with the motor speed.If the difference between the speed command before acceleration and deceleration processing inside the driver and the motor speed is within Pr4.35 "speed consistency width", it is considered consistent.

● Associated parameters

Parameter No	parameter name	set the scope	unit	function
Pr4.35	Consistent speed and width	10-20000	r/min	Set the detection timing for consistent speed output (V-COIN).

(6) Speed command acceleration/deceleration setting function

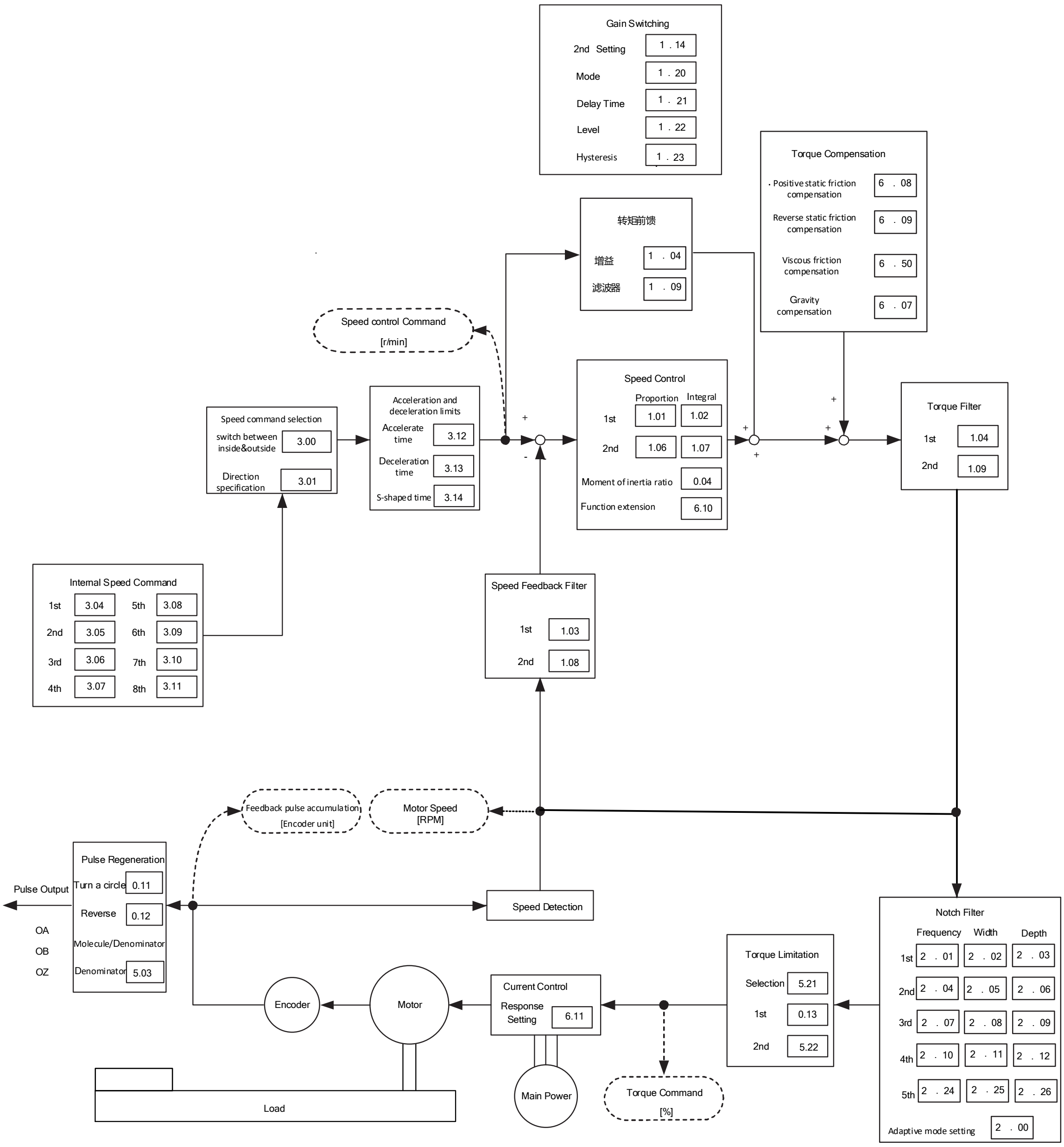
For speed command input, set the acceleration and deceleration settings inside the drive as speed commands for speed control.When entering a stepped speed command and using internal speed settings, a soft start can be performed.In addition, to reduce impact through acceleration changes, the S-shaped acceleration and deceleration function can be used.

● Associated parameters

Parameter No	parameter name	set the scope	unit	function
Pr3.12	Acceleration time setting	1 to 1000000	ms/（1000r/min）	Set the acceleration time for the acceleration processing corresponding to the speed command input.
Pr3.13	Deceleration time setting	1 to 1000000	ms/（1000r/min）	Set the deceleration time for the deceleration processing corresponding to the speed command input.
Pr3.14	S-shaped	0~1000	ms	Set the S-shaped time for

	acceleration and deceleration setting			acceleration and deceleration processing corresponding to the speed command input.

5.3.2 Speed Control Mode Block Diagram



5.4 Torque Control Mode

5.4.1 Overview of Torque Control Mode

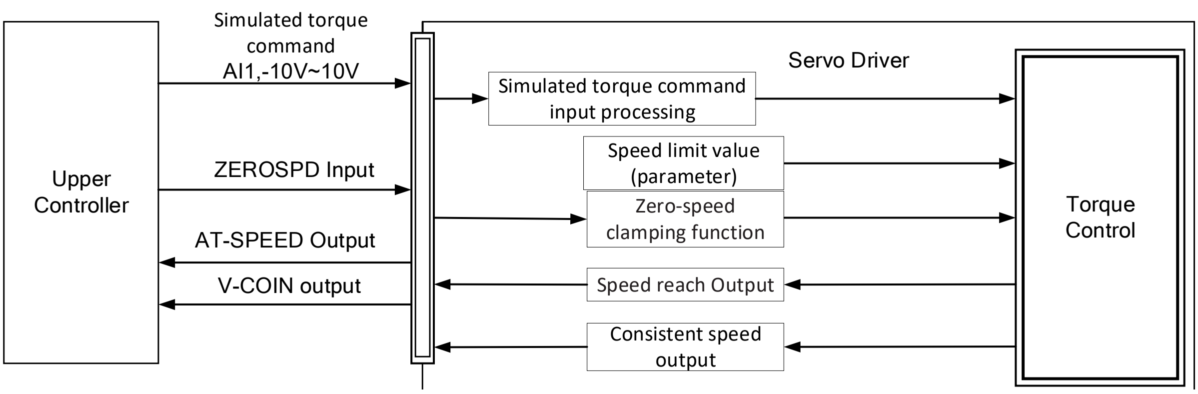
Perform torque control based on the torque command specified by the simulated voltage.In torque control, in addition to torque commands, it is also necessary to input speed limits to control the motor speed within the range of speed limit values.According to the different input methods of torque command/speed limit, it is divided into three modes.Various modes are shown below:

Pr3.17 "Torque Command Selection"

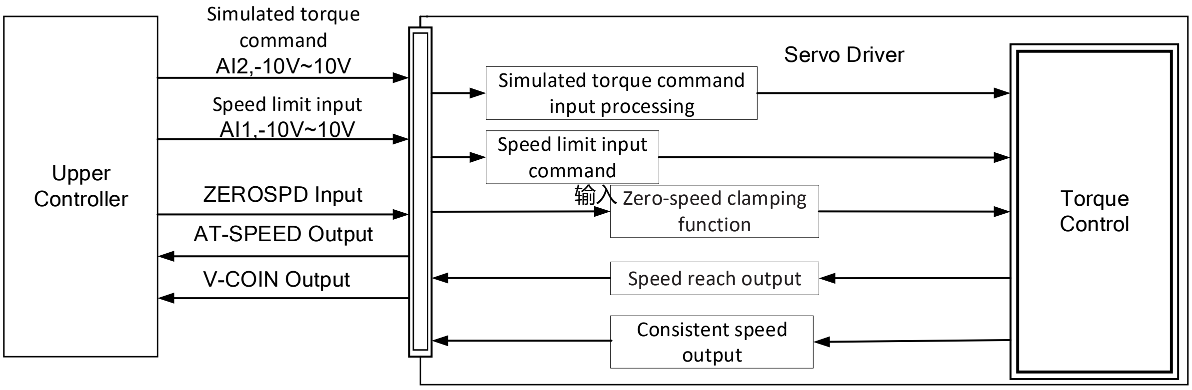
set value	parameter name	Torque command input	Speed limit input
0	Torque command selection 1	Analog Input 1	Parameter value (Pr3.21)
1	Torque command selection 2	Analog input 2	Analog Input 1
2	Torque command selection 3	Analog Input 1	Parameter values (Pr3.21, Pr3.22)

When Pr0.01 "control mode setting"=5 (speed/torque control), the torque command input is analog input 2.

<Torque command selection 1,3>



<Torque command selection 2>



(1) Simulated torque command input processing

Simulate the torque command input (voltage) for AD conversion to obtain a digital value, which will be converted into the torque command value.To remove noise, filters can be set and zero drift adjustment can be performed.

● Associated parameters

Parameter No	parameter name	set the scope	unit	Function
Pr3.18	Direction of torque command Specify selection	0~1	—	The method for specifying the positive/negative direction of torque command selection.
Pr3.19	Torque command input gain	10-100	0.1V/100%	Set the transformation gain from the voltage [V] applied to the simulated torque command (TRQR) to the torque command [%].
Pr3.20	Torque command input reverse	0~1	—	Set the polarity of the voltage applied to the simulated torque command (TRQR).
Pr4.25	Analog input 2 (AI2) zero drift setting	-10000 to 10000	mV	Set the zero drift adjustment value applied to the analog input 2 voltage.
Pr4.26	Analog	0-6400	0.01ms	Set the time constant of the first-order delay

	Input 2 (AI2) Filter Setting			filter applied to the analog input 2 voltage.

(2) Speed limit function

As a protection during torque control, speed limitation is applied.Control the speed within a range smaller than the speed limit during torque control.

Note: During speed limit control, the torque command received by the motor will not be executed according to the input simulated torque command.

When the motor speed reaches the speed limit value, the motor speed will be controlled at the speed limit value.

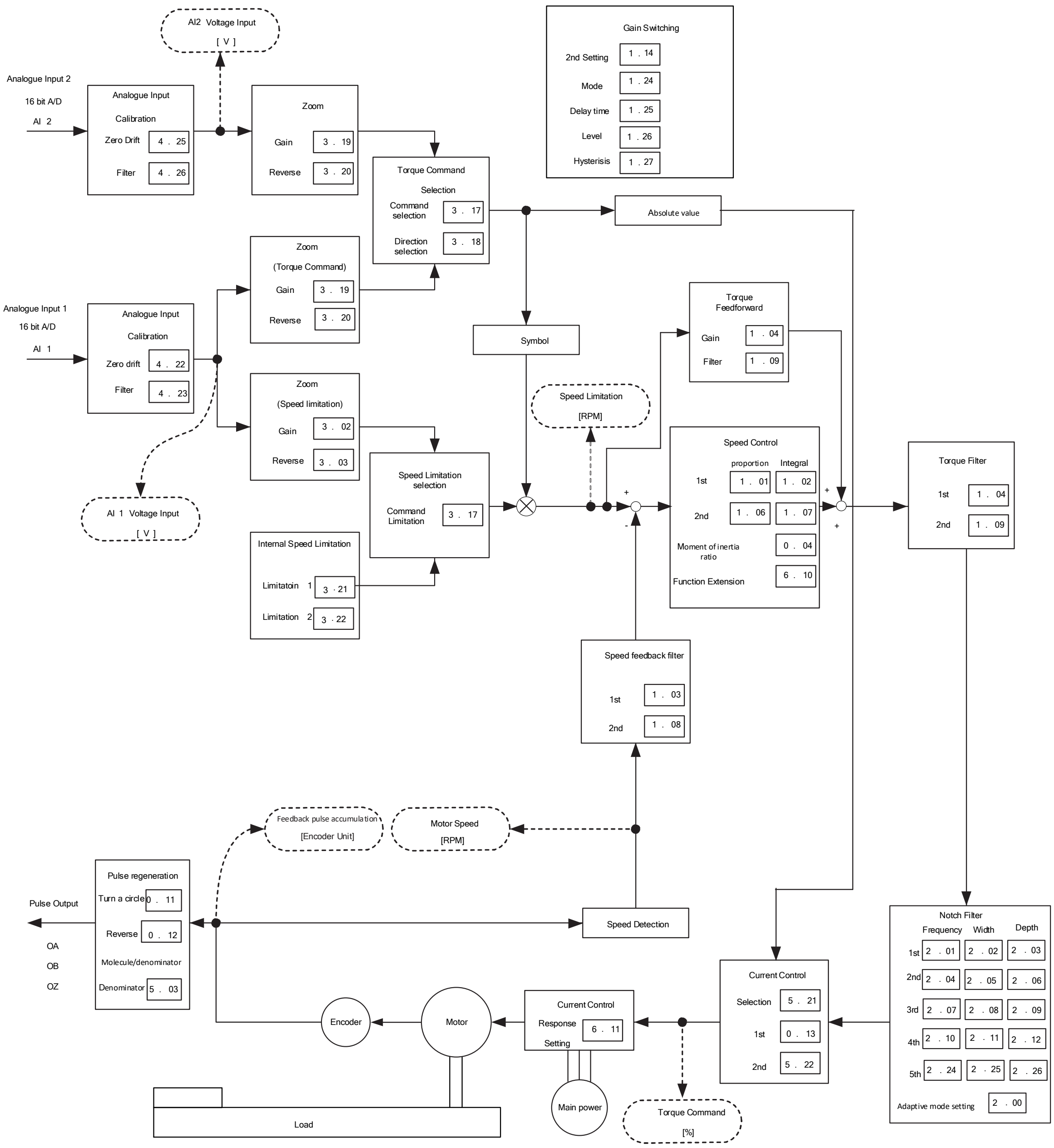
Associated parameter<torque command selection 0,2>

Parameter No	parameter name	set the scope	unit	function
Pr3.21	Speed limit value 1	0~20000	r/min	Set the speed limit value for torque control.
Pr3.22	Speed limit value 2	0~20000	r/min	Set the speed limit value for torque control.
Pr3.15	Zero speed clamping function choice	0-3	—	Set zero speed clamping function.

● Associated parameter<Torque command selection 1>

Parameter No	parameter name	set the scope	unit	function
Pr3.02	Speed command input gain	10-2000	(r/min)/V	Set the transformation gain from the voltage applied to the simulated speed limit input (SPL) to the speed limit value.
Pr4.22	Analog input 1 (AI1) zero drift setting	-10000~10000	mV	Set the zero drift adjustment value applied to the analog input 1 voltage.
Pr4.23	Analog Input 1 (AI1) Filter Setting	0-6400	0.01ms	Set the time constant of the first-order delay filter applied to the analog input 1 voltage.
Pr3.15	Zero speed clamping function choice	0-3	—	Set zero speed clamping function.

5.4.2 Torque Control Mode Block Diagram



5.5 Multi stage/Multi stage Speed Control Mode

5.5.1 Function Description

In certain situations, customers may need to control the motor without using pulse generation to achieve movement and switching of multiple fixed positions.The Ω 6-DP series servo drive can provide up to 32 relative positions and 32 absolute positions, each of which can be configured with different operating speeds.By combining different "internal position controls" to achieve the desired position, the motor is started to reach the corresponding set position of the "internal position control" by triggering the rising edge of the "selection_iO control".Different module numbers can be combined with specified inputs to correspond to different positions.There are two ways to operate the multi-stage function:

(1) IO point control:

$$\text{Arrival Position} = \text{internal position control } 0 \times 2^0 + \text{internal position control } 1 \times 2^1 + \text{internal position control } 2 \times 2^2 + \text{internal position control } 3 \times 2^3 + \text{internal position control } 4 \times 2^4$$

When the corresponding IO is valid, the value is 1, and when it is invalid, the value is 0;

For example, when the "internal position control 2" signal is valid and the "internal position control 4" signal is valid, the following can be calculated:

$$\text{Arrival Position} = \text{internal position control } 0 \times 1 + \text{internal position control } 1 \times 2 + \text{internal position control } 2 \times 4 + \text{internal position control } 3 \times 8 + \text{internal position control } 4 \times 16$$

$= 0 \times 1 + 0 \times 2 + 1 \times 4 + 0 \times 8 + 1 \times 16 = 20$

From this, it can be concluded that the motor needs to reach position 20, and then the trigger signal can be activated through the "selection_iO control trigger" to make the motor reach the corresponding position 20.After the triggered position is reached, the corresponding positioning completion output signal will output IO, and the "workstation detection output" IO signal will be output through the following table:

output signal	Workstation detection output 0	Workstation detection output 1		Workstation detection output 2	Workstation detection output 3	Workstation detection output 4
Corresponding numerical value	1	2		4	8	16

For example, when reaching position 20, the "workstation detection output 2" and "workstation detection output 4" signals are valid.

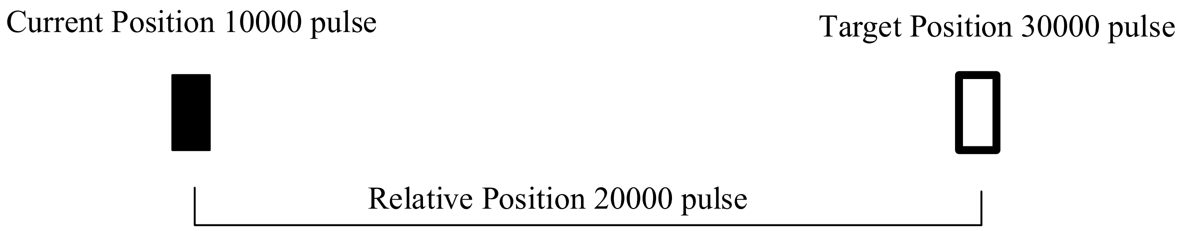
(2) Modbus point control:

Point control can be achieved through servo upper computer or Modbus, in addition to IO implementation.

When implemented on the upper computer or Modbus, simply set the multi segment position number in the corresponding Modbus address and set the trigger to achieve it. After the position is reached, the Modbus point outputs the corresponding position number.

5.5.2 Relative Position Control

Relative position refers to the distance moved from the current position, as shown in the following figure:



The specific implementation method of relative position control is as follows:

(1) When using relative position control, the Pr15.0 multi-stage control mode needs to be selected as 0;

(2) Configuration Internal position control;

(3) Set the relative position and speed of multiple levels;

(4) Servo enabled, triggering the 'Selection_SO Control Trigger'.

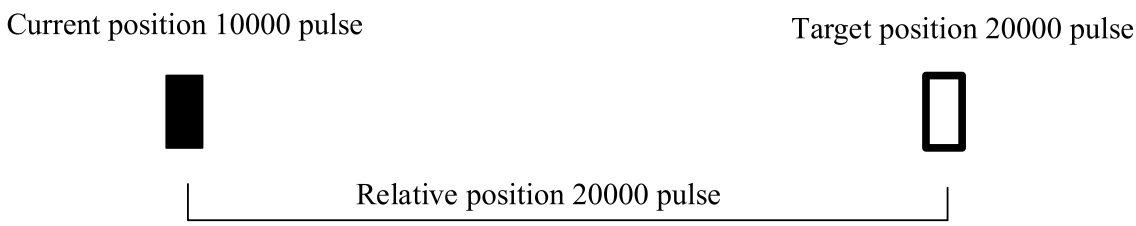
Associated parameters:

Parameter No	parameter name	set the scope	unit	Function
Pr6.28	Multi stage/zero return control mode selection	0-2	—	Select multi-stage/zero return control mode
Pr15.00	Multi stage control mode	0~1	—	Multi level mode selection 0: Relative position control mode; 1: Absolute position control mode.
Pr15.02	Multi segment Modbus trigger	0~1	—	Trigger multiple levels through Modbus or upper computer
Pr15.03	Multi segment position number	0~31	—	In Modbus control mode, set the multi segment position numbers that need to be moved
Pr15.04 ~Pr15.35	Multi level relative position setting	-2^63~2^63	Pulse	Multi level relative position setting
Pr15.68 ~Pr15.99	Multi level speed setting	-20000~20000	Rpm	Multi level speed setting
Pr15.101	Multi level relative position unit selection	0~2	—	0: The position unit is count; 1: The position unit is 0.001 ° 2: The position unit is 0.001mm In relative position control mode, when the position unit is set to count, the calculated data is not an integer. In case of loss of

				accuracy, please change the position unit.

5.5.3 Absolute Position Control

Absolute position refers to the distance that needs to be set from the current position, as shown in the following figure:



There are three modes of absolute position control.

When configured to operate in the positive direction at 0: always operate in the positive direction (for rotational motion mode);

When configured as 1, absolute position control operates in the opposite direction, always moving in the opposite direction (for rotational motion mode); When configured as 2, the absolute position controls the shortest path operation, running in the direction closest to the current position.

The specific implementation method of absolute position control is as follows:

(1) When using absolute position control, the Pr15.0 multi-stage control mode needs to be selected as 1;

(2) Multiple level absolute position mode Pr15.1 needs to be configured;When configured to 0, the absolute position control operates in the positive direction and always operates in the positive direction (for rotational motion mode);When configured as 1, absolute position control operates in the opposite direction, always moving in the opposite direction (for rotational motion mode);When configured as 2, the absolute position control operates in both forward and reverse directions, moving towards the direction closest to the current position

(3) Configure module number specified input;

(4) Set the relative position and speed of multiple levels;Servo enabled, triggering the 'Selection_SO Control Trigger'.

correlated parameters

Parameter No	parameter name	set the scope	unit	Function
Pr6.28	Multi stage/zero return control mode selection	0-2	—	Select multi-stage/zero return control mode
Pr15.00	Multi stage control mode	0~1	—	Multi level mode selection 0: Relative position control mode;

				1: Absolute position control mode.
Pr15.01	Multi level absolute position mode	0~2	—	0: Absolute positive 1: Absolute negative 2: The shortest path
Pr15.02	Multi segment Modbus trigger	0~1	—	Trigger multiple levels through Modbus or upper computer
Pr15.03	Multi segment position number	0~31	—	In Modbus control mode, set the multi segment position numbers that need to be moved
Pr15.36 ~Pr15.67	Multi level absolute position setting	-2^63~2^63	Pulse	Multi level absolute position setting
Pr15.68 ~Pr15.99	Multi level speed setting	-20000~20000	Rpm	Multi level speed setting
Pr15.100	Rotation value	0~2147483647	Pulse	Set the motor rotation range, that is, when Pr0.15=4 when the rotary mode switch is turned on, and the motor position value reaches the set value of the rotary mode, the rotary position value will start cycling again from 0.Assuming that the rotation value is set to 10000 plus, the feedback position value of the rotation encoder will cycle from 0 to 10000.When the rotation range is set to 0, this function is invalid. Please set the "rotation mode" to ten times or more of the encoder;The rotation mode cannot be used simultaneously with trajectory shaping. Under normal operating conditions, the rotation value is equal to the encoder position feedback. This function DD takes the shortest absolute position path more frequently.

5.6 Zero Return Mode (hm)

5.6.1 Function Description

In some specific situations, the servo motor needs to return to the zero position by itself. The Ω 6-DP series servo drive provides customers with 38 zeroing modes to meet different on-site application needs.Different zeroing modes, customers can directly find the Z-phase (index) signal of the servo motor according to the on-site application situation;Alternatively, you can first search for the mechanical (left/right) limit switch and origin signal, and then search for the servo motor Z-phase (index) signal;Mechanical zero positioning can also be achieved by using only mechanical (left/right) limit switches, origin signals, and other methods.

[Note] When using the reset function, the corresponding I/O signal must be connected to the driver. If I/O reset is required, the corresponding input port function should be set to "reset to enable input", and the output port function should be set to "reset to origin complete state". When receiving the "reset to enable input" signal, reset should be enabled, and after completion, output "reset to origin complete".The zeroing speed includes two speeds: one is the speed of the search switch signal (positive limit, negative limit, origin switch), which can be set to a higher value to prevent the zeroing time from being too long and causing abnormal zeroing alarms;The second is to search for the origin speed, which can be set to a lower value to prevent servo overshoot during high-speed parking, resulting in a significant deviation between the stop position and the set mechanical origin position.

5.6.2 Zeroing configuration process

The input configuration of the upper computer corresponds to IO, and the NOT and POT functions are normally open;Set Pr6.28 special function selection 1: Block Motion is valid (Modbus communication) 2: Block Motion is valid (input is valid);Selecting 1 means that it can be reset to zero through the upper computer or Modbus;Choose 2 to return to zero through IO.Select the zeroing mode, set the first zeroing speed (fast speed), set the second zeroing speed (slow speed), zeroing acceleration, and zeroing bias;The servo enables zeroing, and the servo will automatically return to zero according to the set mechanical origin.

5.6.3 Types of Zero Return Modes

The zeroing modes supported by the servo are shown in the table below

Return to zero mode	Return to zero method
1	After leaving the negative limit, the first Index is marked as zero
2	After leaving the positive limit, the first Index is marked as zero
3	After leaving the zero return switch, the first Index is marked as zero (positive stroke zero return switch)
4	After touching the zero return switch, the first Index is marked as zero (positive stroke zero return switch)
5	After leaving the zero return switch, the first Index is marked as zero (negative stroke zero return switch)
6	After touching the return to zero switch, the first index is marked as zero (negative stroke return to zero switch)
7	After leaving the negative edge of the return to zero switch, the first Index is marked as zero and initially moves forward
8	After touching the negative edge of the return to zero switch, the first Index is marked as zero

	and initially moves forward
9	After touching the positive edge of the return to zero switch, the first Index is marked as zero and initially moves forward
10	After leaving the positive edge of the return to zero switch, the first Index is marked as zero and initially moves forward
11	After leaving the positive edge of the return to zero switch, the first Index is marked as zero and initially moves in the negative direction
12	After touching the positive edge of the return to zero switch, the first Index is marked as zero and initially moves in the negative direction
13	After touching the negative edge of the return to zero switch, the first Index is marked as zero and initially moves in the negative direction
14	After leaving the negative edge of the return to zero switch, the first Index is marked as zero and initially moves in the negative direction
15	retain
16	retain
17	Negative limit falling edge
18	Positive limit descending edge
19	Return to zero switch with falling edge (forward return to zero switch)
20	Return to zero switch with rising edge (positive return to zero switch)
21	Return to zero switch with falling edge (negative stroke return to zero switch)
22	Return to zero switch with rising edge (negative stroke return to zero switch)
23	Return to zero switch with negative edge falling back to zero (initial positive motion)
24	Return to zero switch with rising edge on the negative side (initial positive motion)
25	Return to zero switch with positive rising edge (initial forward motion)
26	Return to zero switch with positive edge falling edge (initial forward motion)
27	Return to zero switch with positive edge and falling edge (initial negative motion)
28	Return to zero switch with positive rising edge (initial negative motion)
29	Return to zero switch with rising edge on the negative side (initial negative motion)
30	Return to zero switch with negative edge falling back to zero (initial negative motion)
31	retain
32	Single circle close to zero
33	Run in the initial negative direction to the Index signal point (offset position)
34	Run in the initial positive direction to the Index signal point (offset position)
35	Declare the current position as zero position
36	Reverse collision, with the first Index marked as zero
37	Forward collision, with the first Index marked as zero
38	Collision on both sides, with zero in the middle

5.6.4 Detailed Implementation Description of Zero Return Mode

Zero return method 1: After leaving the negative limit, the first Index signal is at zero position

Signal: negative limit, index signal

Instructions

As shown in the figure, there are two situations for this mode:

Scenario 1: The load is not in the negative limit switch position

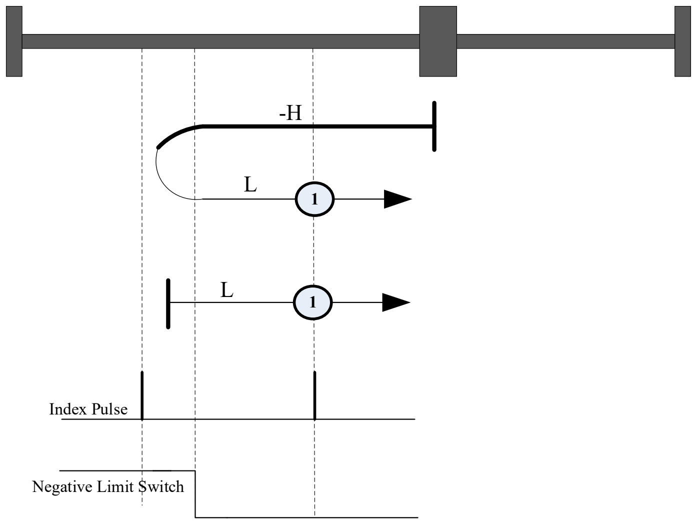
Return to zero steps:

1. Run in the negative direction until the negative limit switch decelerates and stops;
2. After reaching the negative limit, search for the first Index signal in the positive direction to slow down and stop;
3. Run to the Index position and use this position as the zero point.

Scenario 2: The load is in the negative limit switch position

1. Search for the first Index signal in the positive direction to slow down and stop;
2. Run to the Index position and use this position as the zero point.

illustration



Zero return method 2: After leaving the positive limit, the first Index signal is at zero position

Signal: positive limit, index signal

Instructions illustration

As shown in the figure, there are two situations for this mode:

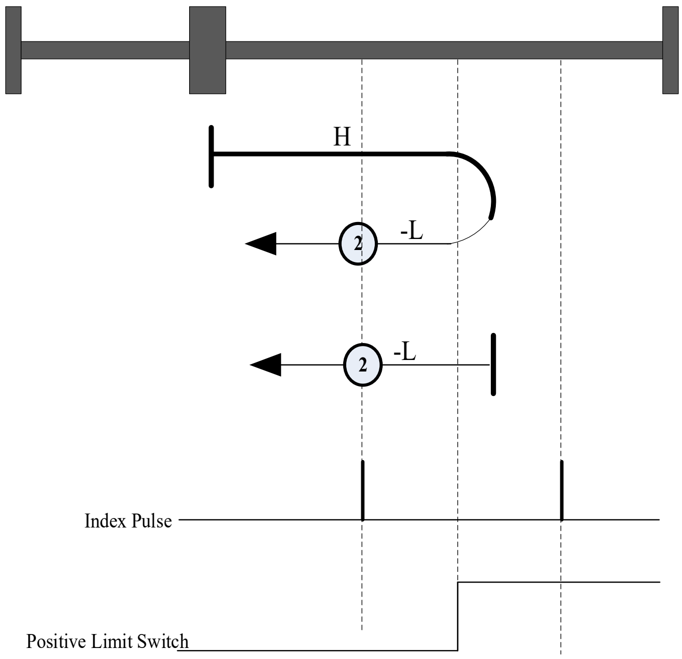
Scenario 1: The load is not in the positive limit switch position

Return to zero steps:

1. Run in the positive direction until the positive limit switch decelerates and stops;
2. After reaching the positive limit, search for the first Index signal in the negative direction to slow down and stop;
3. Run to the Index position and use this position as the zero point.

Scenario 2: The load is in the positive limit switch position

1. Search for the first Index signal in the negative direction to slow down and stop;
2. Run to the Index position and use this position as the zero point.



Zero return method 3: After leaving the origin switch, the first Index is at zero position (positive stroke origin switch)

Signal: Origin switch, index signal

Instructions

As shown in the figure, there are two situations for this mode:

Scenario 1: The load is not at the positive direction origin switch position

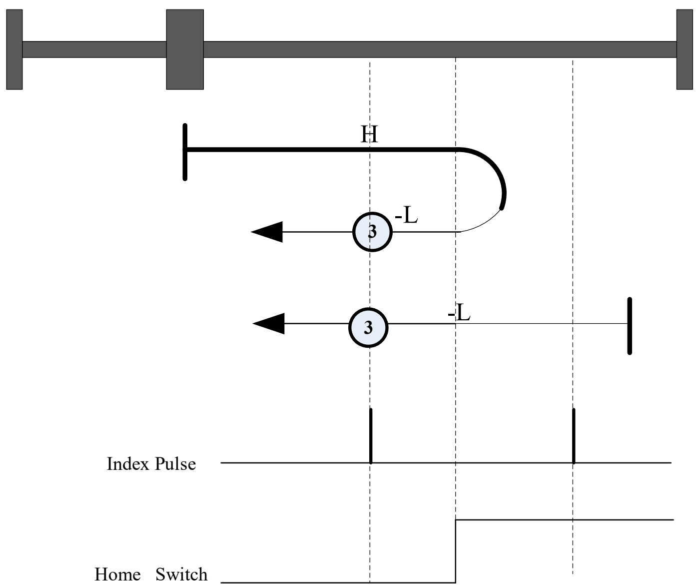
Return to zero steps:

1. Run in the forward direction to the origin switch and then decelerate and stop;
2. Run in the negative direction away from the origin switch and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 2: The load is at the positive direction origin switch position

Return to zero steps:

illustration



1. Run in the negative direction until you leave the origin switch, and when you encounter the first Index signal, slow down and stop;
2. Run to the Index position and use this position as the zero point.

Zero return method 4: Contact the origin switch, with the first Index at zero position (positive stroke origin switch)
Signal: Origin switch, index signal

Instructions

As shown in the figure, there are two situations for this mode:

Scenario 1: The load is not at the positive direction origin switch position

Return to zero steps:

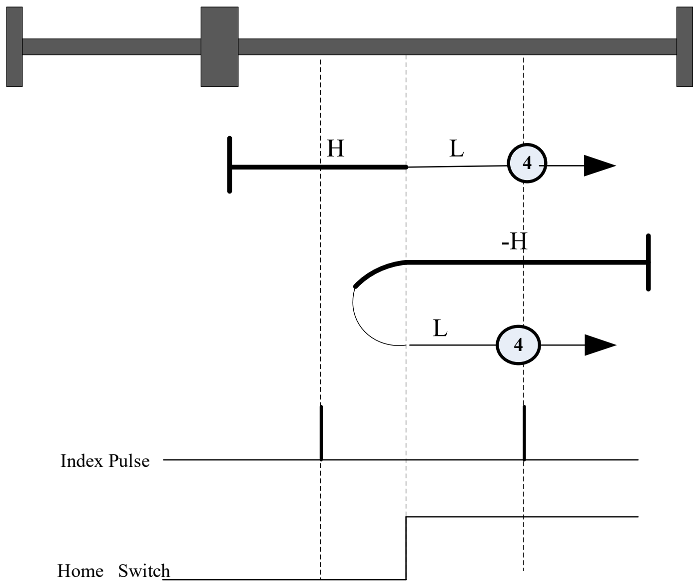
1. Run in the forward direction to the origin switch and then decelerate and stop;
2. Run in the positive direction and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 2: The load is at the positive direction origin switch position

Return to zero steps:

1. Run in the negative direction until it leaves the origin switch and then decelerate and stop;
2. Run in the forward direction to the origin switch, continue running and encounter the first Index signal to slow down and stop;
3. Run to the Index position and use this position as the zero point.

illustration



Zero return method 5: After leaving the origin switch, the first Index is at zero position (negative travel origin switch)
Signal: Origin switch, index signal

Instructions

illustration

As shown in the figure, there are two situations for this mode:

Scenario 1: The load is not at the negative direction origin switch position

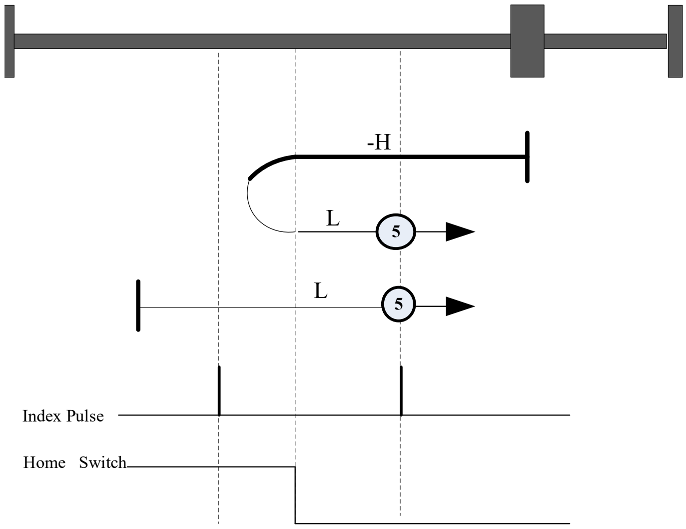
Return to zero steps:

1. After running in the negative direction to the origin switch, slow down and stop;
2. Run in the positive direction away from the origin switch and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 2: The load is at the negative direction origin switch position

Return to zero steps:

1. Run in the forward direction until you leave the origin switch, and when you encounter the first Index signal, slow down and stop;
2. Run to the Index position and use this position as the zero point.



Zero return method 6: Contact the origin switch, with the first Index at zero position (negative travel origin switch)

Signal: Origin switch, index signal

Instructions

As shown in the figure, there are two situations for this mode:

Scenario 1: The load is not at the negative direction origin switch position

Return to zero steps:

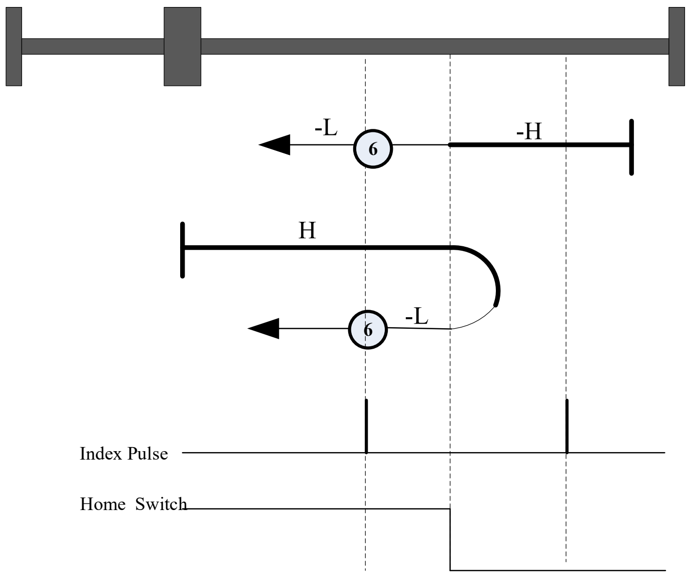
1. After running in the negative direction to the origin switch, slow down and stop;
2. Run in the negative direction and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 2: The load is at the negative direction origin switch position

Return to zero steps:

1. Run in the positive direction until it leaves the origin switch and then decelerate and stop;

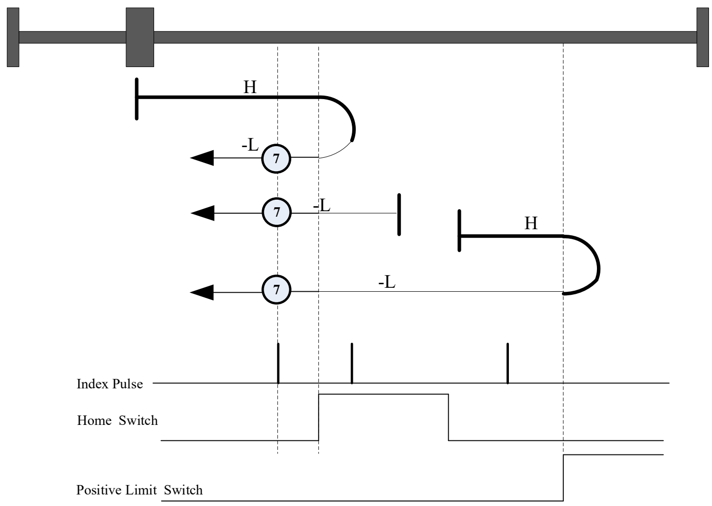
illustration



2. Run in the negative direction to the origin switch, continue running and encounter the first Index signal to slow down and stop;
3. Run to the Index position and use this position as the zero point.

Zero return method 7: Leave the negative edge of the origin switch, with the first Index at zero position (initial positive motion)
Signal: positive limit, origin switch, index signal

Instructions illustration



As shown in the figure, there are three situations for this mode:

Scenario 1: The load is at the negative position of the origin switch
1. Run in the forward direction to the origin switch and then decelerate and stop;
2. Leave the origin switch in the negative direction and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 2: The load is at the origin switch position
1. Run in the negative direction until it leaves the origin switch and slows down to stop. When the negative direction encounters the first Index signal, slow down and stop;
2. Run to the Index position and use this position as the zero point.

Scenario 3: The load is in the positive direction position of the origin switch
1. Run in the positive direction to the positive limit switch and then decelerate and stop;
2. Run in the negative direction until you leave the origin switch, and when you encounter the first Index signal, slow down and stop;
3. Run to the Index position and use this

position as the zero point.

Zeroing method 8: Contact the negative edge of the origin switch, with the first Index at zero position (initial positive motion)

Signal: positive limit, origin switch, index signal

Instructions

As shown in the figure, there are three situations for this mode:

Scenario 1: The load is at the negative position of the origin switch

1. Run in the positive direction until it touches the origin switch, then decelerate and stop;
2. Run in the positive direction and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

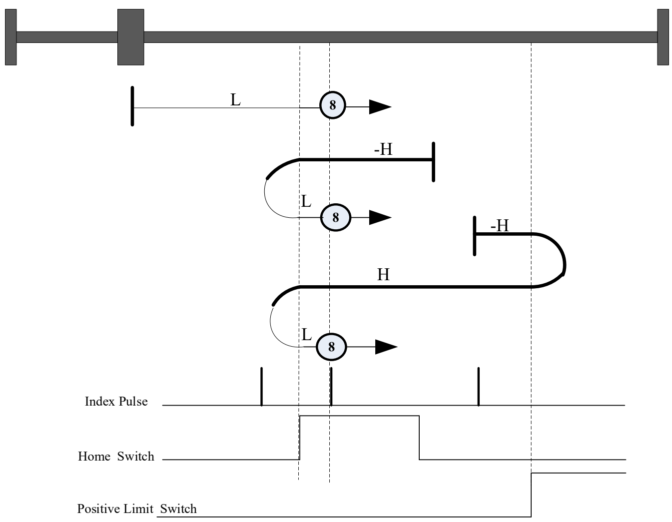
Scenario 2: The load is at the origin switch position

1. Run in the negative direction until it leaves the origin switch and decelerates to stop;
2. After running in the forward direction and touching the origin switch, it decelerates and stops at the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 3: The load is in the positive direction position of the origin switch

1. Run in the positive direction to the positive limit switch and then decelerate and stop;
2. Run in the negative direction until it leaves the origin switch and then decelerate and stop;
3. Run in the positive direction to the contact origin switch, and decelerate and stop when encountering the first Index signal;
4. Run to the Index position and use this position as the zero point.

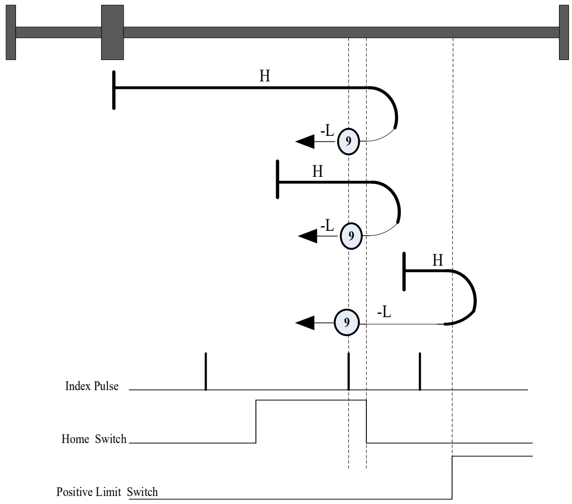
illustration



Zeroing method 9: Contact the positive edge of the origin switch, with the first Index at zero position (initial forward motion)

Signal: positive limit, origin switch, index signal

Instructions illustration



As shown in the figure, there are three situations for this mode:

Scenario 1: The load is at the negative position of the origin switch

1. Run in the positive direction until it leaves the origin switch and then decelerate and stop;

After running in the negative direction and touching the origin switch, it decelerates and stops when encountering the first Index signal;

3. Run to the Index position and use this position as the zero point.

Scenario 2: The load is at the origin switch position

1. Run in the positive direction until it leaves the origin switch and then decelerate and stop;

After running in the negative direction and touching the origin switch, it decelerates and stops when encountering the first Index signal;

3. Run to the Index position and use this position as the zero point.

Scenario 3: The load is in the positive direction position of the origin switch

1. Run in the positive direction to the positive limit switch, and in the negative direction to the contact origin switch before decelerating and stopping;

2. Run in the negative direction and decelerate and stop when encountering the first Index signal;

3. Run to the Index position and use this position as the zero point.

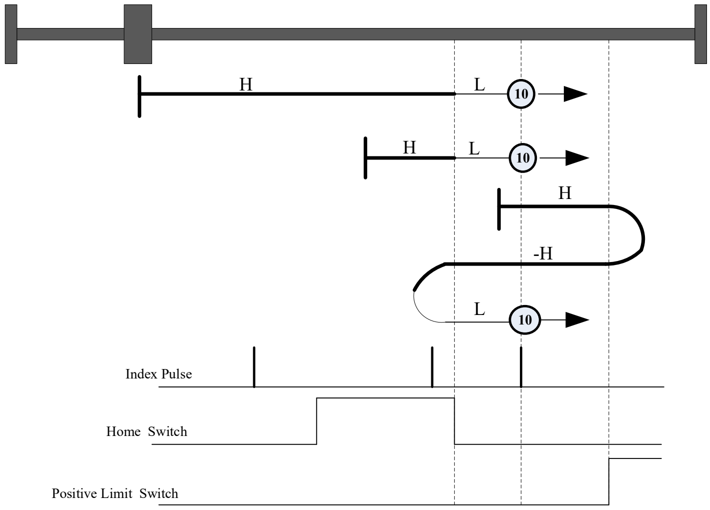
Zero Return Method 10: Leave the positive edge of the origin switch, with the first Index at zero position (initial forward motion)

Signal: positive limit, origin switch, index signal

Instructions illustration

As shown in the figure, there are three situations for this mode:

Scenario 1: The load is at the negative position of the origin switch



1. Run in the positive direction until it leaves the origin switch and then decelerate and stop;
2. Run in the positive direction and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 2: The load is at the origin switch position
1. Run in the positive direction until it leaves the origin switch and then decelerate and stop;
2. Run in the positive direction and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 3: The load is in the positive direction position of the origin switch
1. Run in the positive direction to the positive limit switch and then decelerate and stop;
2. Run in the negative direction until it touches the origin switch and then decelerate and stop;
3. Run in the forward direction until you leave the origin switch, and when you encounter the first Index signal, slow down and stop;
4. Run to the Index position and use this position as the zero point.

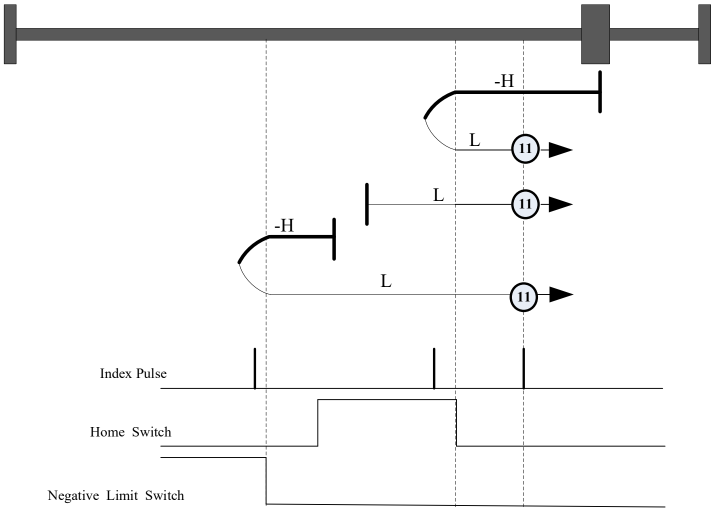
Zero return method 11: Leave the positive edge of the origin switch, with the first Index at zero position (initial negative motion)

Instructions illustration

As shown in the figure, there are three situations for this mode:

Scenario 1: The load is in the positive direction position of the origin switch
1. After running in the negative direction to the origin switch, slow down and stop;

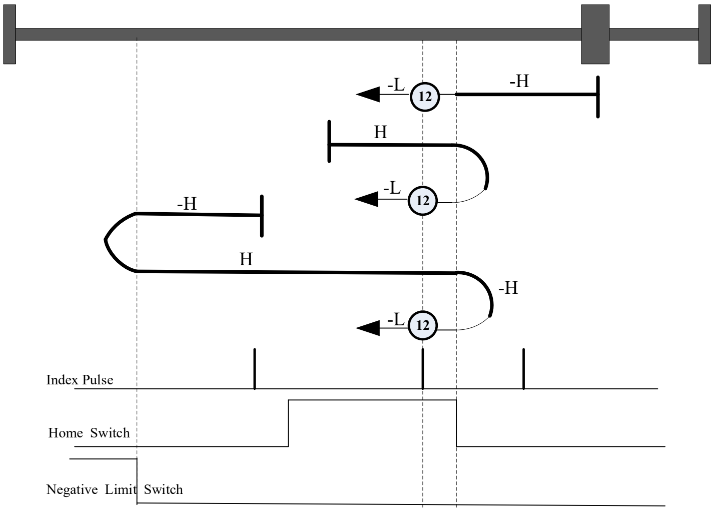
2. Move away from the origin switch in the positive direction and slow down when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.
Scenario 2: The load is at the origin switch position
1. Run in the forward direction until it leaves the origin switch and slows down to stop. When encountering the first Index signal in the forward direction, slow down and stop;
2. Run to the Index position and use this position as the zero point.
Scenario 3: The load is at the negative position of the origin switch
1. After running in the negative direction to the negative limit switch, slow down and stop;
2. Run in the forward direction until you leave the origin switch, and when you encounter the first Index signal, slow down and stop;
3. Run to the Index position and use this position as the zero point.



Zero return method 12: Contact the positive edge of the origin switch, with the first Index at zero position (initial negative motion)
Signal: Negative limit, origin switch, index signal

Instructions illustration

As shown in the figure, there are three situations for this mode:
Scenario 1: The load is in the positive direction position of the origin switch
1. Run in the negative direction until it contacts the origin switch and then decelerate and stop;
2. Run in the negative direction and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this



position as the zero point.

Scenario 2: The load is at the origin switch position

1. Run in the positive direction until it leaves the origin switch and decelerates to stop;
2. Contact the origin switch in the negative direction and slow down when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 3: The load is at the negative position of the origin switch

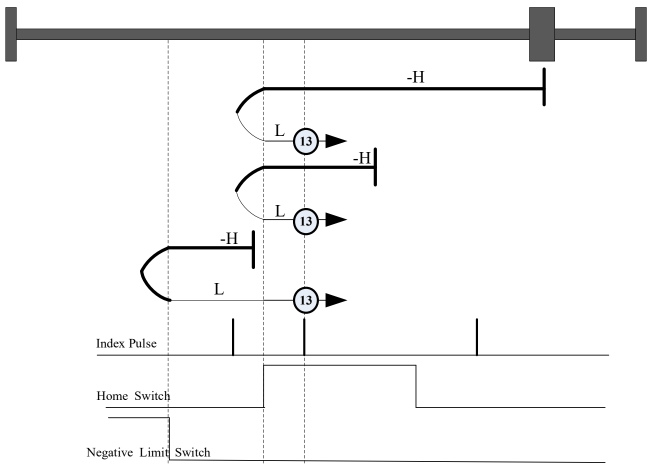
1. After running in the negative direction to the negative limit switch, slow down and stop;
2. Run in the positive direction until it leaves the origin switch and then decelerate and stop;
3. Run in the negative direction to contact the origin switch, and decelerate and stop when encountering the first Index signal;
4. Run to the Index position and use this position as the zero point.

Zeroing method 13: Contact the negative edge of the origin switch, with the first Index at zero position (initial negative motion)

Signal: Negative limit, origin switch, index signal

Instructions

illustration



As shown in the figure, there are three situations for this mode:

Scenario 1: The load is in the positive direction position of the origin switch

1. Run in the negative direction until it leaves the origin switch and then decelerate and stop;
2. After running in the forward direction and contacting the origin switch, it decelerates and stops when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 2: The load is at the origin switch position

1. Run in the negative direction until it leaves the origin switch and then decelerate and stop;
2. After running in the forward direction and contacting the origin switch, it decelerates and stops when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 3: The load is at the negative position of the origin switch

1. Run in the negative direction to the negative limit switch;Slow down and stop when running in the positive direction and touching the origin switch;
2. Run in the positive direction and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Return to zero method 14: Leave the negative edge of the origin switch, with the first Index at zero position (initial negative motion)

Signal: Negative limit, origin switch, index signal

Instructions

As shown in the figure, there are three situations for this mode:

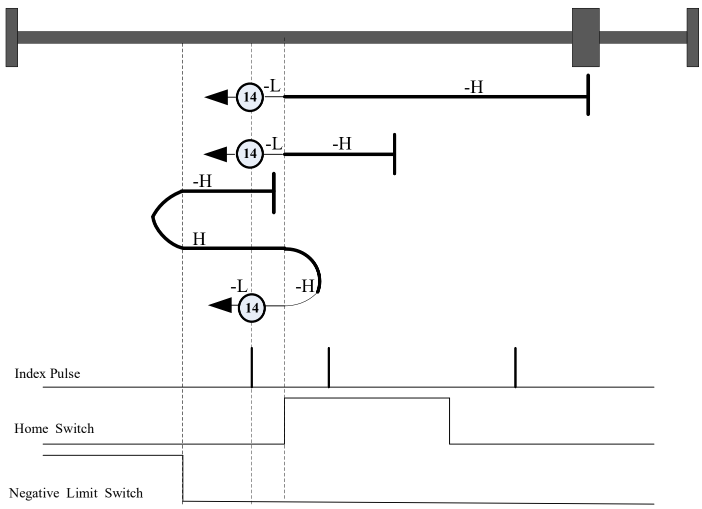
Scenario 1: The load is in the positive direction position of the origin switch

1. Run in the negative direction until it leaves the origin switch and then decelerate and stop;
2. Run in the negative direction and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.

Scenario 2: The load is at the origin switch position

1. Run in the negative direction until it leaves the origin switch and then decelerate and stop;

illustration



2. Run in the negative direction and decelerate and stop when encountering the first Index signal;
3. Run to the Index position and use this position as the zero point.
Scenario 3: The load is at the negative position of the origin switch
1. After running in the negative direction to the negative limit switch, slow down and stop;
2. Run in the positive direction until it touches the origin switch and then decelerate and stop;
3. Run in the negative direction until you leave the origin switch, and when you encounter the first Index signal, slow down and stop;
4. Run to the Index position and use this position as the zero point.

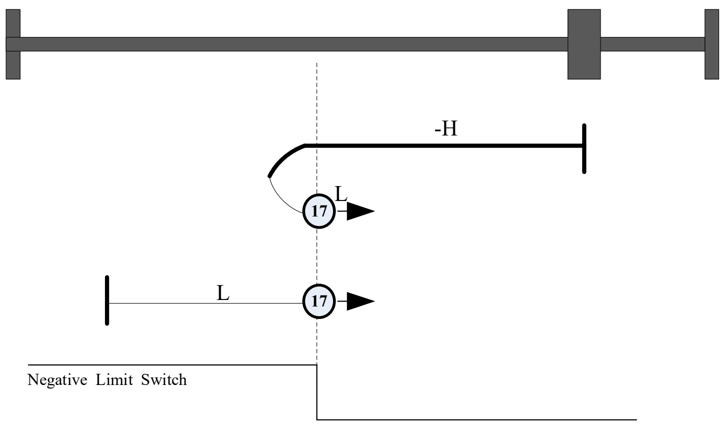
Return to Zero Method 15: Retain
Return to Zero Method 16: Retain

Return to zero method 17: The negative limit falling edge is at zero position
Signal: Negative limit

Instructions

As shown in the figure, there are two situations for this mode:
Scenario 1: The load is not in the negative limit switch position
1. After running in the negative direction to the negative limit switch, slow down and stop;
2. Run in the positive direction until it leaves the limit switch position and decelerate to stop;
3. Use this position as the zero point.
Scenario 2: The load is in the negative limit switch position
1. Run in the positive direction until it leaves the limit switch position and

illustration



decelerate to stop;

2. Use this position as the zero point.

Return to zero method 18: The positive limit falling edge is at zero position

Signal: Positive limit

Instructions

As shown in the figure, there are two situations for this mode:

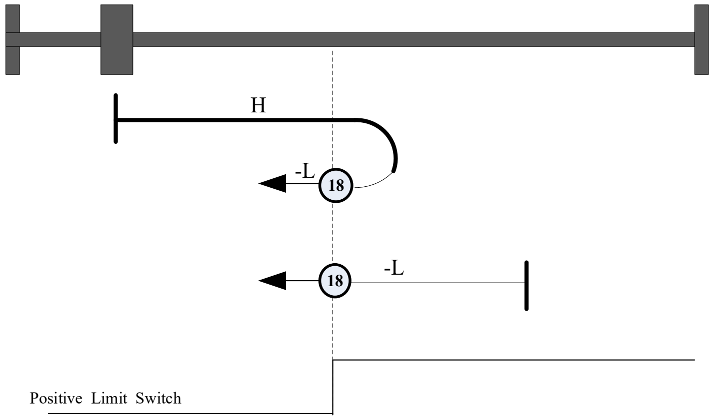
Scenario 1: The load is not in the positive limit switch position

1. Run in the positive direction to the positive limit switch and then decelerate and stop;
2. Run in the negative direction until it leaves the limit switch position and decelerate to stop;
3. Use this position as the zero point.

Scenario 2: The load is in the positive limit switch position

1. Run in the negative direction until it leaves the limit switch position and decelerate to stop;
2. Use this position as the zero point.

illustration



Zero return method 19: The falling edge of the origin switch is at zero position (forward origin switch)

Signal: Origin switch

Instructions

As shown in the figure, there are two situations for this mode:

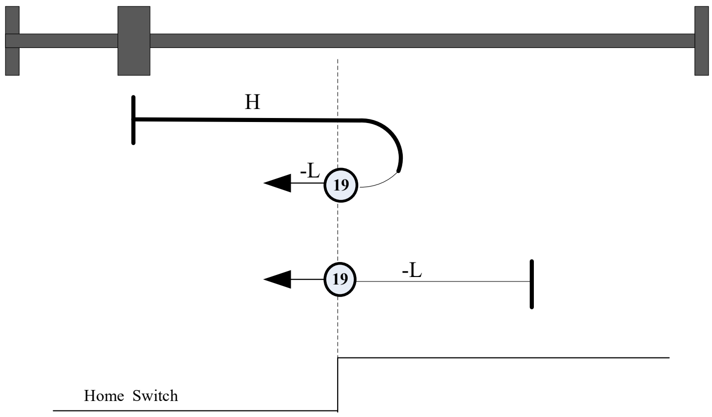
Scenario 1: The load is not at the origin switch position

1. Run in the positive direction until it touches the origin switch, then decelerate and stop;
2. Run in the negative direction until it leaves the origin switch position and slows down to stop;
3. Use this position as the zero point.

Scenario 2: The load is at the origin switch position

1. Run in the negative direction until it

illustration



leaves the origin switch position and decelerates to stop;
2. Use this position as the zero point.

Zero return method 20: The falling edge on the origin switch is at zero position (forward origin switch)
Signal: Origin switch

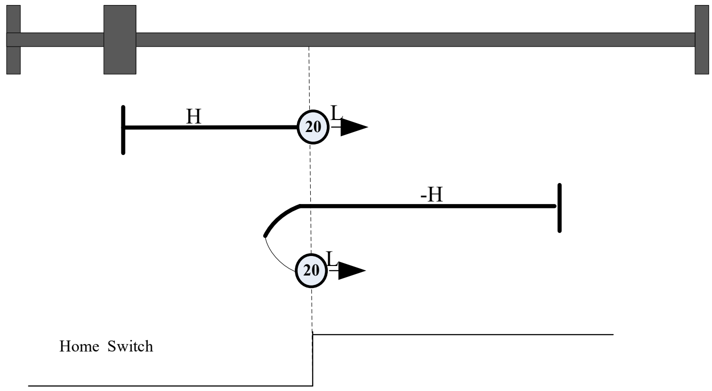
Instructions

As shown in the figure, there are two situations for this mode:

Scenario 1: The load is not at the origin switch position
1. Run in the positive direction until it touches the origin switch, then decelerate and stop;
2. Use this position as the zero point.

Scenario 2: The load is at the origin switch position
1. Run in the negative direction until it leaves the origin switch position and decelerates to stop;
2. Run in the positive direction until it touches the origin switch and then decelerate and stop;
3. Use this position as the zero point.

illustration



Zero return method 21: The falling edge of the origin switch is at zero position (negative origin switch)
Signal: Origin switch

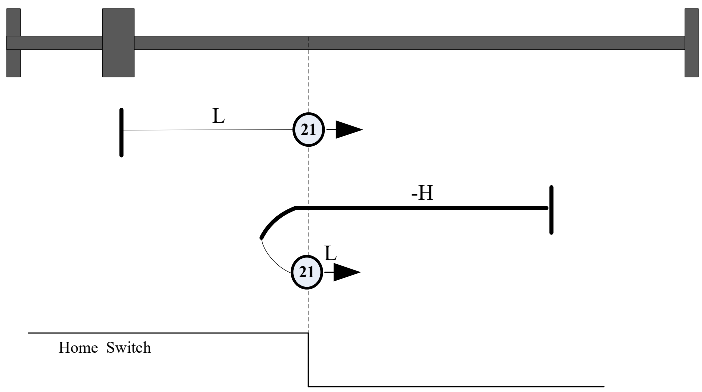
Instructions

As shown in the figure, there are two situations for this mode:

Scenario 1: The load is not at the origin switch position
1. Slow down and stop when running in the negative direction to the contact origin switch position;
2. Run in the positive direction until it leaves the origin switch position and decelerates to stop;
3. Use this position as the zero point.

Scenario 2: The load is at the origin switch position

illustration



1. Run in the positive direction until it leaves the origin switch position and decelerates to stop;
2. Use this position as the zero point.

Zero return method 22: The falling edge on the origin switch is at zero position (negative origin switch)
Signal: Origin switch

Instructions

As shown in the figure, there are two situations for this mode:

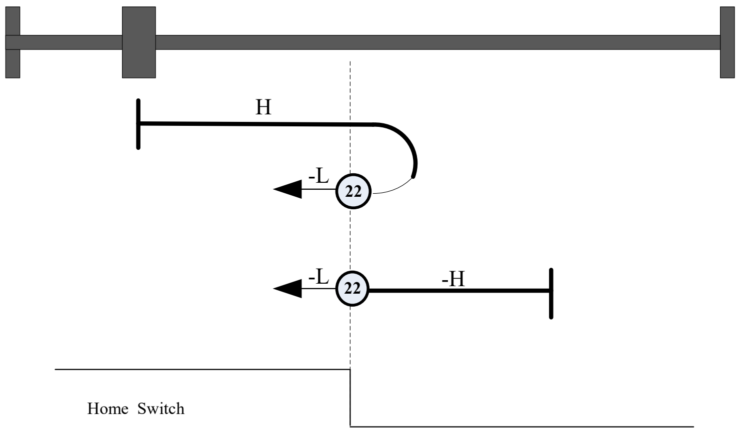
Scenario 1: The load is not at the origin switch position

1. Slow down and stop when running in the negative direction to the contact origin switch position;
2. Use this position as the zero point.

Scenario 2: The load is at the origin switch position

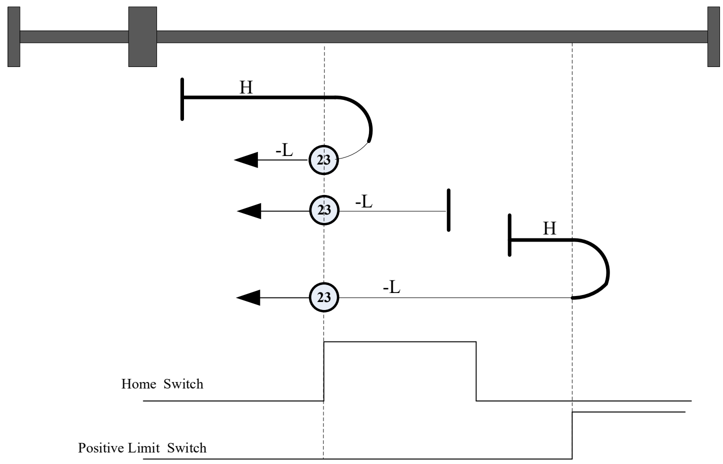
1. Run in the positive direction until it leaves the origin switch and then decelerate and stop;
2. Run in the negative direction to the contact origin switch position and decelerate to stop;
3. Use this position as the zero point.

illustration



Zero return method 23: The negative edge of the origin switch falls to zero position (initial positive motion)
Signal: Origin switch, positive limit

Instructions illustration



As shown in the figure, there are three situations for this mode:

Scenario 1: The load is at the negative position of the origin switch

1. Run in the forward direction to the origin switch and then decelerate and stop;
2. Run in the negative direction until it leaves the origin switch position and slows down to stop;
3. Use this position as the zero point.

Scenario 2: The load is at the origin switch position

1. Run in the negative direction until it leaves the origin switch position and decelerates to stop;
2. Use this position as the zero point.

Scenario 3: The load is in the positive direction position of the origin switch

1. Run in the positive direction to the positive limit switch and then decelerate and stop;
2. Run in the negative direction until it leaves the origin switch position and slows down to stop;
3. Use this position as the zero point.

Zero return method 24: The rising edge of the negative side of the origin switch is at zero position (initial positive motion)

Signal: Origin switch, positive limit

Instructions illustration

As shown in the figure, there are three situations for this mode:

Scenario 1: The load is at the negative position of the origin switch

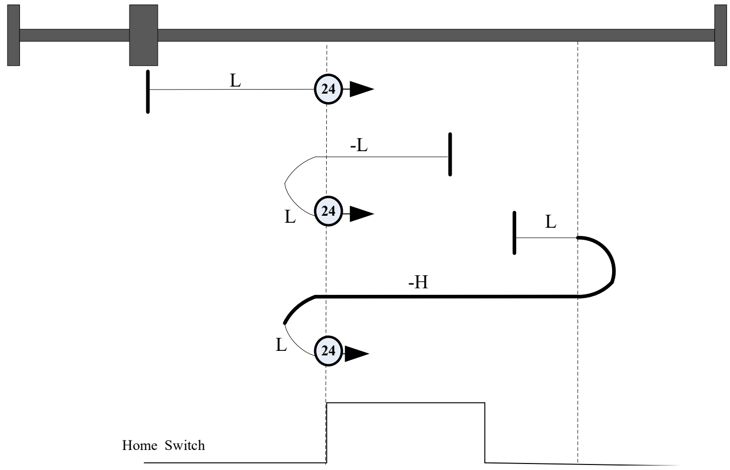
1. Run in the positive direction until it touches the origin switch, then decelerate and stop;
2. Use this position as the zero point.

Scenario 2: The load is at the origin switch position

1. Run in the negative direction until it leaves the origin switch position and decelerates to stop;
2. Run in the positive direction until it touches the origin switch and then decelerate and stop;
3. Use this position as the zero point.

Scenario 3: The load is in the positive direction position of the origin switch

1. Run in the positive direction to the positive limit switch and then decelerate and stop;
2. Run in the negative direction until it leaves the origin switch position and slows down to stop;
3. Run in the positive direction to the contact origin switch position and decelerate to stop;
4. Use this position as the zero point.



Zero return method 25: The rising edge of the positive side of the origin switch is at zero position (initial forward motion)

Signal: Origin switch, positive limit

Instructions

As shown in the figure, there are three situations for this mode:

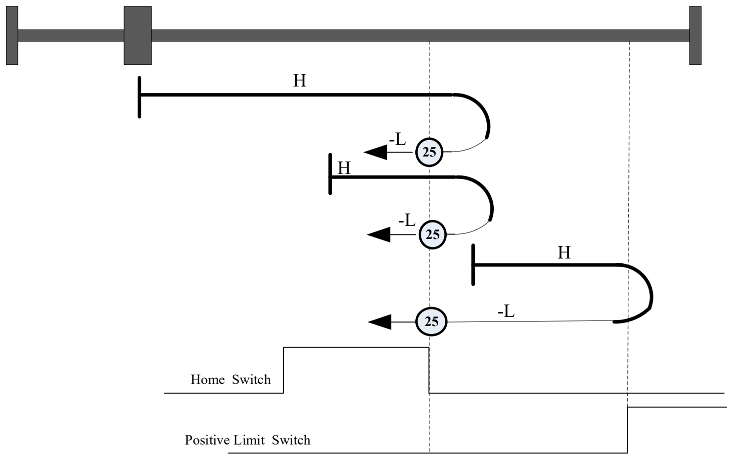
Scenario 1: The load is at the negative position of the origin switch

1. Run in the positive direction until it leaves the origin switch and then decelerate and stop;
2. Run in the negative direction to the contact origin switch position and decelerate to stop;
3. Use this position as the zero point.

Scenario 2: The load is at the origin switch position

1. Run in the positive direction until it leaves the origin switch and then decelerate and stop;

illustration



2. Run in the negative direction to the contact origin switch position and decelerate to stop;
3. Use this position as the zero point.

Scenario 3: The load is in the positive direction position of the origin switch
1. Run in the positive direction to the positive limit switch and then decelerate and stop;
2. Run in the negative direction to the contact origin switch position and decelerate to stop;
3. Use this position as the zero point.

Return to zero method 26: The positive edge of the origin switch falls to zero position (initial forward motion)

Signal: Origin switch, positive limit

Instructions

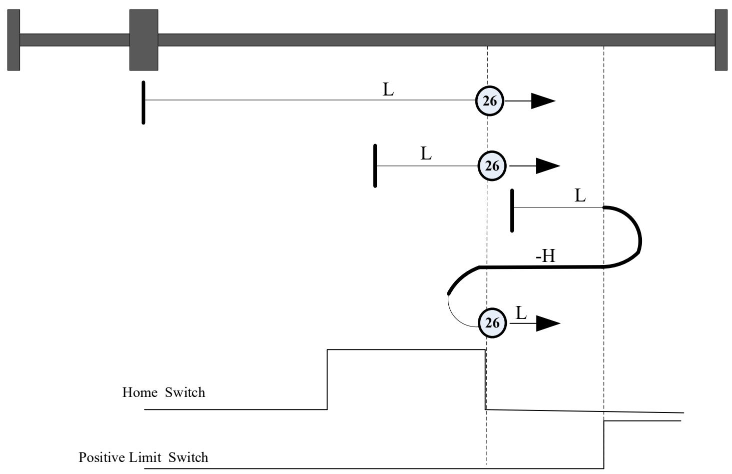
As shown in the figure, there are three situations for this mode:

Scenario 1: The load is at the negative position of the origin switch
1. Run in the positive direction until it leaves the origin switch and then decelerate and stop;
2. Use this position as the zero point.

Scenario 2: The load is at the origin switch position
1. Run in the positive direction until it leaves the origin switch and then decelerate and stop;
2. Use this position as the zero point.

Scenario 3: The load is in the positive direction position of the origin switch
1. Run in the positive direction to the positive limit switch and then decelerate and stop;
2. Run in the negative direction to the contact origin switch position and decelerate to stop;
3. Run in the positive direction until it leaves the origin switch position and

illustration



decelerates to stop;
4. Use this position as the zero point.

Zero return method 27: The positive edge of the origin switch falls to zero position (initial negative motion)
Signal: Origin switch, negative limit

Instructions

As shown in the figure, there are three situations for this mode:

Scenario 1: The load is at the negative position of the origin switch

1. After running in the negative direction to the negative limit switch, slow down and stop;
2. Run in the positive direction until it leaves the origin switch position and decelerates to stop;
3. Use this position as the zero point.

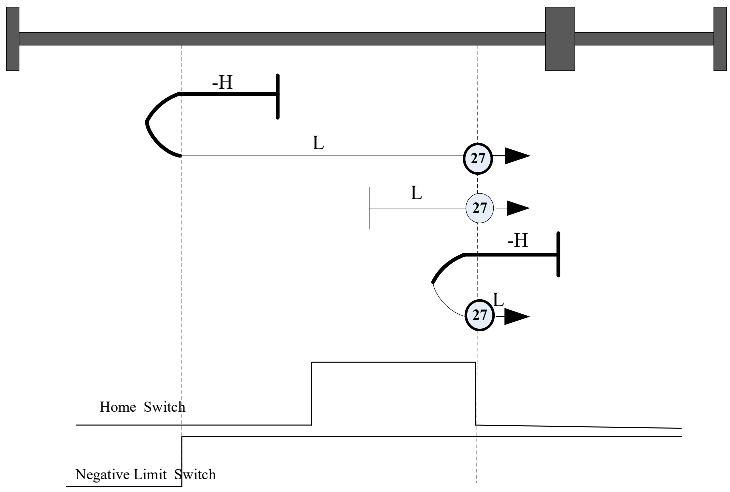
Scenario 2: The load is at the origin switch position

1. Run in the positive direction until it leaves the origin switch position and decelerates to stop;
2. Use this position as the zero point.

Scenario 3: The load is in the positive direction position of the origin switch

1. Run in the negative direction until it contacts the origin switch and then decelerate and stop;
2. Run in the positive direction until it leaves the origin switch position and decelerates to stop;
3. Use this position as the zero point.

illustration



Return to zero method 28: The rising edge of the positive side of the origin switch is at zero position (initial negative motion)
Signal: Origin switch, negative limit

Instructions illustration

As shown in the figure, there are three situations for this mode:

Scenario 1: The load is in the positive direction position of the origin switch

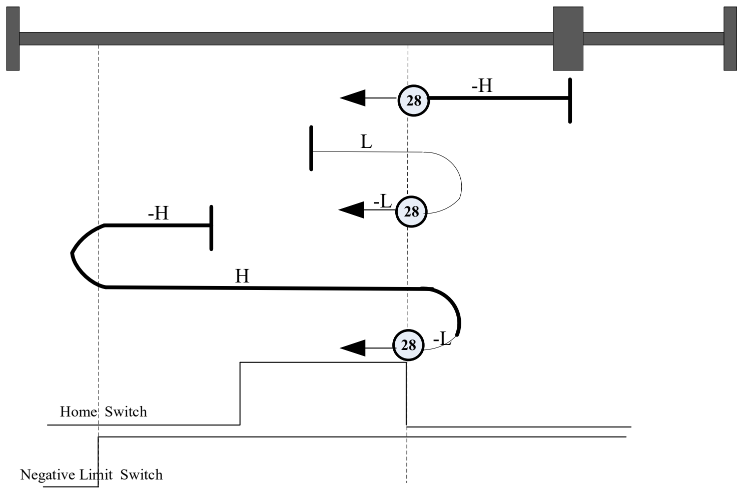
1. Run in the negative direction until it contacts the origin switch and then decelerate and stop;
2. Use this position as the zero point.

Scenario 2: The load is at the origin switch position

1. Run in the positive direction until it leaves the origin switch position and decelerates to stop;
2. Run in the negative direction until it touches the origin switch and then decelerate and stop;
3. Use this position as the zero point.

Scenario 3: The load is at the negative position of the origin switch

1. After running in the negative direction to the negative limit switch, slow down and stop;
2. Run in the positive direction until it leaves the origin switch position and decelerates to stop;
3. Slow down and stop when running in the negative direction to the contact origin switch position;
4. Use this position as the zero point.



Zero return method 29: The rising edge of the negative side of the origin switch is at zero position (initial negative motion)

Signal: Origin switch, negative limit

Instructions illustration

As shown in the figure, there are three situations for this mode:

Scenario 1: The load is at the negative position of the origin switch

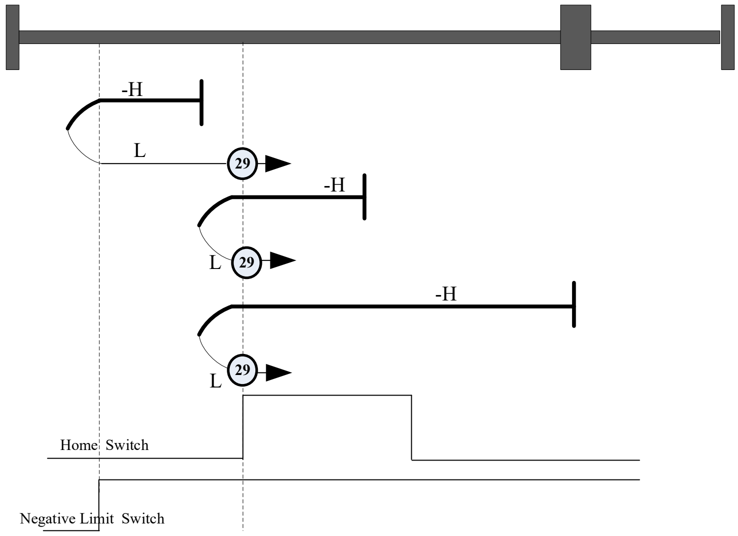
1. After running in the negative direction to the negative limit switch, slow down and stop;
2. Run in the positive direction to the contact origin switch position and decelerate to stop;
3. Use this position as the zero point.

Scenario 2: The load is at the origin switch position

1. Run in the negative direction until it leaves the origin switch and then decelerate and stop;
2. Run in the positive direction to the contact origin switch position and decelerate to stop;
3. Use this position as the zero point.

Scenario 3: The load is in the positive direction position of the origin switch

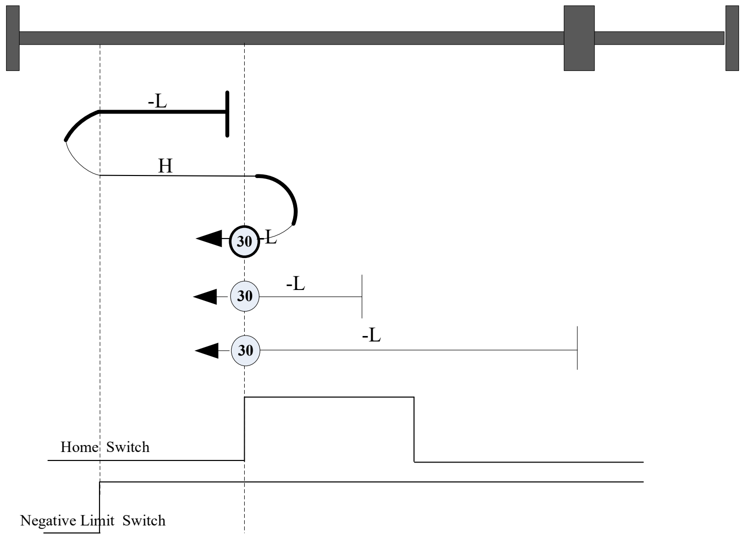
1. Run in the negative direction until it leaves the origin switch position and decelerates to stop;
2. Run in the positive direction to the contact origin switch position and decelerate to stop;
3. Use this position as the zero point.



Zero return method 30: The negative edge of the origin switch falls to zero position (initial negative motion)

Signal: Origin switch, negative limit

Instructions illustration



As shown in the figure, there are three situations for this mode:

Scenario 1: The load is at the negative position of the origin switch

1. After running in the negative direction to the negative limit switch, slow down and stop;
2. Run in the positive direction to the contact origin switch position and decelerate to stop;
3. Run in the negative direction until it leaves the origin switch and then decelerate and stop;
4. Use this position as the zero point.

Scenario 2: The load is at the origin switch position

1. Run in the negative direction until it leaves the origin switch and then decelerate and stop;
2. Use this position as the zero point.

Scenario 3: The load is in the positive direction position of the origin switch

1. Run in the negative direction until it leaves the origin switch position and decelerates to stop;
2. Use this position as the zero point.

Return to Zero Method 31: Retain

Return to zero method 32: Run a single loop nearby until the index is zero

Signal: index signal

Instructions illustration

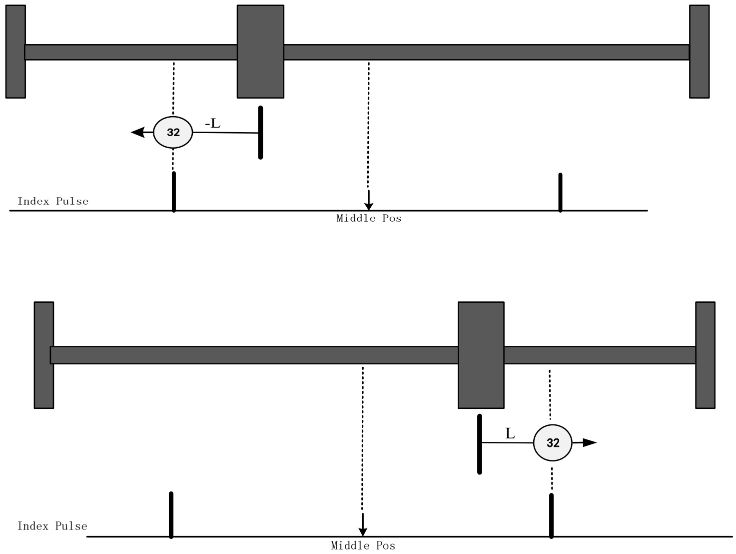
As shown in the diagram, there are two situations for this mode

Scenario 1: The load is on the left side of the middle position of a single circle

1. Run in the negative direction to the first index signal;
2. Use this position as the zero point.

Scenario 2: The load is on the right side of the middle position of a single circle

1. Run forward to the first index signal;
2. Use this position as the zero point.



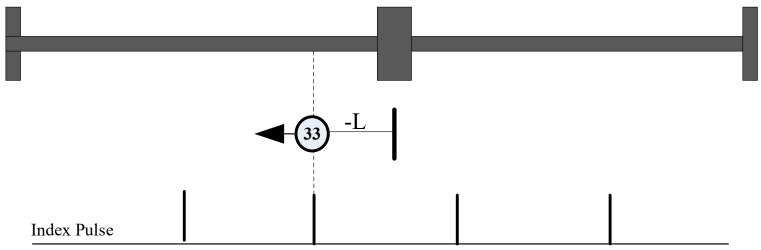
Zero return method 33: Run in the negative direction until the index is zero

Signal: index signal

Instructions illustration

Scenario 1:

1. Run in the negative direction to the first index signal;
2. Use this position as the zero point.



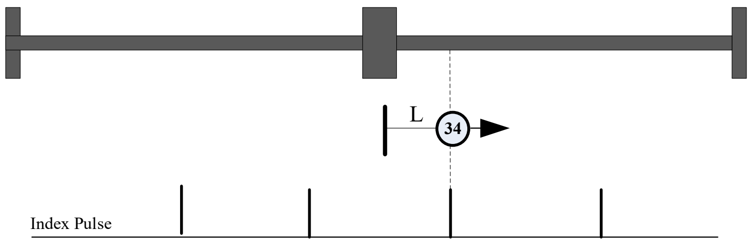
Return to zero method 34: Run in the positive direction until the index is zero

Signal: index signal

Instructions illustration

Scenario 1:

1. Run forward to the first index signal;
2. Use this position as the zero point.

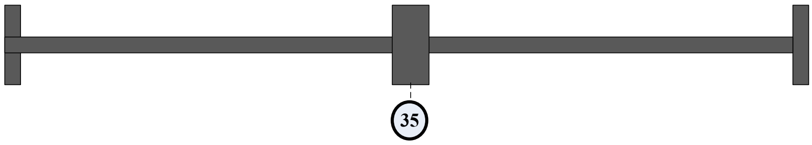


Return to zero method 35: The current position is zero

Signal: None

Instructions illustration

The current position serves as the zero point.



Zeroing method 36: Reverse collision, with the first Index at zero position

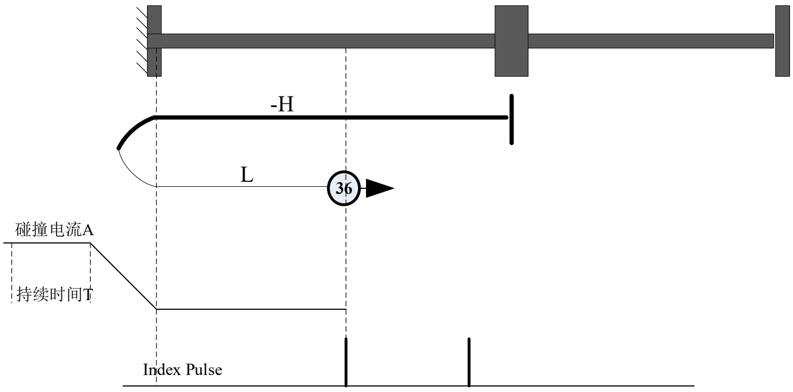
Signal: mechanical edge, index signal

Instructions illustration

1. Move in the negative direction until it collides with the mechanical edge;

When the current reaches the collision current, the load moves in the positive direction and decelerates and stops when it encounters the first Index signal;

3. Run to the Index position and use this position as the zero point.



Zeroing method 37: Forward collision, with the first Index at zero position

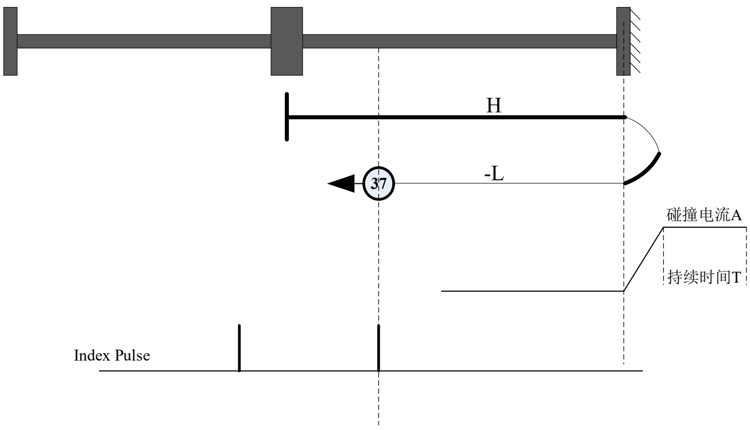
Signal: mechanical edge, index signal

Instructions illustration

1. Move in the positive direction until it collides with the mechanical edge;

When the current reaches the collision current, the load moves in the negative direction and decelerates and stops when it encounters the first Index signal;

3. Run to the Index position and use this position as the zero point.

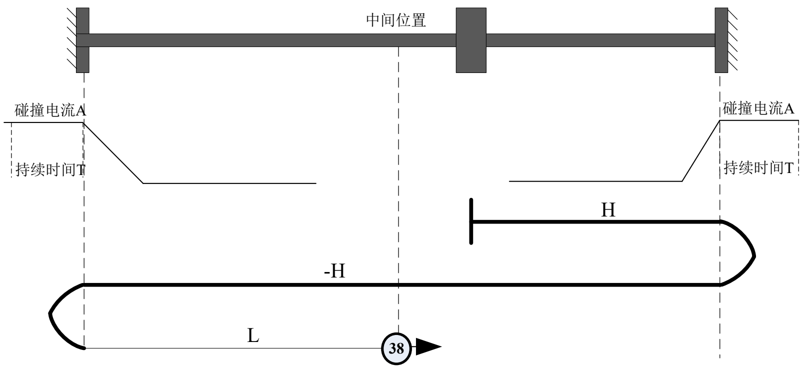


Zero return method 38: Collision on both sides, with zero in the middle

Signal: mechanical edge, index signal

Instructions illustration

1. Move in the positive direction until it collides with the mechanical edge;
When the current reaches the collision current, it moves in the negative direction until it collides with the mechanical edge;
When the current reaches the collision current, it moves in the positive direction to the middle position, and this position is taken as the zero point.



6 Application Functions

6.1 Torque limit switching function

6.1.1 Function Description

The Ω 6-DP series servo drive supports multiple torque output limiting methods internally and also supports torque limit switching function. For detailed parameter settings, please refer to Pr5.21 parameter description below.

6.1.2 Relevant parameters

serial number Pr5.21	name	Torque limit selection			Effective method	Effective immediately	data range	0~6
	Modbus address	0x352A	unit	-	Related modes	P/S/T/F	factory settings	1

The selection method for setting torque limits.

set value	positive direction	negative direction
0	Not supported, please do not set	
1	First torque limit (Pr0.13)	
2	First torque limit (Pr0.13)	Second torque limit (Pr5.22)

3	TL-SEL OFF → 1st torque limit (Pr0.13) TL-SEL ON → Second torque limit (Pr5.22)	
4	Not supported, please do not set	
5	Not supported, please do not set	
6	TL-SEL OFF	
	First torque limit (Pr0.13)	Second torque limit (Pr5.22)
	TL-SEL ON	
	Positive torque limit during external input (Pr5.25)	Negative direction torque limit during external input (Pr5.26)

When set to 0: not supported, please do not set
When set to 1: positive=Pr0.13;Negative=- Pr0.13;
When set to 2: positive=Pr0.13;Negative=- P5.22;
When set to 3: it needs to be used in conjunction with the torque limit switching input in IO: when Off, forward=Pr0.13;Negative=- Pr0.13;When On, positive=Pr5.22;Negative=- P5.22;
When set to 4: not supported, please do not set
When set to 5: not supported, please do not set it;
When set to 6, it needs to be used in conjunction with the torque limit switching input in IO: When Off, forward=Pr0.13;Negative=- P5.22;On, positive=Pr5.25;Negative=- P5.26;

serial number Pr0.13	name	First torque limit			Effective method	Effective immediately	data range	0~500
	Modbus address	0x301A	unit	%	Related modes	ALL	factory settings	350
Set the first limit value for the output torque of the motor.								

serial number Pr5.22	name	Second torque limit			Effective method	Effective immediately	data range	0~500
	Modbus address	0x352C	unit	%	Related modes	P/S/F	factory settings	500
Set the second torque limit value for the motor output torque. In addition, the parameter values are limited by the maximum torque of the applicable motor.								

6.2 Instruction division frequency switching function

6.2.1 Scope of Application

The Ω 6-DP series servo drive not only uses electronic gear ratios set with parameters Pr0.08 (command pulses per motor rotation), Pr0.09 (electronic gear numerator), and Pr0.10 (electronic gear denominator), but also has gear ratio switching function.

By combining the "Instruction Division Frequency Switching Input 1" and "Instruction Division Frequency

Switching Input 2" in the IO input function into different modes, 4-channel gear ratio switching can be achieved.

This function operates under the following conditions.

	Action conditions for using instruction multiplication
control mode	Location mode
other	Servo enabled on state.

6.2.2 Relevant parameters

Note:

【〇】: Indicates that the parameter will take effect when powered on again

【1】: Indicates that the parameter takes effect immediately

serial number Pr0.08*	name	Number of command pulses per revolution of the motor			Effective method	〇	data range	0~16777216
	Modbus address	0x3010	unit	pluse	Related modes	P	factory settings	10000
Set the command pulse for each rotation of the motor. When this setting value is 0, Pr0.09 "first instruction multiplier numerator" and Pr0.10 "instruction multiplier denominator" are valid.								

serial number Pr0.09*	name	The first instruction is divided into multiple frequency molecules			Effective method	〇	data range	$0\sim2^{30}$
	Modbus address	0x3012	unit	-	Related modes	P	factory settings	0
The molecule that sets the instruction pulse input for frequency division processing, namely the electronic gear ratio molecule. Pr0.08 is valid when the number of command pulses per revolution of the motor is 0.								
serial number Pr0.10*	name	Instruction multiplier denominator			Effective method	〇	data range	$1\sim2^{30}$
	Modbus address	0x3014	unit	-	Related modes	P	factory settings	10000
Set the denominator of the instruction pulse input multiplication processing, which is the denominator of the electronic gear ratio. Pr0.08 is valid when the number of command pulses per revolution of the motor is 0.								

The relationship between Pr0.08, Pr0.09, and Pr0.10 during position control

Pr0.08	Pr0.09	Pr0.10	Instruction division frequency processing
1~8388608	— (No impact)	— (No impact)	Command Pulse Input $\longrightarrow \dfrac{\text{Encoder Resolution}}{\text{Pr0.08 Setting Value}} \longrightarrow$ Position Command Unrelated to the settings of Pr0.09 and 0.10, the above figure is processed based on the set value of Pr0.08.
0	0	1~1073741824	Command Pulse Input $\longrightarrow \dfrac{\text{Encoder Resolution}}{\text{Pr0.10 Setting Value}} \longrightarrow$ Position Command When both Pr0.08 and Pr0.09 are 0, perform the above graph processing based on the set value of Pr0.10.
	1~1073741824	1~1073741824	Command Pulse Input $\longrightarrow \dfrac{\text{Pr0.09 Setting Value}}{\text{Pr0.10 Setting Value}} \longrightarrow$ Position Command When Pr0.08 is 0 and Pr0.09 ≠ 0, perform the above graph processing based on the set values of Pr0.09 and 0.10.

TIPS Note:

Although the values of the denominator and numerator can be set to any value, their action cannot be guaranteed when extreme division or multiplication ratios are set.Please select a frequency division/multiplication ratio range between 1/1000 and 8000 times

serial number Pr5.00	name	The second instruction divides the frequency of molecules into multiples			Effective method	Effective immediately	data range	0~230
	Modbus address	0x3500	unit	-	Related modes	P	factory settings	0
serial number Pr5.01	name	The third instruction divides the frequency molecule			Effective method	Effective immediately	data range	$0\sim2^{30}$
	Modbus address	0x3502	unit	-	Related modes	P	factory settings	0
serial number Pr5.02	name	The fourth instruction divides the harmonic molecule			Effective method	Effective immediately	data range	$0\sim2^{30}$
	Modbus address	0x3504	unit	-	Related modes	P	factory settings	0
Set the second to fourth molecules for frequency division processing of instruction pulse input. When Pr0.08 "the number of command pulses per rotation of the motor" is 0, it is considered valid.								

When the set value under position control is 0, the encoder resolution is set to numerator. Multiple gear ratios can be set and used through IO switching.

6.3 Various timing action settings

6.3.1 Driver Prohibited Input (NOT, POT) Timing

Set the action timing when the driver prohibits input (NOT, POT) from being valid.

(1) Parameter association:

<table>
<tr><td rowspan="2">serial number Pr5.04*</td><td>name</td><td colspan="3">Driver input prohibition setting</td><td>Effective method</td><td>○</td><td>data range</td><td>0~2</td></tr>
<tr><td>Modbus address</td><td>0x3508</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>1</td></tr>
<tr><td colspan="9">Set the action of prohibiting input (POT, NOT) for the driver.
<table>
<tr><th>set value</th><th>action</th></tr>
<tr><td>0</td><td>POT → Positive direction drive prohibited NOT → Negative direction drive prohibited</td></tr>
<tr><td>【 1 】</td><td>POT and NOT are invalid</td></tr>
<tr><td>2</td><td>Either POT/NOT input will result in Err38.0 "Driver input prohibition protection"</td></tr>
</table>
Please configure this value reasonably: When NOT/POT is invalid, the servo will not process the shutdown logic.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr5.05*</td><td>name</td><td colspan="3">Driver prohibition time sequence</td><td>Effective method</td><td>○</td><td>data range</td><td>0~2</td></tr>
<tr><td>Modbus address</td><td>0x350A</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">When Pr5.04 "Drive Prohibit Input Setting" is set to 0, the state of deceleration after the input of drive inhibit inputs (POT, NOT) is stopped.
Detailed content of Pr5.05 'Driver prohibition timing'
<table>
<tr><th>Pr5.04</th><th>Pr5.05</th><th>Driver prohibition time sequence</th></tr>
<tr><td rowspan="3">0</td><td>0</td><td>Immediate shutdown - deceleration time is 0 (* 1)</td></tr>
<tr><td>1</td><td>Rapid shutdown - deceleration time of 10ms/krpm (* 2)</td></tr>
<tr><td>2</td><td>Deceleration stop - Deceleration time</td></tr>
</table>
</td></tr>
</table>

		is 100ms/krpm (* 3)	

*1. Immediate shutdown: position control, position command=0;During speed control, the speed command is 0;During torque control, the speed limit value is 0.
*2. Rapid shutdown: refers to the situation where the servo does not accept the position command sent by the controller when the drive prohibition input (NOT, POT) signal is valid, and directly controls its rapid deceleration and shutdown from the current speed.At this time, the torque command value is limited by Pr5.11 "torque setting for immediate stop", and there is no need to amplify the position deviation. It can be set reasonably.
*3. Deceleration and shutdown: refers to the situation where the servo does not accept the position command sent by the controller when the drive prohibition input (NOT, POT) signal is valid, and directly controls its deceleration and shutdown from the current speed.At this time, the torque command value is also limited by Pr5.11 "torque setting for immediate stop".The calculation method for Pr0.14 'excessive position deviation setting' is the same as the quick stop method, and there is no need to amplify the deviation. It can be set to a reasonable value.
Description of limit motion control: When the drive prohibition input signal is valid, if the controller continues to send instructions in the direction of drive prohibition, the servo will not respond to the position instructions issued by the controller. Based on the current speed and the set drive prohibition time sequence, the shutdown mode will be planned;In position control mode, when the controller continues to send motion commands exceeding 20 times the current stop position of the single turn encoder value (taking a rotating motor as an example), an alarm Err91.1 will be triggered. In speed mode, there is no position limit alarm.

<table>
<tr><td rowspan="2">serial number Pr5.11</td><td>name</td><td colspan="3">Torque setting for instant stop</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~500</td></tr>
<tr><td>Modbus address</td><td>0x3516</td><td>unit</td><td>%</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set torque limit for immediate stop.
Note: When the set value is 0, it applies to the torque limit during normal operation.</td></tr>
</table>

Special note: When the system uses the internal reset function of the driver, the Pr5.04 driver disable setting parameter needs to be set to 0 or 1. At this time, in non reset mode, the driver will effectively shut down according to the described logic. Some controllers place the reset action on the system, etc. Generally, the limit protection of this system is also handled by the system. Therefore, setting the Pr5.04 driver disable parameter to 1 is invalid, and the driver will not provide any protection for the limit signal.

6.3.2 Timing of servo enable shutdown

(1) Associated parameters:

serial	name	Servo enable shutdown	Effective	Effective	data range	0~9

number Pr5.06		timing sequence			method	immediately		
	Modbus address	0x350C	unit	-	Related modes	ALL	factory settings	0

Set the deceleration and stop states after the servo is turned off.

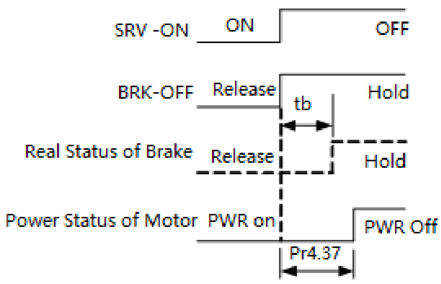
set value	Decelerating * 3	After stopping	position bias
0	Dynamic Brake (DB) Action	Dynamic Braking (DB) Action	Clear [*4]
1	Free operation (DB OFF)	Dynamic Braking (DB) Action	Clear [*4]
2	Dynamic Brake (DB) Action	Freedom (DB OFF)	Clear [*4]
3	Free operation (DB OFF)	Freedom (DB OFF)	Clear [*4]
4	Dynamic Brake (DB) Action	Dynamic Braking (DB) Action	Maintain [*2]
5	Free operation (DB OFF)	Dynamic Braking (DB) Action	Maintain [*2]
6	Dynamic Brake (DB) Action	Freedom (DB OFF)	Maintain [*2]
7	Free operation (DB OFF)	Freedom (DB OFF)	Maintain [*2]
8	Stop immediately [*1]	Dynamic Braking (DB) Action	Clear [*4]
9	Stop immediately [*1]	Freedom (DB OFF)	Clear [*4]

1. Immediate stop refers to stopping immediately in order to achieve control effects while the servo is enabled.At this time, the torque command is limited by Pr5.11 "torque setting for immediate stop".
2. When the servo is turned off and continuously sends position commands, or when the motor continues to operate and accumulates position deviation, Err24.0 "excessive position deviation protection" will occur.In addition, if the servo enable is turned on when the position deviation is too large, in order to control the deviation to 0, the motor may run rapidly.Please maintain sufficient positional deviation before use.
3. The so-called deceleration refers to reducing the motor's operating state to a speed range below 30r/min (default value, can be set through parameters).When the speed drops below 30r/min and changes after stopping, it will not be affected by the motor speed but will follow the state after stopping.
4. Position deviation, always maintain a zero state.

Attention: When an error occurs during servo enable shutdown, follow Pr5.10 "Alarm Time Sequence" for action.In addition, if the power is turned off during the servo enable shutdown, it is necessary to follow Pr5.07 "Power Off Timing".

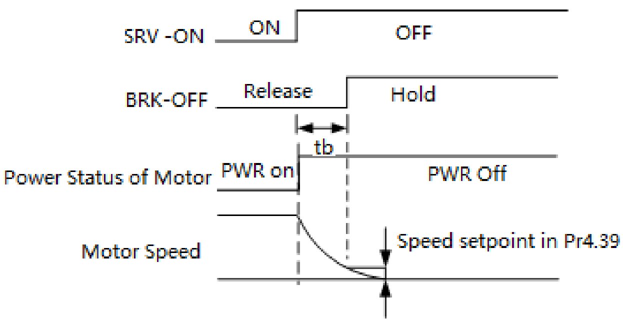
serial number Pr4.37	name	Mechanical brake action setting when stopping			Effective method	Effective immediately	data range	0~10000
	Modbus address	0x344A	unit	ms	Related modes	ALL	factory settings	0

When the servo enable is turned off while the motor is stopped, set the time for the brake release signal (BRK-OFF) to be turned off (brake held) until the motor is not powered on (servo free).
To prevent small movements/drops of the motor (workpiece) caused by response delay (t_b) of the brake.
The setting of Pr4.37 is ≥ t_b
In practice, after the brake is activated, it is set to the servo enabled closed state.
Note: This value is used to set the PWM off delay time after the motor stops;If the motor needs to stop freely, please set this value to 0;



serial number Pr4.38	name	Mechanical brake action setting during operation			Effective method	Effective immediately	data range	0~32000
	Modbus address	0x344C	unit	ms	Related modes	ALL	factory settings	0

When the servo enable is turned off during motor rotation, set the time from the detection of the servo enable on input signal (SRV-ON) being turned off to the external brake release signal (BRK-OFF) being turned off.
Designed to prevent brake degradation caused by motor rotation.
The servo enable shutdown method during motor rotation is as follows. The time tb in the following figure is the set time of Pr4.38 or the smaller time value when the motor rotation speed drops below the set speed of Pr4.39.



Note: This value is used to set the delay time for holding the brake DO off after enabling DI to be disconnected;If the motor needs to stop freely, please set this value to 0;

serial number Pr4.39	name	Brake release speed setting			Effective method	Effective immediately	data range	30~3000
	Modbus	0x344E	unit	rpm	Related	ALL	factory	30

	address				modes		settings	

Set the speed value when the brake is released

The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.

serial number Pr5.11	name	Torque setting for instant stop			Effective method	Effective immediately	data range	0~500
	Modbus address	0x3516	unit	%	Related modes	ALL	factory settings	0

Set torque limit for immediate stop.

Note: When the set value is 0, it applies to the torque limit during normal operation.

serial number Pr6.10	name	Function extension settings			Effective method	Effective immediately	data range	0~2147483647
	Modbus address	0x3614	unit	-	Related modes	ALL	factory settings	16

Each function is set in bit units.

	function	set value	
		0	1
bit0	Unused	Please fix position 0	
bit1	Overload detection of shielded IGBT module	detection valid	Invalid detection
bit6	Block ABZ disconnection detection	invalid	effective
bit11	Encoder overheating abnormal protection detection	invalid	effective
Bit12	The servo fast power-off function is effective	effective	invalid
bit15	Slow stop function	invalid	effective

*The lowest bit is bit0

*When the encoder overheating warning occurs, Err15.1 "Encoder Overheating Abnormal Protection" occurs.

serial number Pr6.14	name	Immediate stop time upon alarm			Effective method	Effective immediately	data range	0~1000
	Modbus address	0x361C	unit	ms	Related modes	ALL	factory settings	200

Set the allowable time to immediately stop the action when an alarm occurs.

If it exceeds this set value, it will become a mandatory alarm state.

When the set value is 0, it does not immediately stop, but immediately becomes an alarm stop state. Note: To make the motor stop freely, set it to 0.

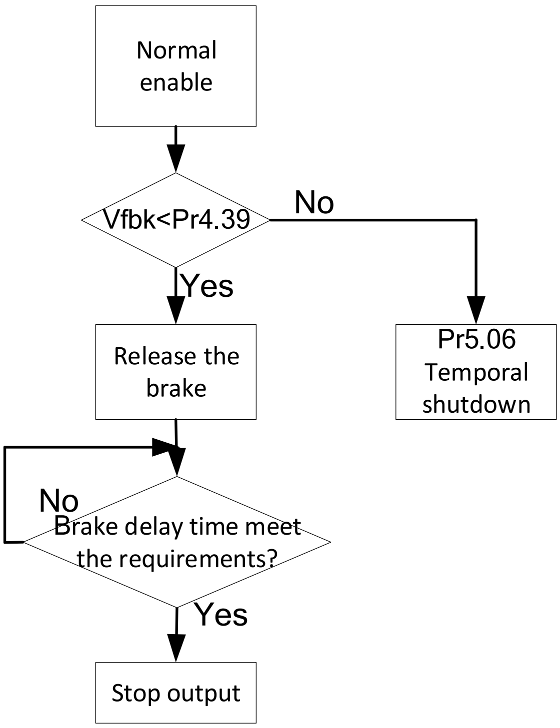
<table>
<tr><td rowspan="2">serial number Pr6.51</td><td>name</td><td colspan="3">Instant stop completion waiting time</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~10000</td></tr>
<tr><td>Modbus address</td><td>0x3666</td><td>unit</td><td>ms</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">When a warning corresponding to immediate stop occurs, the brake release output (BRK-OFF) is set to OFF, and the motor is maintained energized for a certain period of time.
Note: To make the motor stop freely, set it to 0.</td></tr>
</table>

(2) Clearance of positional deviation:

Absolute position system, when an alarm occurs, the position deviation is automatically reset to zero.

(3) Shutdown timing:

When the driver detects normal actuation (excluding non abnormal alarms such as alarms or AC power outages), the current shutdown logic is determined as follows: the time in the figure is Pr4.37 brake delay closing time;



When the enable is disabled and the speed feedback is greater than the Pr4.39 setting, the shutdown mode can be selected based on the Pr5.06 parameter mentioned above. There are several specific types:

*Mode 1: DB-DB, DB slows down - DB stops;

<table>
<tr><td colspan="2">DB-DB, DB slows down - DB stops</td></tr>
<tr><td rowspan="2">During the shutdown process</td><td>Force system disconnection to enable;</td></tr>
<tr><td>When the system enable status is confirmed to be turned off and the PWM output is turned off, the dynamic braking DB action is directly opened;</td></tr>
</table>

	When the downtime is less than Pr4.38 and the speed feedback is less than Pr4.39, turn off the enable and brake; 2. Otherwise, when the shutdown time is greater than Pr4.38, the enable will be forcibly turned off and the brake will be turned off;
SERVO_OFF	After the shutdown is completed, as it is a DB shutdown, activate the dynamic brake

*Mode2：Free-DB,Idle deceleration - DB stops;

Free-DB,Idle deceleration - DB stop	
During the shutdown process	Force system disconnection to enable;
	When the downtime is less than Pr4.38 and the speed feedback is less than Pr4.39, turn off the enable and brake; 2. Otherwise, when the shutdown time is greater than Pr4.38, the enable will be forcibly turned off and the brake will be turned off;
SERVO_OFF	After the shutdown is completed, as it is a DB shutdown, activate the dynamic brake

*Mode 3: DB Free, DB slows down, idle stops

DB Free, DB slows down, idle stops	
During the shutdown process	Force system disconnection to enable;
	When the system enable status is confirmed to be turned off and the PWM output is turned off, the dynamic braking DB action is directly opened;
	When the downtime is less than Pr4.38 and the speed feedback is less than Pr4.39, turn off the enable and brake; 2. Otherwise, when the shutdown time is greater than Pr4.38, the enable will be forcibly turned off and the brake will be turned off;
SERVO_OFF	After the shutdown is completed, as it is a free shutdown, the dynamic brake is turned off

*Mode4：Free-Free，Idle stop, idle stop

Free-Free，Idle stop, idle stop	
During the shutdown process	Force system disconnection to enable;
	When the downtime is less than Pr4.38 and the speed feedback is less than Pr4.39, turn off the enable and brake; 2. Otherwise, when the shutdown time is greater than Pr4.38, the enable will be forcibly turned off and the brake will be turned off;
SERVO_OFF	After the shutdown is completed, as it is a free shutdown, the dynamic brake is turned off

*Mode 5: Stop DB: STOP stops, DB stops

Stop DB: STOP stops, DB stops	
During the shutdown process	Bit15=0 for Pr6.10, when anti fall is turned off, the speed loop is set to force=0
	Bit15=1 for Pr6.10, turn on anti fall, switch Motion to JOG, set speed=0, plan shutdown;
	The implementation of anti fall function is described in detail below;
SERVO_OFF	After the shutdown is completed, as it is a DB shutdown, activate the dynamic brake

*Mode 6: Stop Free, STOP stop, idle stop

Stop Free, STOP stop, idle stop	
During the shutdown process	Bit15=0 for Pr6.10, when anti fall is turned off, the speed loop is set to force=0
	Bit15=1 for Pr6.10, turn on anti fall, switch Motion to JOG, set speed=0, plan shutdown;
	The implementation of anti fall function is described in detail below;
SERVO_OFF	After the shutdown is completed, as it is a free shutdown, the dynamic brake is turned off

*7. Time sequence of anti fall function

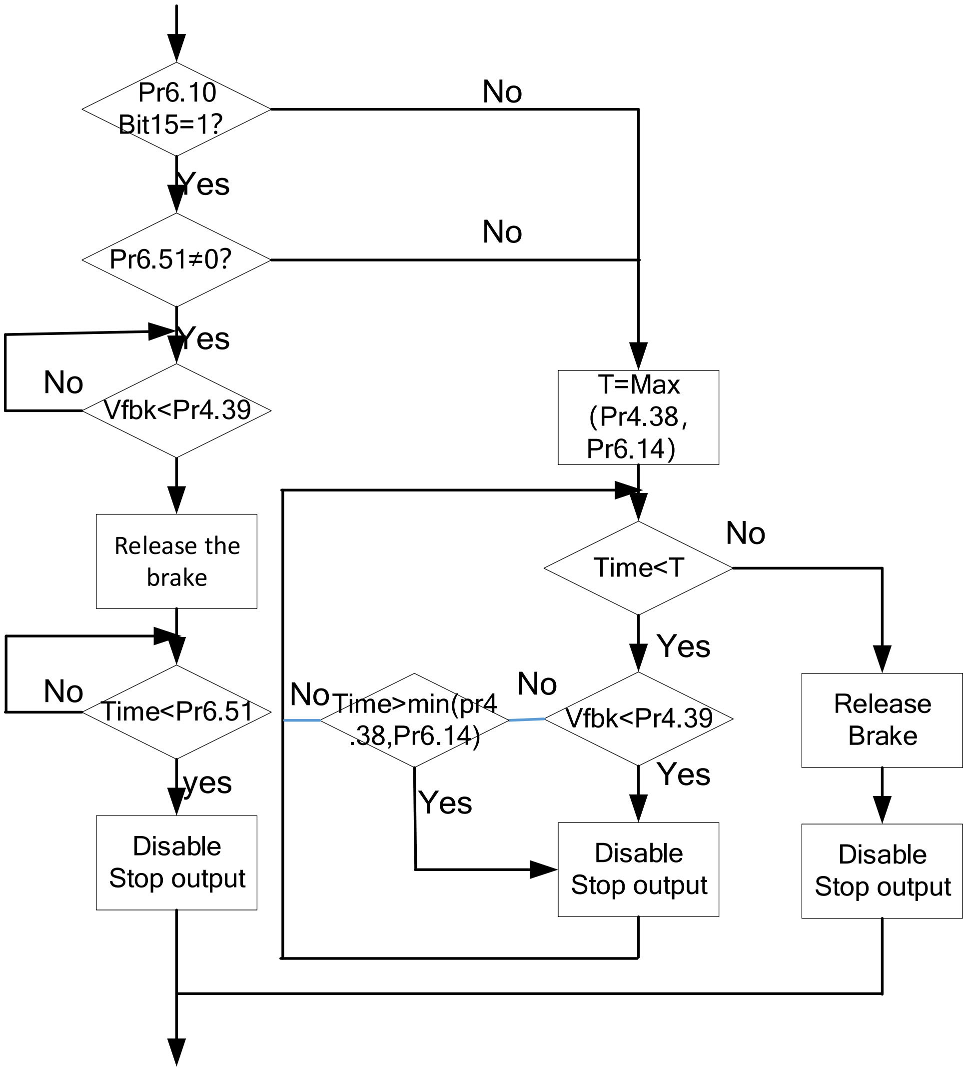


Figure 6.3.2-1 Time sequence diagram of anti fall function

*The maximum value for immediately stopping torque output is Pr5.11;

6.3.3 Alarm timing sequence

Set the action timing for alarm occurrence status.

(1) Associated parameters:

<table>
<tr><td rowspan="2">serial number Pr5.10</td><td>name</td><td colspan="3">Alarm timing sequence</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~7</td></tr>
<tr><td>Modbus address</td><td>0x3514</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
</table>

Set the state during deceleration and after stopping when an alarm occurs.

set value	Decelerating *[3]	After stopping	position bias
0	Dynamic Brake (DB) Action	Dynamic Brake (DB) Action	Reset *[1]
1	Free operation (DB OFF)	Dynamic Brake (DB) Action	Reset *[1]
2	Dynamic Brake (DB) Action	Freedom (DB OFF)	Reset *[1]
3	Free operation (DB OFF)	Freedom (DB OFF)	Reset *[1]
4	Action A: Stop immediately Action B: DB action *[2]	Dynamic Brake (DB) Action	Reset *[1]
5	Action A: Stop immediately Action B: DB action *[2]	Dynamic Brake (DB) Action	Reset *[1]
6	Action A: Stop immediately Action B: DB action *[2]	Freedom (DB OFF)	Reset *[1]
7	Action A: Stop immediately Action B: DB action *[2]	Freedom (DB OFF)	Reset *[1]

1. Position deviation, absolute position system, reset directly after the alarm occurs.
2. Actions A and B indicate whether to immediately stop when an alarm occurs. If the corresponding alarm for immediate stop occurs, and the set value is 4-7, then action A should be followed for immediate stop.If there is an alarm that does not immediately stop, it will not stop immediately, but instead become the dynamic brake (DB) action specified by action B, or become idle.Please maintain the power supply of the main circuit until the deceleration stops.
3. The so-called deceleration refers to the interval where the motor's operating state is reduced to a speed below 30r/min.

<table>
<tr><td rowspan="2">serial number Pr5.11</td><td>name</td><td colspan="3">Torque setting for instant stop</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~500</td></tr>
<tr><td>Modbus address</td><td>0x3516</td><td>unit</td><td>%</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set torque limit for immediate stop.
Note: When the set value is 0, it applies to the torque limit during normal operation.</td></tr>
</table>

serial number Pr6.47	name	Function Expansion Setting 2			Effective method	Power on again	data range	-32768~32767
	Modbus address	0x365E	unit	-	Related modes	ALL	factory settings	1

Each function is set in bit units.

	function	set value 0	set value 1
Bit0	2-degree-of-freedom control mode	invalid	effective
Bit11	Instant stop alarm extension	invalid	effective

*The lowest bit is bit0

serial number Pr4.37	name	Mechanical brake action setting when stopping			Effective method	Effective immediately	data range	0~10000
	Modbus address	0x344A	unit	ms	Related modes	ALL	factory settings	0

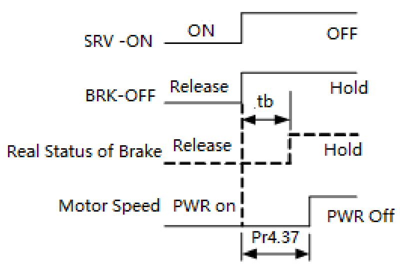
When the servo enable is turned off while the motor is stopped, set the time for the brake release signal (BRK-OFF) to be turned off (brake held) until the motor is not powered on (servo free).

To prevent small movements/drops of the motor (workpiece) caused by response delay (t_b) of the brake.

The setting of Pr4.37 is $\geq t_b$

In practice, after the brake is activated, it is set to the servo enabled closed state.

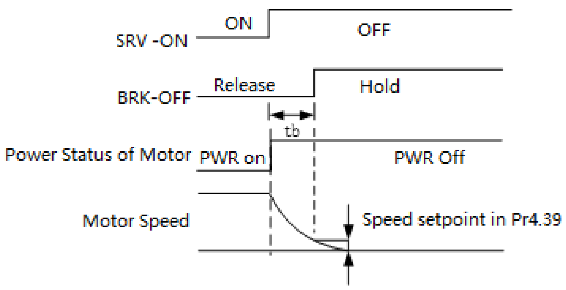
Note: This value is used to set the PWM off delay time after the motor stops;If the motor needs to stop freely, please set this value to 0;



serial number Pr4.38	name	Mechanical brake action setting during operation			Effective method	Effective immediately	data range	0~32000
	Modbus address	0x344C	unit	ms	Related modes	ALL	factory settings	0

When the servo enable is turned off during motor rotation, set the time from the detection of the servo enable on input signal (SRV-ON) being turned off to the external brake release signal (BRK-OFF) being turned off. Designed to prevent brake degradation caused by motor rotation.

The servo enable shutdown method during motor rotation is as follows. The time tb in the following figure is the set time of Pr4.38 or the smaller time value when the motor rotation speed drops below the set speed of Pr4.39.



Note: This value is used to set the delay time for holding the brake DO off after enabling DI to be disconnected;If the motor needs to stop freely, please set this value to 0;

serial number Pr4.39	name	Brake release speed setting			Effective method	Effective immediately	data range	30~3000
	Modbus address	0x344E	unit	rpm	Related modes	ALL	factory settings	30

Set the speed value when the brake is released

The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.

serial number Pr5.11	name	Torque setting for instant stop			Effective method	Effective immediately	data range	0~500
	Modbus address	0x3516	unit	%	Related modes	ALL	factory settings	0

Set torque limit for immediate stop.

Note: When the set value is 0, it applies to the torque limit during normal operation.

serial number Pr6.10	name	Function extension settings			Effective method	Effective immediately	data range	0~2147483647
	Modbus address	0x3614	unit	-	Related modes	ALL	factory settings	16

Each function is set in bit units.

	function	set value	
		0	1
bit0	Unused	Please fix position 0	
bit1	Overload detection of shielded IGBT module	detection valid	Invalid detection

bit6	Block ABZ disconnection detection	invalid	effective
bit11	Encoder overheating abnormal protection detection	invalid	effective
Bit12	The servo fast power-off function is effective	effective	invalid
bit15	Slow stop function	invalid	effective

*The lowest bit is bit0

*When the encoder overheating warning occurs, Err15.1 "Encoder Overheating Abnormal Protection" occurs.

serial number Pr6.14	name	Immediate stop time upon alarm			Effective method	Effective immediately	data range	0~1000
	Modbus address	0x361C	unit	ms	Related modes	ALL	factory settings	200

Set the allowable time to immediately stop the action when an alarm occurs.
If it exceeds this set value, it will become a mandatory alarm state.
When the set value is 0, it does not immediately stop, but immediately becomes an alarm stop state.
Note: To make the motor stop freely, set it to 0.

serial number Pr6.51	name	Instant stop completion waiting time			Effective method	Effective immediately	data range	0~10000
	Modbus address	0x3666	unit	ms	Related modes	ALL	factory settings	0

When a warning corresponding to immediate stop occurs, the brake release output (BRK-OFF) is set to OFF, and the motor is maintained energized for a certain period of time.
Note: To make the motor stop freely, set it to 0.

There are two modes of timing requests during shutdown, SeqA and SeqB, which are set according to parameter Pr5.10 as follows:

Parameter value setting	SeqA - Instant Stop	SeqB - Non immediate stop
Pr5.10=0	DB_DB	DB_DB
Pr5.10=1	FREE_DB	FREE_DB
Pr5.10=2	DB_FREE	DB_FREE
Pr5.10=3	FREE_FREE	FREE_FREE
Pr5.10=4	STOP_DB	DB_DB
Pr5.10=5	STOP_DB	FREE_DB
Pr5.10=6	STOP_FREE	DB_FREE
Pr5.10=7	STOP_FREE	FREE_FREE

*1. Set Bit11 to 1 through parameter Pr6.47 to enable all errors for immediate stopping;

*When bit11=0 in Pr6.47, does the attribute of this error in the internal alarm list of the servo support immediate stop;

*3. When immediate stop is allowed, use SegA's timing shutdown, otherwise use SeqB shutdown. The detailed shutdown logic is consistent with the description in the servo enable shutdown mode.

6.4 Torque saturation protection function

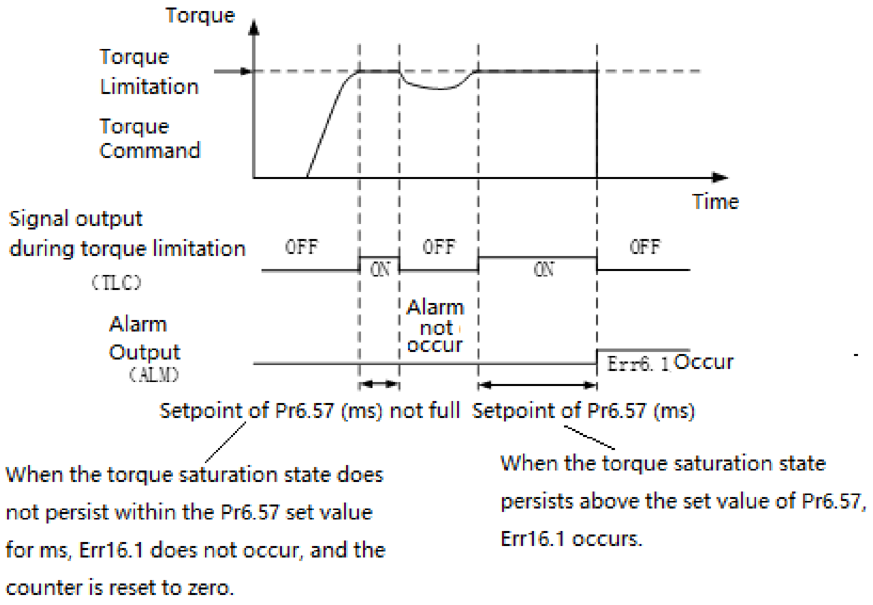
6.4.1 Function Description

In order to effectively protect the load equipment, an appropriate torque limit value can be set during the initial adjustment stage or normal use. After reaching the limit torque, the output torque saturation abnormal protection can be set. The saturation detection time can be specified in parameter Pr6.57 for details.

Attention: This function is invalid in torque mode.

6.4.2 Associated Parameters

<table>
<tr><td rowspan="2">serial number Pr6.57</td><td>name</td><td colspan="3">Detection time of torque saturation anomaly protection</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~5000</td></tr>
<tr><td>Modbus address</td><td>0x3672</td><td>unit</td><td>ms</td><td>Related modes</td><td>P/S/F</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set the detection time for torque saturation anomaly protection.
When torque saturation occurs above the set time, Err16.1 "torque saturation abnormal protection" occurs.
When the set value is 0, this function is invalid and no alarm occurs.
For example, when set to 5000, Err16.1 occurs when the torque saturation state lasts for about 5 seconds.
During torque control, this function is invalid and Err16.1 does not occur.
When the warning is immediately stopped, this function is invalid and Err16.1 does not occur.</td></tr>
</table>



6.5 Position comparison output (aerial photography)

6.5.1 Function Description

Position comparison output (flying shot) function, which compares the servo with different set position values during motion. When the comparison conditions are met, it immediately outputs a high-speed digital DO signal of adjustable length for subsequent motion control.The comparison action is completed by hardware without software delay issues, and can accurately compare high-speed moving axes. Therefore, when using the position comparison output function, please configure this function to be used on high-speed DO.

The Ω 6-DP series servo drive does not have a high-speed output port, therefore, it only supports low-speed position comparison output function.For DP pulse type drivers: up to 8 position comparison values can be set;Multiple positions can be configured at the same output port or different output ports, and the average high and low voltage of the output signal can be independently set.In addition, the position comparison output function is limited to single ended output signals of the universal DO port, without differential output interfaces. Therefore, the Pr4.47 setting is invalid.

The basic specifications of the Ω 6-DP series servo drive are as follows:

type	Support parameters		remark
output	I/F	[Universal+High Speed Output (SO)] Single ended Route 3 (SO1~6)	The hardware output port definition of each driver in the Ω 6 series is different, and the wiring method should refer to the hardware wiring

			instructions of each model
	logic	Parameter setting (output polarity can be set)	-
	Output signal width	Parameter setting (0.1~3276.8ms)	Can set output width
	delay compensation	Support, compensation time can be set through parameter settings	Compensate for delay errors caused by hardware transmission
Comparing sources	Encoder (Communication/ABZ)	support	-
comparison value	set quantity	eight o'clock	
	Set position range	Signed 32-bit	The user unit needs to undergo gear ratio conversion

6.5.2 Scope of use

If the following conditions are not met, this function cannot be used.

	Action conditions for position comparison output function
control mode	Position Mode
other	Origin reset action completed

Precautions

The accuracy of position comparison output may be limited under the following conditions.

(1) When the encoder resolution is low.

6.5.3 Hardware Wiring

For detailed hardware wiring of the Ω 6-DP series pulse servo driver, please refer to the relevant IO chapters.

6.5.4 Relevant parameters

Classification	No.	parameter name	set the scope	unit	function
4	44	Position comparison output pulse width setting	0.1～3276.7	0.1ms	Set the pulse width for position comparison output.At 0 o'clock, the pulse does not output.
4	45	Position comparison output polarity selection	0-63	-	Bit0: SO1 or OCMP1 Bit1: SO2 or OCMP2 Bit2: SO3 or OCMP3 Bit3: SO4 or OCMP4 bit4: SO5 bit5: SO6 set value 0: In pulse output, SO2~6 output optocouplers are ON, and OCMP1~4 are L levels respectively. 1: In the pulse output, SO1-6 output optocouplers are OFF, and OCMP1-4 are at H level. Usually set to 0.
4	47	Pulse output selection	0~7	-	Select the signal from the pulse output/position comparison output terminal. DP pulse driver does not support differential output, this parameter is invalid.
4	48	Position comparison value 1	-2147483648~2147483647	command unit	Set the comparison value for position comparison 1.
4	49	Position comparison value 2	-2147483648~2147483647	command unit	Set the comparison value for position comparison 2.
4	50	Position	-2147483648~	command	Set the comparison value for position comparison 3.

Classification	No.	parameter name	set the scope	unit	function
		comparison value 3	2147483647	unit	
4	51	Position comparison value 4	-2147483648~ 2147483647	command unit	Set the comparison value for position comparison 4.
4	52	Position comparison value 5	-2147483648~ 2147483647	Instruction unit	Set the comparison value for position comparison 5.
4	53	Position comparison value 6	-2147483648~ 2147483647	command unit	Set the comparison value for position comparison 6.
4	54	Position comparison value 7	-2147483648~ 2147483647	command unit	Set the comparison value for position comparison 7.
4	55	Position comparison value 8	-2147483648~ 2147483647	command unit	Set the comparison value for position comparison 8.
4	56	Position comparison output delay compensation amount	-32768~32767	0.1us	Compare the output delay based on the compensation position of the circuit.
4	57	Position	-2147483648~	-	Set the output terminals corresponding to positions 1 to 8 using bit settings.

Classification	No.	parameter name	set the scope	unit	function
		comparison output allocation setting	2147483647		Multiple comparison values can be set at one output terminal. Set bit Bit 0-3 position comparison 1 Bit4-7 position comparison 2 Bit 8-11 position comparison 3 Bit12-15 position comparison 4 Bit16-19 position comparison 5 Bit 20-23 position comparison 6 Bit24-27 position comparison 7 Bit 28-31 position comparison 8 The set values of each setting bit * 2) * 3 The output of the set value 0000 is invalid 0001 assigned to SO1 or OCMP1 0010 is allocated to SO2 or OCMP2 0011 assigned to SO3 or OCMP3 0100 assigned to SO4 or OCMP4 0101 assigned to SO5 0110 assigned to SO6 Used by manufacturers other than those mentioned above (do not set)
4	58	Position comparison output direction setting	0~2	-	Set position comparison output trigger direction 0: Triggered in the positive direction, not triggered in the negative direction; 1: Negative direction triggered, positive direction not triggered; 2: Bidirectional triggering.

*1) Parameter properties, please refer to the relevant parameter descriptions.

*2) When using the universal output (SO1~SO2, single axis) as the position comparison output (CMP-OUT), please set the functions of Pr4.10~Pr4.15;Cannot monitor position comparison output through EtherCAT communication.

6.6 Software Reset

6.6.1 Function Description

In order to restart the driver device and simplify the debugging steps in the event of non hardware power failure, the upper computer debugging software is now available

Ω.Master has added a one click device restart function

6.6.2 Operating instructions and precautions

The operation is shown in the following figure: Use the following buttons in the debugging software menu bar to operate:

6.7 Positioning compensation function

6.7.1 Function Description

In some situations where high positioning accuracy is required, there may be certain errors between the encoder values and the actual angles or distances due to mechanical structure or encoder technology. In this case, we can effectively improve the positioning accuracy of the equipment by using the "positioning compensation" function.When using "positioning compensation", first use the driver's "Homing Zeroing Mode" to reset to zero, then use a laser interferometer to test the actual error of the device, and then import the error file into the positioning compensation table.The main process is divided into:

(1) Error data collection

When collecting error data from load devices, it is necessary to first use a laser interferometer to collect error data and save it in a specific format file (before this operation, ensure that the driver is reset to zero);The driver integrates the "position test" function to correctly set the motion distance and number of motion points.

(2) Positioning data compensation

Currently, only Renishaw RTA and RTL data imports are supported. Please ensure that the units for importing data are mrad (RTA) and um (RTL).The RTA data is applicable to the positioning compensation of incremental rotating motors. When importing RTA angle data, the compensation interval calculation formula is:

$$\frac{\Delta\theta}{1000*2*\pi}*\mathrm{Pr}10.19$$

Among them: $\Delta\theta$ to compensate for the angle interval, the unit is 0.001rad, Pr10.19 is the incremental encoder resolution;The applicable scenario for RTL distance data is the positioning compensation of incremental linear motors. When importing RTL distance data, the compensation interval calculation formula is:

$$\Delta l * \mathrm{Pr}10.21$$

Among them, Δl represents the distance interval between each point, with a unit of 0.001um, and Pr10.21 is the resolution of the grating ruler.After enabling the positioning compensation function, $P_{fdb} = P_{enc} + P_{cmp}$ where is the actual feedback position, P_{fdb} is the encoder's actual feedback, P_{enc} and is the position compensation position;When compensating for position, currently only incremental angles and lengths are supported as positive numbers. The compensation position is: $0, \Delta P, 2\Delta P, 3\Delta P.....N\Delta P; \Delta P \geq 0$

6.7.2 Position testing

Before position testing, please turn off the positioning compensation function, then use the zero return function to return to zero, turn on the Renishaw laser interferometer recording function, turn on automatic positioning, and the motor starts running according to the set parameters. After running, save the interferometer recording data. Note that during position testing, it is necessary to ensure that the movement is in both directions, and one-way operation will cause abnormal internal calculation of point positions.

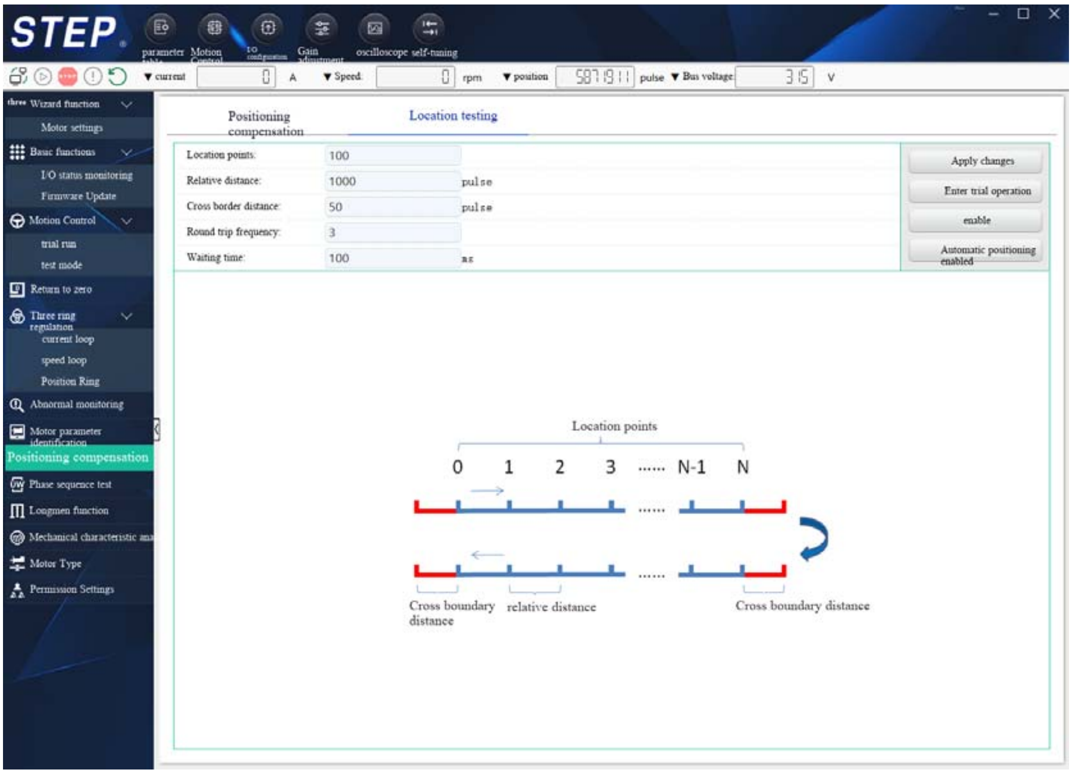


Figure 6.7.2-1 Position Test Interface

6.7.3 Positioning compensation

After loading RTA/RTL data, click Write to save the data to the servo;After setting the positioning compensation switch, compensation start index, and compensation start position, click Apply to modify and restart.

The conditions for enabling positioning compensation are: the positioning compensation switch is set to one-dimensional error compensation+commutation completion+zeroing completion;

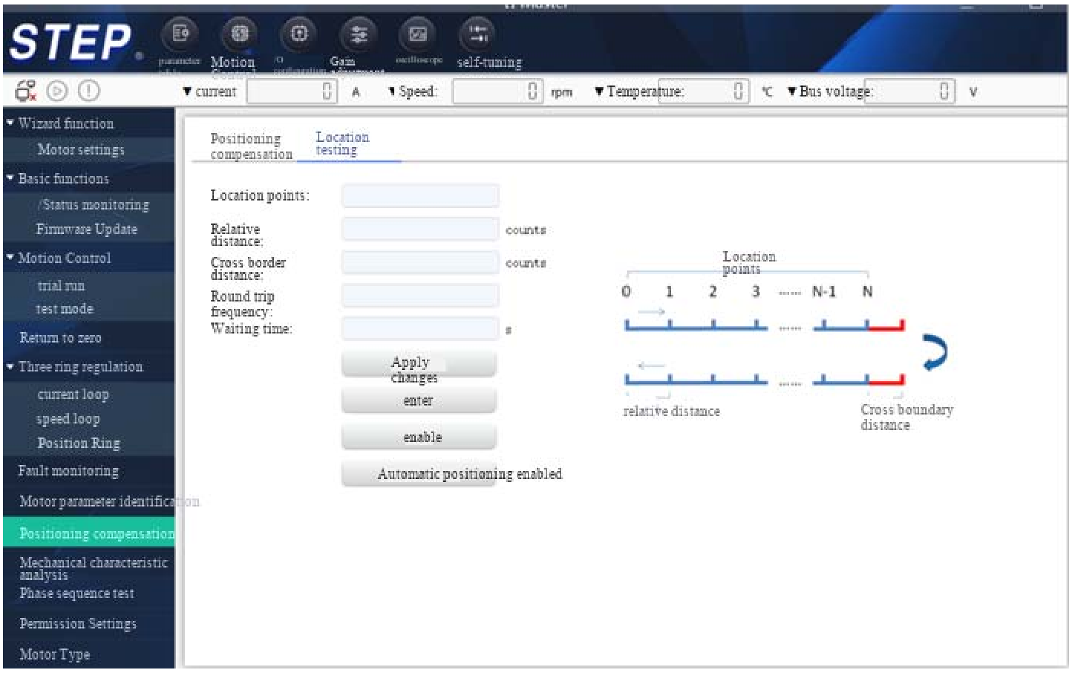


Figure 6.7.3-1 Positioning Compensation Interface

Interface related parameter description:

parameter name	Modbus address	Effective mode	Set range	Instructions
Positioning compensation switch	0x8428	restart	0-1	0-Close, 1-Open Compensation
Compensation data type	0x842a	immediately	0-2	0-pulse, 1-0.01um, 2-0.001rad
Compensation starting index	0x842c	immediately	0-999	Set the starting position index
Compensation starting position	0x842e	immediately	-2^31-1-2^31	*1)
Compensation points	0x8430	immediately	0-999	Set the number of data in the compensation table

Compensation position gap	0x8432	immediately	-2^31-1-2^31	*2）

*1) Set compensation starting position: The encoder position at which compensation starts should be set to the minimum value of the encoder feedback position when testing error data;If the feedback position of the motor encoder is in the positive direction area when testing error data, then the starting position is 0.If the feedback position of the motor encoder is in the negative direction area when testing error data, the starting position is the farthest position in the negative direction.For example, when testing error data, if the encoder feedback position area is from 0 to 400000, the starting position is set to 0;If the encoder feedback position area is -40000 to 0, set the starting position to -40000.

*2) Set the theoretical interval pulse number for adjacent data in the compensation table,

6.8 Absolute Value System

6.8.1 Absolute Encoder

If Pr0.15 "Absolute Encoder Setting" is set to a value other than "1" (factory setting), it can form an absolute system that does not require an origin reset action after power on.

■ Associated parameters

Classification	No.	attribute	parameter name	set the scope	unit	function
0	15	C	Absolute encoder setting	0～4	-	Set the usage method for absolute encoders. 0: Used in absolute systems (absolute mode). 1: Used in incremental systems (incremental mode). The detection of the following protection functions is invalid. Err40.0 "Absolute System Down Exception Protection" Err41.0 "Absolute Counter Overflow Exception Protection" Err42.0 "Absolute Over Speed Exception Protection" Err45.0 "Absolute Multi Loop Counter Abnormal

						Protection" 2: Used in absolute systems (absolute mode), but ignoring multi cycle counter overflow. 3: Used in absolute systems (absolute mode), but not with multi turn counters. (Single loop absolute mode) 4: Rotation mode (using multi-stage function).

Absolute encoder type	Pr0.15 (absolute encoder setting)	
	0，2，4	1，3
with battery	need	No need
battery-free	No need	

1 Absolute encoder zeroing

The absolute encoder with battery utilizes an absolute data battery to store multiple cycles of data.Therefore, after installing the absolute encoder battery, when starting the device initially, it is necessary to perform the encoder reset action at the origin position and set the multi turn data value to 0.The clearing action of the absolute encoder is performed through USB communication (specialized debugging software Ω Master) or auxiliary function 10 of the panel LED.Please refer to the description in the panel function chapter for panel auxiliary functions, which will not be described in detail here. When debugging software on the upper computer, please enter the "advanced password" first, open the expert mode, as shown in the following figure:

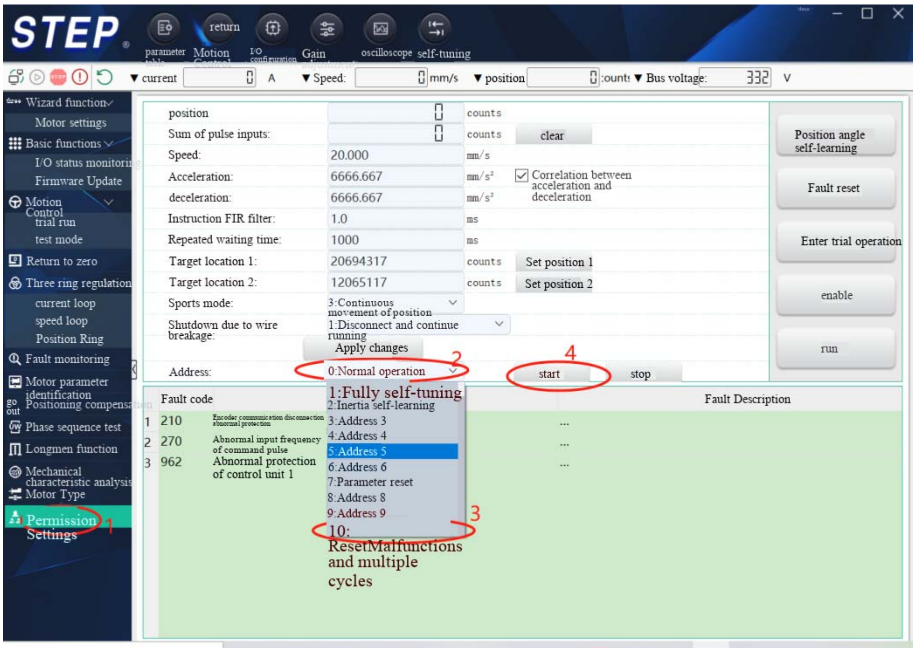


Figure 6.8-1 Multi cycle Clearing Method

2. Battery replacement for absolute encoder with battery

If the battery (salt lithium sulfite battery) is stored in a non discharging state for a long time, a battery alarm may occur due to a brief low voltage phenomenon during the next discharge.To prevent this situation, discharge treatment (replacement) of the battery can be carried out.The battery replacement can be done through USB communication.

Note: * 1) If battery replacement is performed, a battery warning may occur.In this case, please clear the battery warning.

*2) If it is a battery free absolute encoder, do not perform battery updates.

6.9 Pulse regeneration function

6.9.1 Function Description

Pulse type drivers can also transmit the movement amount from the servo to the upper computer controller in AB pulse mode for position monitoring or feedback closed-loop control function of the upper system;The output source can be selected as an encoder or an external displacement sensor output;The output type can be set to signal regeneration and no signal regeneration;At present, the pulse output limit protection can be turned on through parameter Pr5.33, with a protection threshold of 4M.

(1) Encoder resolution calculation:

Linear motor:$Line = \frac{pole\ spacing}{Resolution}$

Rotating motor+ABZ encoder:$Line = Pr\ 1\ 0.32(Incremental\ encoder\ resolution)$

Rotating motor+communication encoder: $Line = 2^{Pr10.16}$

Among them, Pr10.16 is the encoder single loop resolution, and Pr10.32 is the incremental encoding resolution.

(2) Determination of numerator and denominator for pulse regeneration:

Pr0.11	Pr5.03	Pr0.12=0/1 encoder	
Number of divided pulses	Dividing denominator	Calculation of gear ratio (Fac)	Number of output pulses per cycle
---	0	pr0.11*4/Line	Pr0.11
---	≠0	Pr0.11/Pr5.03	Fac*Line/4

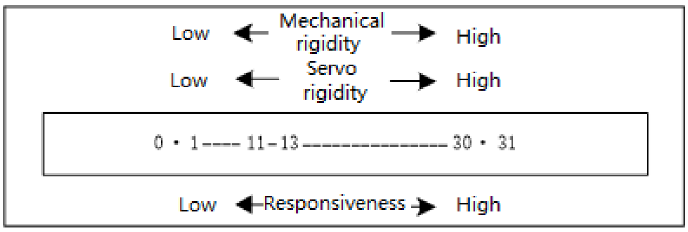
(3) Native regeneration selection

The current frequency division output and native regeneration output are all set by software for frequency division, and the z-phase width cannot be set.

(4) Direction setting

Parameter Pr0.12	Pulse output logic inversion/output source selection
=1 or 3	B-phase reversal
=0 or 2	B-phase non reversal

6.9.2 Relevant parameters

<table>
<tr><td rowspan="2">serial number Pr0.03</td><td>name</td><td colspan="2">Real time automatic adjustment of machinery Rigid setting</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>0~31</td></tr>
<tr><td>accessibility</td><td>RW</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>13</td></tr>
<tr><td colspan="9">Set the responsiveness when real-time automatic adjustment is effective.


Note:
As the set value increases, the speed responsiveness increases and the servo rigidity also improves, but it becomes more prone to vibration.Please change the set value from low to high while confirming the action.</td></tr>
</table>

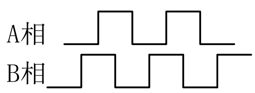
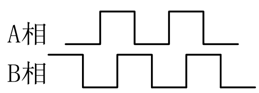
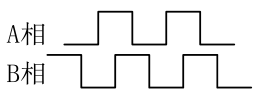
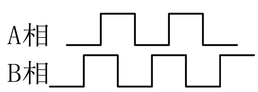
2. Because the control gain is updated when it stops, if the motor does not stop and the gain is extremely low or continuous input of commands in the same direction, changing Pr0.03 "Real time automatic adjustment of mechanical rigidity setting" will result in a situation where the change cannot be reflected.In this case, there may be abnormal noise or vibration based on the rigidity setting reflected after stopping.Please temporarily stop the motor when the rigidity changes, confirm that the rigidity setting has been accurately reflected, and then proceed to the next action.

serial number Pr0.11*	name	The motor outputs the number of pulses per revolution			Effective method	Power on again	data range	1~2097152
	Modbus address	0x3016	unit	P/r	Related modes	ALL	factory settings	2500
Set the pulse output resolution based on the number of output pulses for each rotation of OA and OB.								

serial number Pr0.12*	name	Pulse output logic inversion/ Output source selection			Effective method	Power on again	data range	0~3
	Modbus address	0x3018	unit	-	Related modes	ALL	factory settings	0

Set the B-phase logic and output source for pulse output.According to this parameter, the phase relationship of the B-phase pulse corresponding to the A-phase pulse can be reversed by inverting the B-phase pulse

Pulse output logic inversion

<table>
<tr><th>Pr0.12</th><th>B-phase logic</th><th>output source</th><th>When operating in the CCW direction</th><th>When operating in the CW direction</th></tr>
<tr><td>0</td><td rowspan="2">Non-Revertive</td><td>encoder</td><td rowspan="2">
</td><td rowspan="2">
</td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>1</td><td rowspan="2">reverse</td><td>encoder</td><td rowspan="2">
</td><td rowspan="2">
</td></tr>
<tr><td>3</td><td></td></tr>
</table>

Note:
Including selecting the Z-phase output source.Set values 0 and 1 as the Z-phase output of the encoder

serial number Pr5.03*	name	Pulse output frequency division denominator			Effective method	Power on again	data range	0~16777216
	Modbus address	0x3506	unit	-	Related modes	ALL	factory settings	0

Set the denominator for pulse output frequency division. When set to 0, the number of output pulses per 1 rotation of the motor is parameter Pr0.11; When non-zero is set, the pulse output frequency division gear ratio is pr0.11/pr5.03;

<table>
<tr><td rowspan="2">serial number Pr5.33*</td><td>name</td><td colspan="3">Pulse regeneration output limit setting</td><td>Effective method</td><td>Power on again</td><td>data range</td><td>0~1</td></tr>
<tr><td>Modbus address</td><td>0x3542</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set the detection of Err28.0 'pulse regeneration limit protection' to be valid/invalid.</td></tr>
</table>

set value	content
0	invalid
1	effective

<table>
<tr><td rowspan="2">serial number Pr6.19 *</td><td>name</td><td colspan="3">Encoder Z-phase setting</td><td>Effective method</td><td>Power on again</td><td>data range</td><td>3~32767</td></tr>
<tr><td>Modbus address</td><td>0x3626</td><td>unit</td><td>pluse</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>30</td></tr>
<tr><td colspan="9">Note that the current width cannot be set and is fixed internally.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr6.22</td><td>name</td><td colspan="3">AB phase output type external displacement sensor AB phase regeneration method selection</td><td>Effective method</td><td>Power on again</td><td>data range</td><td>0~1</td></tr>
<tr><td>Modbus address</td><td>0x362C</td><td>unit</td><td>-</td><td>Related modes</td><td>F</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">When dividing the pulse output into ABZ encoders, select the regeneration mode:
0- No signal regeneration;
1- Signal regeneration, AB phase regeneration, Z native, serial encoder only has regeneration function.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr10.15</td><td>name</td><td colspan="3">encoder type</td><td>Set effective</td><td>Power on again</td><td>data range</td><td>0~11</td></tr>
<tr><td>Modbus address</td><td>0x3A1E</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
</table>

Set the encoder type used for the connected motor.

set value	encoder type
0	Tamagawa 2.5M Encoder
1	Nikon 2.5M Encoder
2	Panasonic encoder, currently not supported
3	ABZ encoder
4	Tamagawa 4M Encoder
5	Nikon 4M Encoder
6	Singlinna 2.5M encoder
7	Singlinna 4M encoder
8	Tamagawa 1M encoder, currently not supported
9	Shengtaiqi encoder, currently not supported
10	BiSS C encoder

<table>
<tr><td rowspan="2">serial number Pr10.16</td><td>name</td><td colspan="2">Single cycle resolution of communication encoder</td><td>Set effective</td><td>Power on again</td><td>data range</td><td>10～32</td></tr>
<tr><td>Modbus address</td><td>0x3A20</td><td>unit</td><td>Bit</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>17</td></tr>
<tr><td colspan="9">Set the resolution of the absolute position encoder used for single turn counting.</td></tr>
</table>

6.9.3 Pulse regeneration Z-phase setting

The current version cannot set the Z-phase width, it is fixed internally.

6.9.4 Pulse regeneration function with positioning compensation

Currently, positioning compensation data is used as the source for frequency division output.

6.10 Forced disconnection enable

6.10.1 Function Description

After the driver is powered on automatically using external IO or bus, when it needs to update the servo program, disable debugging, or adjust the mechanical structure, it is necessary to change the IO configuration and restart to take effect. The operation is cumbersome and inconvenient. In order to simplify the debugging process, the Ω 6-DP series servo supports the strong disable function and uses the highest priority to ensure that the current axis is in an unprepared state.

6.10.2 Operating Instructions

Click the STOP button in the upper left corner of the upper computer debugging software to activate this function. In order to prevent misleading information caused by the button remaining after the drive is powered off, this action is set as a non power-off save attribute.

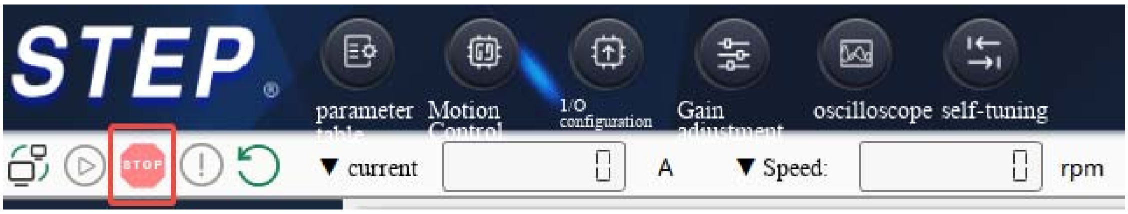


Figure 6.10.2-1 Force Enable Operation Interface

6.11 Black Box

6.11.1 Function Description

In order to facilitate the analysis of the causes of occasional servo failures, the Ω 6-DP series servo drive supports black box function, which can set the data to be collected (up to 8 sampling data can be set). Under the set triggering conditions, the data can be sampled and saved through the set sampling time interval;When the triggering conditions are met, the sampling data near the fault can be read online to draw waveform analysis.

6.11.2 Function Introduction

① The lower right corner is the trigger condition configuration area,② The upper right corner corresponds to the channel configuration area,③ The navigation above is the function activation area;

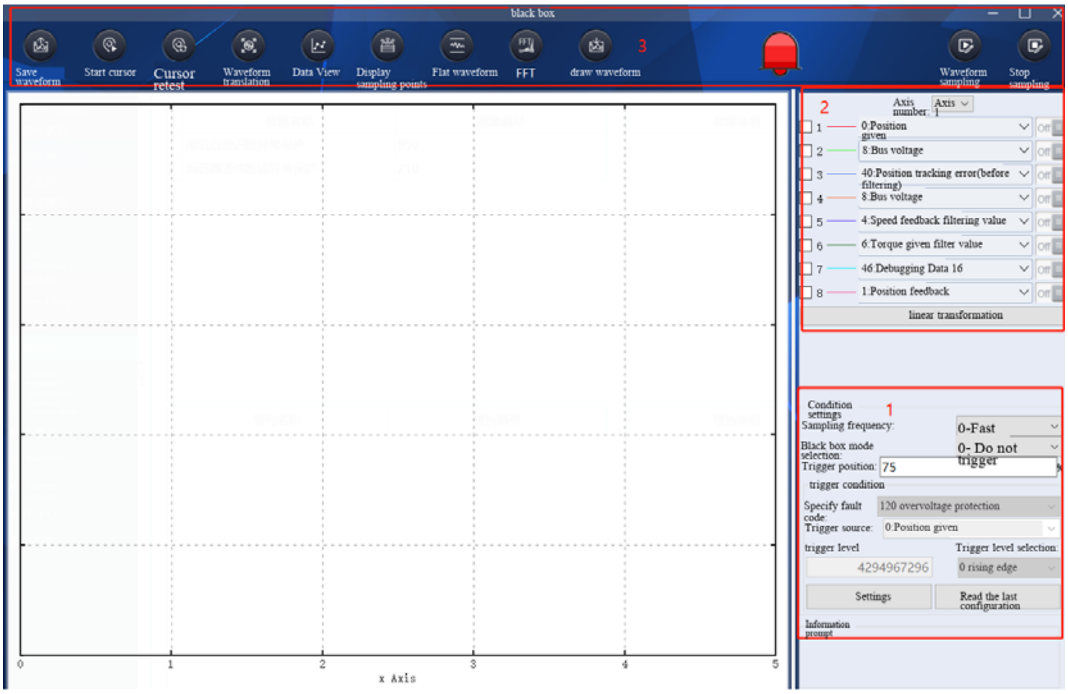


Figure 6.11.2-1 Black Box Channel Configuration and Sampling Configuration

1. Trigger condition configuration

Settings: Click the Settings button to send the values of the condition settings and channel settings to the drive.

Read last configuration: Read the condition settings and channel settings of the servo's last configuration.

The specific configuration parameters are as follows:

Set entries	value retrieval	Instructions
sampling frequency	0-Fast	Sampling interval of 100us
	1- Middle	Sampling interval 500us
	2- Slow	Sampling interval 1ms
Black box mode selection	0- Do not open	Set to not on, the black box function will not sample data.
	1- Trigger any fault	Any malfunction will result in data being collected and saved.
	2- Designated fault trigger	Data will only be collected and saved when a specified fault occurs.
	3- Trigger specified conditions	Data will only be collected and saved when triggered under specified conditions.
trigger position	0%~100%	The triggering position is 0%, all of which are sampled data after the triggering conditions are met. The triggering position is 100%, all of which are sampled data before the triggering conditions are met.The triggering position is 75%, which is the sampling data before the triggering conditions are met;25% is the sampled data after the triggering condition is met.Each channel supports 400 sampling points.

Specify fault code	Fault code	Select from the dropdown menu list of specific values.
trigger source	trigger source	The specific value can be selected from the dropdown menu list.
trigger level	-2^64 ~ 2^64	The specific value depends on the trigger source configuration.
Trigger level selection	0-Rising edge	Trigger source variable value greater than trigger level
	1- Descending edge	The trigger source variable value is less than the trigger level
	2- Equal to	The trigger source variable value is equal to the trigger level
	3- Along the change	The trigger source variable value is not equal to the trigger level

2. Channel configuration

Channel settings, select the variable to be observed from the drop-down variable list, and use on/off to enable the sampling channel selection.After selecting the corresponding channel, click the "Settings" button to send the configured channel variables to the servo drive and store them.

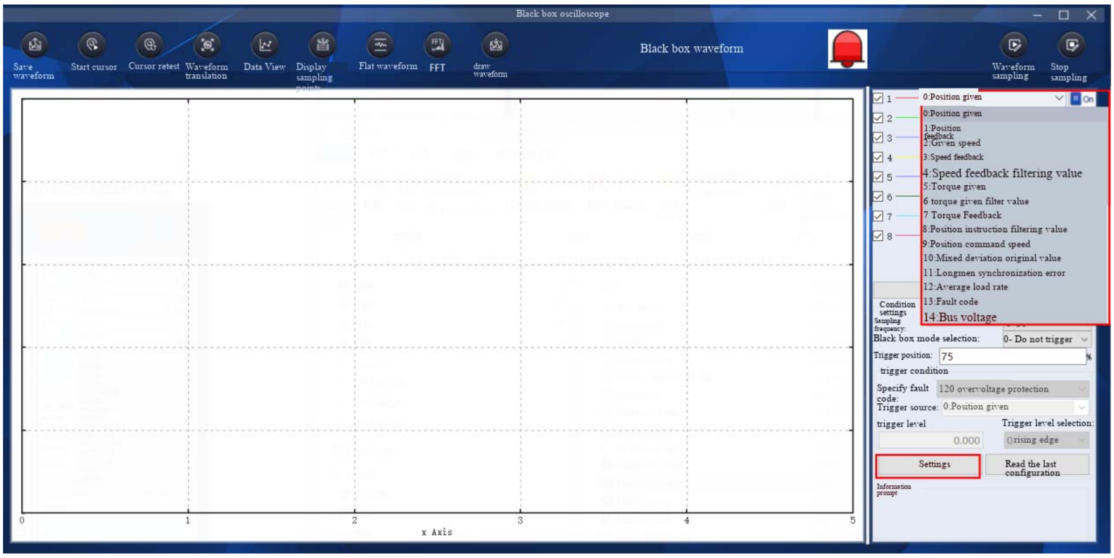
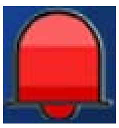


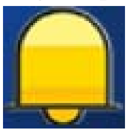
Figure 6.11.2-2 Black Box Channel Configuration Method

3. Function activation area

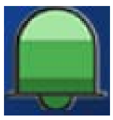
The data status display has three states: red light, yellow light, and green light, which respectively indicate "no data", "sampling in progress", and "sampling completed".



No data



Sampling in progress



Complete sampling

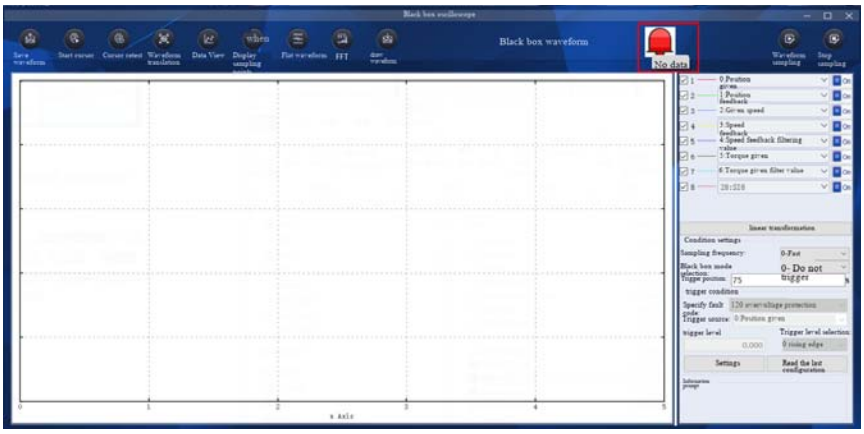


Figure 6.11.2-3 Black Box Data Status

Click on "waveform sampling" to activate the black box function. The data status display area is highlighted with a yellow light, and the black box function is in the process of sampling. At this time, the interface parameters cannot be set.Click 'Stop Sampling' to stop the black box function, the data status display area will turn red, and the parameters will return to the configurable state.When a green light appears, the sampling is completed.Click on 'Draw Waveform' to draw the waveform of the collected data.When the data status display area is green or yellow, the black box is in an unsampled state.Clicking the 'waveform sampling' button will initiate a new round of sampling.

6.11.3 Function Usage

Open the black box function configuration interface, fault monitoring - fault waveform (black box).

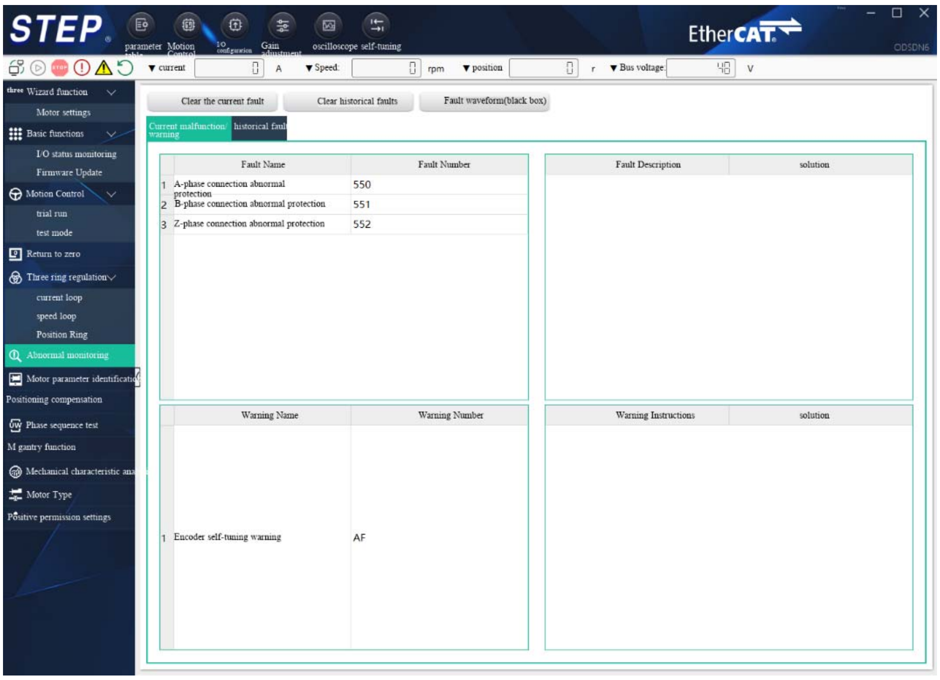


Figure 6.11.3-1 Black Box Open Interface

The configuration and waveform interface of the pop-up black box function are as follows. Configure the parameters such as acquisition channel, sampling frequency, black box mode selection, trigger position, etc., and send them to the servo driver through the "Settings" button.As shown in the following figure, 'specified fault trigger' requires configuring a specified fault code.

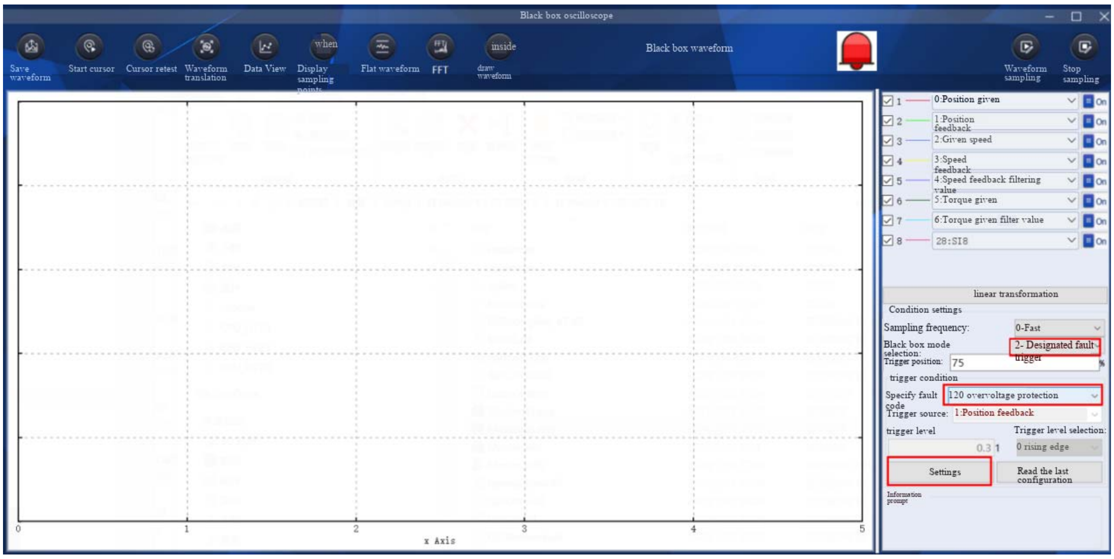


Figure 6.11.3-2 Black Box Designated Fault Trigger

To trigger under specified conditions, it is necessary to configure the corresponding trigger source, trigger level, and trigger level selection.

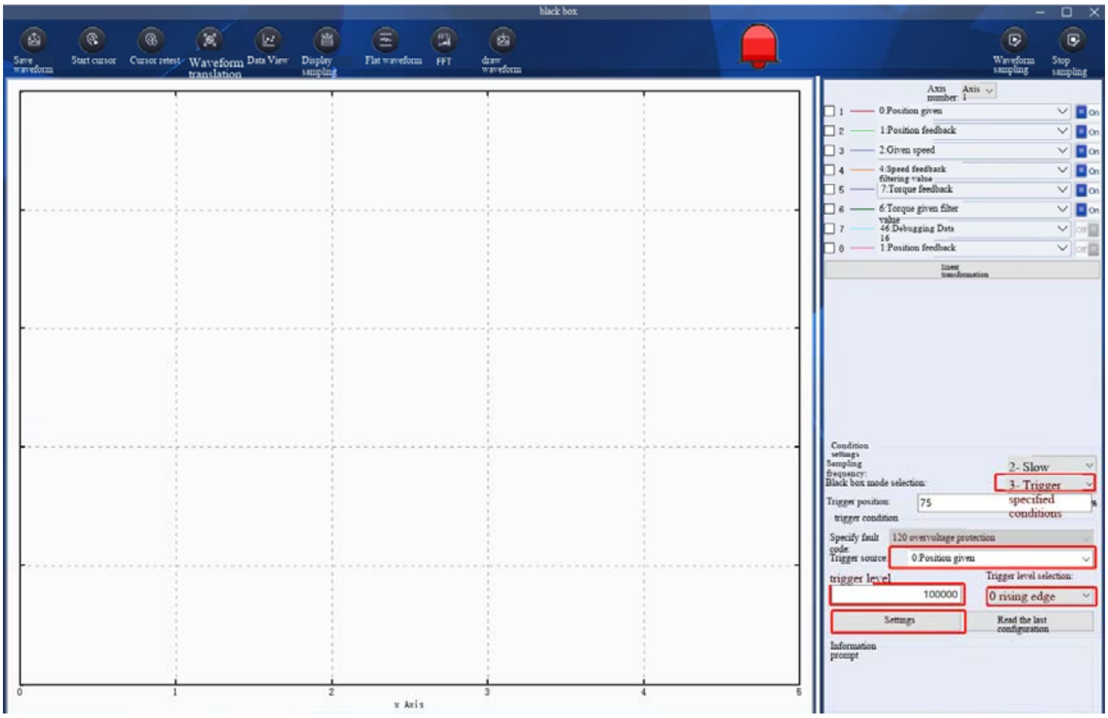


Figure 6.11.3-3 Black Box Specific Condition Trigger

Click on "waveform sampling" to activate the black box function. At this time, the working state of the black box is "sampling in progress...", as shown in the following figure.

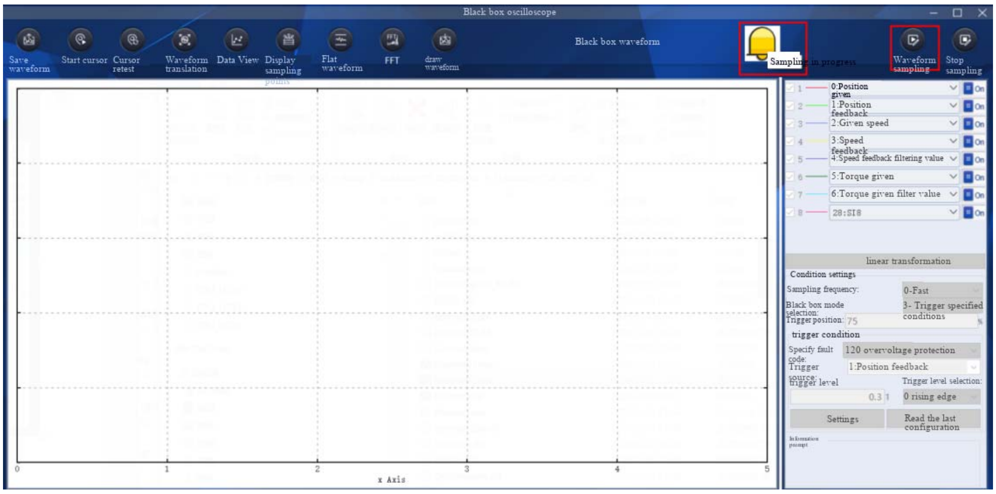


Figure 6.11.3-4 Black Box Startup Sampling

When the data display area is green, click "Draw Waveform" to draw the waveform of the collected data. When drawing the waveform, the interface parameters cannot be drawn. After the data is drawn, the parameters will be restored to adjustable.As shown below, there are normal data points and fault data points before and after the boundary line.

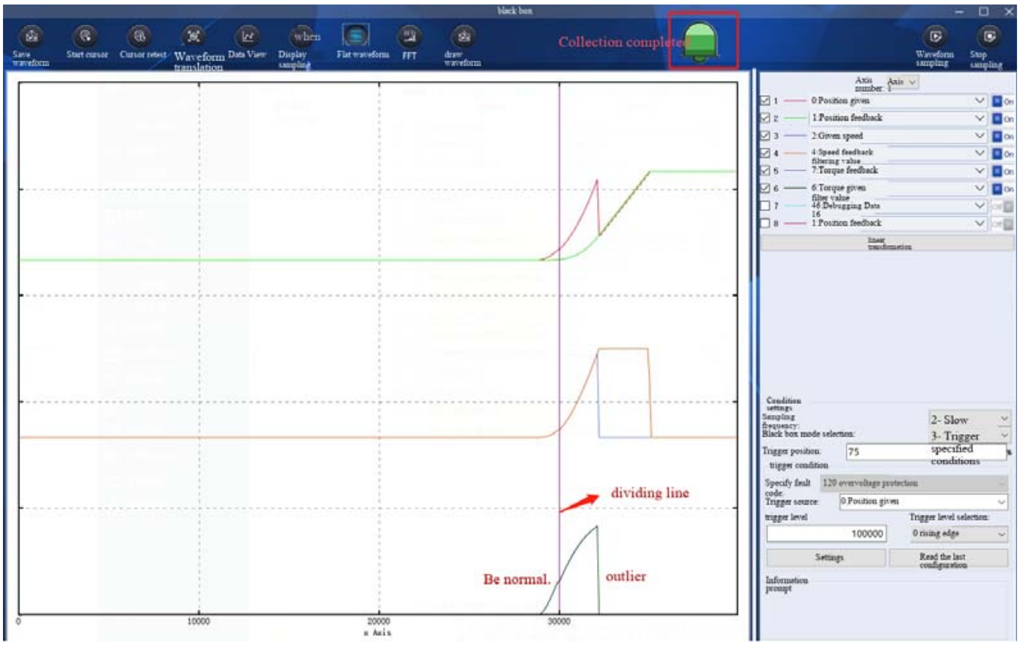


Figure 6.11.3-5 Analysis of Black Box Sampling Waveform

Attention

1. The DP series does not have a built-in power-off data retention function and only supports online viewing. After the servo is powered on again, the data will not be saved and needs to be resampled.
2. If the triggering conditions of the servo drive are not met before it is powered off, the servo drive will automatically turn on the sampling function by default when it is powered on again, using the channel settings, condition configuration, and triggering conditions set last time.

7 Communication

7.1 Introduction to Modbus Communication

The Ω 6-DP series servo drive has Modbus communication function, which can realize servo drive parameter modification, query, status monitoring, motor operation, etc. through the upper computer communication software, and supports RTU communication mode.
For actual use, please refer to Appendix B Ω 6-DP series servo driver Modbus communication manual.

7.2 Modbus RTU Communication Configuration

After the hardware wiring is completed, the communication parameters need to be configured correctly.

project	description
agreement	Modbus RTU (RTU mode only)
physical layer	RS485
Baud rate	2400、4800、9600、19200、38400、57600、115200、230400 bps
data	8 bit
parity check	none
start position	1 bit
stop bit	1. 2 bits (factory value is 1 bit)

The communication parameters are set as follows:

1 Modbus connection setting: Set the communication protocol to 2, Modbus RTU (RS485 communication, corresponding to 1: N);

2. Set axis number: When multiple servo drives are networked, each drive can only have a unique address, otherwise it will cause communication abnormalities and inability to communicate. Set axis numbers in order;

3. Set communication baud rate: The Ω 6-DP series servo drive supports baud rates of 2400bps~230400bps. Set the correct baud rate according to actual needs, and the communication baud rate of the drive must be consistent with the communication baud rate of the upper computer;

4. Set the data verification method for communication between the driver and the upper computer;

If it involves zeroing and multi-stage functions, special function selection parameters need to be set, and the zeroing and multi-stage control mode should be set to Modbus control.

The associated parameters are as follows:

Classification	NO	Parameter name	Set range	Function and Content
5	30	RS485 communication baud rate setting	0~7	0:2400 bps 1:4800 bps 2:9600 bps 3:19200 bps 4:38400 bps 5:57600 bps 6:115200 bps 7:230400 bps
5	31	Axis number	0~127	When multiple drives are networked, the server needs to identify which axis to communicate with when communicating with the upper host such as a computer. This parameter can be used to set the axis number.
5	37	Modbus connection settings	0~2	Set up RS485 communication protocol. 0: MINAS Standard Protocol 1: Modbus RTU (RS232 communication, 1:1 only) 2: Modbus RTU (RS485 communication, corresponding to 1: N) Only supports Modbus RTU (RS485 communication, supports 1: N)
5	38	Modbus communication settings	0~5	0:Even/1bit 1:Even/2bit 2:Odd/1bit 3:Odd/2bit 4:None/1bit 5:None/2bit Set the parity of Modbus communication (Even/Odd/None) and stop the bit length (1-bit/2-bit).
6	28	Special function selection	0~2	Select the validity/invalidity of the Block motion function. 0: Invalid 1: Enable multi-stage and zero return through Modbus communication 2: Make multi-stage and zero return effective through input signals

7.3 Introduction to CAN Communication

The Ω 6-DP series servo drive has CAN communication function, which can realize servo drive parameter modification, query, status monitoring, motor operation, etc. through the upper computer communication software.

7.4 CAN Communication Configuration

Follow-up supplement

8 Fault Handling

The drive has various protection functions. When the protection function is activated, the motor stops, and the front panel of the drive flashes and prompts a fault/alarm code. The cause of the fault/warning can be investigated by querying the fault code list/warning code list. Faults are divided into purgeable faults and unclearable faults. After eliminating the cause of the abnormality and ensuring safety, reset the fault for resettable faults when the machine is stopped;Fault that cannot be reset, power off and restart after eliminating the cause of the abnormality;For faults that cannot be resolved after restarting, please seek technical support from the manufacturer.

8.1 List of fault codes

Fault code	seven-segment display	Fault Name	Can it be reset
120	Err.12.0	overvoltage protection	yes
130	Err.13.0	Main power insufficient voltage protection (PN voltage insufficient)	yes
140	Err.14.0	overcurrent protection	yes
141	Err.14.1	IPM abnormal protection	No
150	Err.15.0	overheat protection	No
151	Err.15.1	Encoder overheating abnormal protection	No
160	Err.16.0	overload protection	yes
161	Err.16.1	Abnormal torque saturation protection	yes
162	Err.16.2	Motor stalling protection	yes
163	Err.16.3	IGBT I2T protection	yes
210	Err.21.0	Encoder communication disconnection abnormal	No

		protection	
211	Err.21.1	Encoder communication anomaly protection	yes
230	Err.23.0	Encoder communication data anomaly protection	yes
240	Err.24.0	Protection against excessive positional deviation	yes
241	Err.24.1	Protection against excessive speed deviation	yes
260	Err.26.0	The first overspeed protection	yes
261	Err.26.1	Second overspeed protection	yes
262	Err.26.2	Exercise enabled prohibition	yes
270	Err.27.0	Abnormal protection for instruction pulse input frequency	yes
272	Err.27.2	Abnormal protection for instruction pulse doubling	yes
280	Err.28.0	Pulse regeneration limit protection	yes
290	Err.29.0	Deviation counter overflow protection	yes
292	Err.29.2	Counter overflow exception protection	yes
330	Err.33.0	Input duplicate allocation exception 1 protection	No
331	Err.33.1	Input duplicate allocation exception 2 protection	No
332	Err.33.2	Input function exception 1	No
333	Err.33.3	Input function exception 2	No
334	Err.33.4	Abnormal output function 1	No
335	Err.33.5	Abnormal output function 2	No
376	Err.37.6	PowerID error	No
377	Err 37.7	Software version mismatch	No
380	Err.38.0	Driver input prohibition protection	yes
400	Err.40.0	Absolute system shutdown protection	yes
410	Err.41.0	Absolute counter overflow protection	No
420	Err.42.0	Absolute overspeed protection	yes
440	Err.44.0	Absolute rotating single turn counter protection	No
450	Err.45.0	Absolute multi turn counter protection	No
550	Err.55.0	ABZ connection abnormality protection	No
700	Err.70.0	Abnormal protection of U-phase current detector	No
701	Err.70.1	W-phase current detector abnormal protection	No
720	Err.72.0	Abnormal temperature sensor	No
870	Err.87.0	Forced alarm input protection	yes
911	Err.91.1	Instruction exception protection (limit instruction out of bounds)	yes
926	Err.92.6	Encoder position angle recognition failed	yes
927	Err.92.7	Inertia identification failed	yes
950	Err.95.0	Motor automatic recognition abnormality 0	No
951	Err.95.1	Motor automatic recognition abnormality 1	No
954	Err.95.4	Motor automatic recognition abnormality 4	No

955	Err.95.5	Motor power range mismatch	No
956	Err.95.6	Motor parameters are incorrect or parameters have not been written using fixtures	No
980	Err.98.0	Return to zero exception	yes
982	Err.98.2	Z-signal overtravel protection	yes
989	Err.98.9	Micro commutation timeout	yes
990	Err.99.0	Micro commutation failed	yes

8.2 Fault Code Details

fault code	fault name	Can it be cleared	cause of failure	Treatment measures
120	Overvoltage protection	yes	If the voltage between DC+and DC - at the rectification position is higher than the specified value (80V) for a period of time, overvoltage protection will be reported. ① The power supply voltage exceeds the allowable input voltage range due to the high AC input power supply. ② Driver malfunction (circuit failure).	Measure the DC+and DC - voltages of connectors and terminal blocks. ① Enter the correct voltage. ②Replace the drive with a new one.
130	Main power insufficient voltage protection (PN voltage insufficient)	yes	When parameter Pr5.08=1, the instantaneous stop time between DC+and DC - exceeds the time set by Pr5.09.Or when the servo is enabled, if the voltage between DC+and DC - at the rectification position of the main power supply is lower than the specified value (15V) for a period of time, an alarm will be triggered.	Measure the line to line voltage of DC+and DC - for connectors and terminal blocks. ① Increase the capacity of the power supply voltage and replace the power supply.Check if there are any factors such as electronic transformers connected to the site, eliminate the cause of the main power contactor, and reconnect the power supply. ② Attempt to extend the Pr5.09 setting value. ③ Increase power capacity. ④ Connect the power supply correctly ⑤ Replace the drive with a new one.

<table>
<tr><td>140</td><td>overcurrent protection</td><td>yes</td><td rowspan="2">The current flowing through the rectifier exceeds the specified value.
① Driver failure (IGBT or other circuit failure, etc.)
② Motor cables U, V, W are short circuited.
③ The motor power line is short circuited to PE.
④ The motor is burnt out.
⑤ Poor contact of motor wires.
⑥ Frequent activation and deactivation lead to relay failure of the dynamic brake.
⑦ Pulse input and servo enable time synchronization or pulse input too fast.
⑧ Power module overheat protection.</td><td rowspan="2">① Remove the motor cable and enable the servo. If a malfunction occurs immediately, a new driver needs to be replaced.
② Check if the motor wire connections U, V, W are short circuited, and if there are burrs on the connector wires.
③ Connect the motor cable correctly.Check the insulation resistance between the U, V, W of the motor cable and the motor wire.Please replace the motor with a new one when the insulation is poor.
④ Check if the resistance between the wires of the motor is balanced. If it is not balanced, the motor needs to be replaced.
⑤ Check if the connector terminals of motors U, V, and W are loose or detached. If they are loose or detached, they should be tightened.
⑥ Replace the drive.
⑦ After enabling the server for 100 ms, input the pulse command.
⑧ Increase drive capacity.Extend acceleration and deceleration time, reduce load.</td></tr>
<tr><td>141</td><td>IPM abnormal protection</td><td>No</td></tr>
<tr><td>150</td><td>overheat protection</td><td>No</td><td>If the temperature of the heat sink and power components of the driver exceeds the specified value of 85 ° C for a certain period of time, the servo alarm will sound.
① The ambient temperature of the drive exceeds the specified value.
② Overloading.</td><td>① Improve the ambient temperature and cooling conditions of the drive, and check for any fan abnormalities.
② Improve the capacity of servo drives and motors.Extend the acceleration and deceleration time.Reduce the load.</td></tr>
</table>

151	Encoder overheating abnormal protection	No	When the encoder overheating abnormal protection detection of parameter Pr6.10's set value bit 11 is effective (the initial set value is invalid), the temperature of the encoder exceeds the encoder overheating threshold (the threshold may vary slightly depending on the encoder type). ① The temperature around the servo motor is high. ② Overloading.	① Check if the encoder power supply is normal. ② Increase the capacity of the motor and extend the acceleration and deceleration time.Reduce the load.

160	overload protection	yes	When the actual action value of the torque command exceeds the overload protection time limit characteristic, overload protection occurs. ① Overloaded, actual torque exceeds rated torque, and operates continuously for a long time. ② Poor gain adjustment leads to vibration.The motor is experiencing vibration and abnormal noise, and the set value of Pr0.04 inertia ratio is abnormal. ③ The UVW three-phase wiring of the motor is incorrect or disconnected. ④ Mechanical collision, sudden increase in weight, and mechanical distortion. ⑤ When the brake is not turned on, the motor operates. ⑥ In multiple mechanical wiring systems, the motor wires were mistakenly connected to other shafts and wired incorrectly.	The upper computer debugging software monitors the torque (current) waveform and compares it with the rated current and maximum current to see if the current is too high and if the current waveform vibrates too much.Confirm the overload warning display and load rate through the upper computer software or front panel. ① Increase the capacity of the motor.Increase acceleration and deceleration time, reduce load. ② Adjust the gain again. ③ Connect the motor wires correctly according to the wiring diagram and replace the cables. ④ Check if the equipment installation is abnormal, eliminate mechanical distortion factors, and reduce the load. ⑤ Test the voltage at the brake end of the motor.Open the brake. ⑥ Connect the motor and encoder wires correctly to the corresponding shafts. Attention: This alarm can only be cleared after 10 seconds of occurrence. When this alarm occurs, be careful not to clear it frequently.
161	Abnormal torque saturation protection	yes	The motor current is greater than the set value of Pr0.13 and the duration is greater than the set time of Pr6.57 "torque saturation abnormal protection detection time".	Confirm the operational status of the drive. Please perform the same processing as Err16.0. Check if Pr6.57 is set too low.
162	Motor stalling protection	yes	Torque saturation, speed less than 0.5rpm and duration exceeding 500ms	① Confirm the operational status of the drive. ② Please perform the same processing as Err16.0.

163	IGBT I2T protection	yes	IGBT module junction temperature exceeds the limit, possible reasons: (1) Abnormal cooling fan of the drive; 2) The servo motor is running at low speed and high load; (3) The selection of the driver is too small;	(1) Check whether the NTC temperature of the driver and the fan are working properly; (2) Check if abnormal motor parameters are causing incorrect operation; (3) Calculate whether the driver selection is appropriate and whether the selection is too small
210	Encoder communication disconnection abnormal protection	No	The communication between the encoder and the driver is interrupted continuously for a certain number of times (10 consecutive times).	Connect the encoder wire correctly according to the wiring diagram. Correct the incorrect wiring of the connector terminals and check if the encoder type selection is abnormal.
240	Protection against excessive positional deviation	yes	The filtered position deviation value (which can be collected from oscilloscope channel 48-position tracking error (filtered)) exceeds the setting of Pr0.14. ① The motor did not operate according to the instructions. ② The value of Pr0.14 (set for excessive position deviation) is too small.	① Check if the motor is running normally, if there is an alarm similar to a runaway situation, and check if the motor power line wiring and encoder feedback are normal;Check if the rigidity is too weak, causing the motor to shake and the position to follow poorly. ② When the motor is running normally, increase the set value of Pr0.14 appropriately (usually set to 3-5 times the position deviation under extreme speed and acceleration/deceleration conditions).

241	Protection against excessive speed deviation	yes	The difference (speed deviation) between the internal command speed and the actual speed exceeds the set value of Pr6.02. Note: Due to the prohibition of instruction pulse input (INH) or the immediate stop of positive/negative direction drive input, forcibly setting the internal position instruction speed to 0 will result in an increase in speed deviation at this moment.When the internal position command speed starts, the speed deviation will also increase, so please set sufficient margin.	① Check if the motor is running normally, if there is an alarm similar to a runaway situation, and check if the motor power line wiring and encoder feedback are normal;Check if the rigidity is too weak, causing poor speed tracking. You can increase the setting value of Pr6.02 appropriately. ② Increase the acceleration and deceleration time of the internal position command speed, or improve responsiveness through gain adjustment. ③ Set the speed deviation protection value Pr6.02 to a higher value.
260	The first overspeed protection	yes	The rotational speed of the motor exceeds the set value of Pr5.13. When Pr5.13=0, the threshold is 1.2 times the maximum speed;When Pr5.13 ≠ 0, take the smaller of Pr5.13 and the maximum speed of the motor as the alarm threshold.	①Check if the speed command is too large. ② Confirm the input frequency and division/multiplication ratio of the command pulse. ③ When overshoot occurs due to inappropriate gain adjustment, please adjust the gain. ④ Connect the encoder wires correctly according to the wiring diagram. ⑤ Check whether the maximum speed parameter and overspeed level setting of the motor are reasonable.
261	Second overspeed protection	yes	The rotational speed of the motor exceeds the set value of Pr6.15. When Pr6.15=0, the threshold is 1.2 times the maximum speed;When Pr6.15 ≠ 00, take the smaller of Pr5.13 and the maximum motor speed as the alarm threshold.	

270	Abnormal protection for instruction pulse input frequency	yes	The input frequency of the command pulse exceeds the set value of Pr5.32 by 1.2 times (maximum 4M before 4th harmonic).	Confirm if there are any abnormalities in the command pulse input.
272	Abnormal protection for instruction pulse doubling	yes	The product of the instruction pulse count and the instruction multiplication ratio exceeds approximately 5000M. ① Abnormal frequency of instruction pulse input;The multiplication ratio set for the numerator and denominator of the 1st to 4th instruction multiplication is not appropriate. ② The input of command pulses is counted incorrectly due to interference.	① Set the minimum value as much as possible within the range of 1/1000 to 8000 times the instruction division ratio. ② Confirm command pulse input. ③ Use long line driven interfaces as much as possible. ④ Set Pr5.32 (instruction pulse input maximum setting/digital filter setting) below 1000.
280	Pulse regeneration limit protection	yes	Pr5.33 = 1，When pulse regeneration protection is effective;The output frequency of pulse regeneration exceeds the 16M protection limit (after 4 harmonics).	① Confirm the set values of Pr0.11 and Pr5.03. ② When detected as invalid, please set Pr5.33 to 0.
290	Deviation counter overflow protection	yes	When in position control or fully closed-loop control, the position deviation value of the encoder unit before filtering exceeds -2 ^ 30-1 (2^30) - 1 = 1073741823	① Confirm if the motor is rotating. ② The oscilloscope monitors whether the torque output is saturated. ③ Adjust the gain. ④ Set Pr0.13 and Pr5.22 as maximum values. ⑤ Connect the encoder according to the wiring diagram.

330	Input duplicate allocation exception 1 protection	No	① The function allocation of input signals (SI1, SI2, SI3, SI4) is repeatedly set.	Please correctly allocate the functions of the connector pins. Different input signals cannot be configured for the same function, otherwise error 330331 will be reported; When using the mode switching function, it is necessary to configure the position, speed, and torque modes, otherwise error 332333 will be reported;Functions used in multiple modes must be assigned to the same pin. When the A_CLR (alarm clearing function) is configured as normally closed, it triggers alarms 332 and 333.
331	Input duplicate allocation exception 2 protection	No	① The normally open/normally closed state settings of the input signals (SI1, SI2, SI3, SI4) are inconsistent.	
332	Abnormal input function model 1	No	The input signals (SI1, SI2, SI3, SI4) are assigned undefined numbers in the functional allocation.	
334	Abnormal output function model 1	No	The output signals (SO1, SO2) have no defined numbering in the functional allocation.	
376	PowerID error	No	Alarm PowerID error when driver power or voltage segment is not correctly identified	This issue is to detect abnormal resistance of the PowerID driver and replace the driver
380	Driver input prohibition protection	yes	When Pr5.04 "Drive Prohibit Input Setting" is set to 0, both the positive and negative direction drive inhibit input (POT/NOT) signals are turned on. When Pr5.04=2, the positive/negative direction drive prohibits one of the input signals from being in the open state.	Confirm if there are any abnormalities in the connection switch, wires, and power supply that prohibit input signals for positive/negative direction driving.It is particularly necessary to confirm whether the start of the control signal power supply (DC12-24V) is delayed.

400	Absolute system shutdown protection	yes	The power supply voltage provided to the encoder drops, or the encoder battery voltage is lower than the specified value (in general, the normal battery supply voltage is 3.6V, and if it is lower than 2.8V, an alarm will be triggered at 400).	① For the first time connecting a motor with a battery, a reset action of the absolute encoder is required to clear the battery alarm and zero the number of turns. ② If this alarm occurs during a non first connection, it is necessary to check if the encoder battery voltage is below 2.8V (some encoders may trigger an alarm if the battery voltage is below 3V). If so, replace the battery and clear the alarm;No, check if the encoder battery wiring is loose and if the power supply voltage of the encoder is abnormal.
410	Absolute counter overflow protection	No	When Pr0.15=0 or the external communication encoder is a multi turn encoder, if the encoder's multi turn count exceeds the specified value, an alarm will be triggered.	① Set Pr0.15 to 2 and ignore the overflow of the multi turn counter. ② Move the motor until the number of turns is within the alarm range. ③ Try replacing the motor.
420	Absolute overspeed protection	yes	When using an absolute encoder ① When there is a power outage and only battery power is supplied, the motor rotation speed exceeds the specified value. ② During normal operation, due to some reason, the power supply of the encoder is cut off and the rotation speed exceeds the specified value.	① Confirm whether there is external force pushing the motor, and at the same time confirm the current speed, and operate to keep the speed below the specified value. ② Starting from switching to power outage mode during normal operation Confirm the power supply voltage on the encoder side (5V ± 5%). Confirm the connection status of the encoder.
550	ABZ connection abnormality protection	No	The phase line of the incremental encoder ABZ has experienced abnormalities such as disconnection, and the ABZ three-phase is shared.	Confirm if the encoder type selection is normal;Confirm the wiring of the external displacement sensor.

700	Abnormal protection of U-phase current detector	No	The current collection value of phase U is the maximum negative value, triggering an alarm	①After cutting off the power, reconnect and check if the STO wiring is abnormal. ② After the driver is enabled, the current waveform is collected. If this alarm still occurs and the current waveform is abnormal, it may be due to a fault in the driver itself. ③ Please discontinue use and replace the servo drive.Return to the agency for inspection (repair).
701	W-phase current detector abnormal protection	No	The current collection value of phase W is the maximum negative value, triggering an alarm	① After the driver is enabled, the current waveform is collected. If this alarm still occurs and the current waveform is abnormal, it may be due to a fault in the driver itself. ② Please discontinue use and replace the servo drive.Return to the agency for inspection (repair).
720	Abnormal temperature sensor	No	An alarm is triggered when the detected driver temperature is below the temperature threshold (-21 ℃) when there is no resistance.	①After cutting off the power, reconnect it.If this alarm still occurs, it may be due to a malfunction in the internal temperature sensor of the drive. Please discontinue use and replace the servo drive.Return to the agency for inspection (repair).
798	Site address setting failed	yes	Ecat 0x12 Site Address Register Cannot Write Correctly	Check if the Ecat communication chip is functioning properly. If so, restart the servo;If there is an abnormality, the servo needs to be replaced.
799	Ecat initialization failed	No, no	Ecat initialization failed.	Re burn the XML to the servo drive.
852	Lost link detection anomaly protection	yes	Hardware connection error occurred after Safeop mode: software lost frames continuously 5 times in Op mode	Confirm if there are any issues with the wiring of EtherCAT communication cables Determine if there are any communication issues from the upper device
870	Forced alarm input protection	yes	When configuring the forced alarm input (E-STOP) for IO, the IO port inputs a valid level, forcing the alarm to shut down	Confirm the wiring of the forced alarm input (E-STOP).

883	Abnormal gear ratio setting	No	The numerator or denominator of the bus in this round is 0;Or the ratio value for this round is greater than 8000 or less than 0.01;	After adjusting the electronic gear settings, turn on the control power again
926	Encoder position angle recognition failed	yes	① Motor phase sequence error. ② Motor parameter setting error ③ The motor brake is not open ④ overload	① Replace any two-phase phase sequence of the motor. ② Check the motor parameters (especially the number of pole pairs and the resolution of the encoder's single turn) ③ Check if the motor brake is open ④ Reduce load
927	Inertia identification failed	yes	① The running distance is too short. ② Unreasonable parameter settings for identifying speed, acceleration, etc ③ The P0.04 value differs significantly from the actual load inertia ratio ④ Inappropriate gain parameters	① Set an appropriate operating distance. ② Set appropriate identification parameters such as speed and acceleration ③ Estimate a suitable inertia ratio set to the P0.04 parameter ④ Confirm the balance between the gain of the position loop and the gain of the velocity loop, and do not generate oscillations during control Attention: When this alarm occurs or there is no change in inertia, collect the speed feedback filter value to see if there is a large fluctuation in speed. If so, increase Pr1.03 appropriately and use the first speed detection filter.
950	Motor automatic recognition abnormality 0	No	950 indicates encoder self recognition failure;When the encoder self recognizes, it cannot correctly identify whether the encoder type is: Tamagawa, Nikon, Panasonic; When the encoder type of 951 is three-way, it cannot recognize the correct encoder information through certain specific parameters in E2. 954 failed to self identify Panasonic motor parameters	① Confirm whether the motor encoder E2 is written normally; ② Confirm whether the driver has performed parameter reset. If it still cannot recognize itself after power off and restart after reset, the driver and motor need to be replaced.

980	Return to zero exception	yes	Return to zero condition not met or abnormal return to zero	Confirm whether the return to zero conditions such as the return to zero switch are correct ① Perform other operations after the servo returns to zero ② Ensure that the zeroing acceleration and deceleration settings are appropriate, and ensure that there is no disconnection or abnormal shutdown during zeroing
989	Reversing timeout	yes	Micro commutation timeout	20S still cannot recognize the correct electrical angle;Check if the encoder feedback is normal and replace any two-phase phase sequence of the motor. Check the motor parameters (especially the number of pole pairs and encoder resolution) to reduce the load and place the linear motor in the middle position
990	Abnormal commutation	yes	Abnormal commutation	

8.3 Warning Code List

If the warning can be restored in an abnormal state, it can automatically recover to a state that did not occur.As shown in the table below, the lock will remain in a warning state for the duration of the lock.If the warning is lifted, it will automatically clear and return to a non occurring state after the lock duration ends.

Warning Code	Warning Name
A0	Overload warning
A2	Battery warning
A3	Collision limit signal warning
AA	High temperature warning for servo chamber
AE	Servo waiting to restart warning
AF	Encoder self-tuning warning
C3	Lack of phase warning

8.4 Warning Code Details

Warning Code	Warning Name	cause of failure	Treatment measures

A0	Overload warning	When the load rate is above 85% of the protection level and the duration is greater than the Pr6.27 setting, an overload warning is triggered.	① Increase the acceleration and deceleration time during operation and reduce acceleration and deceleration; ② Set Pr6.27 as a reasonable value.
A2	Battery warning	When the battery voltage is below 3.2V, a battery warning is triggered	① When measuring whether the battery voltage is normal, if the voltage is below 3.2V, replace the battery; ② Under normal voltage conditions, check if the encoder battery wiring is functioning properly.
A3	Collision limit signal warning	When encountering a limit signal, trigger a warning	1. Check if the hard limit is encountered during movement; 2. Check if there is interference with the limit signal.
AA	High temperature warning for servo chamber	When the temperature resistance is normal, if the chamber temperature exceeds the threshold (the NTC threshold of the heat sink is 85 ℃, the overheating threshold of the Arm chip is 95 ℃, the temperature rise threshold of the Arm chip is too high is 45 ℃, the warning threshold of the heat sink NTC temperature rise is 40 ℃, and the upper limit of the temperature threshold for the driver temperature resistance not connected is 130 ℃), and the duration is greater than Pr6.27, a warning will be triggered	① Increase the deceleration time during operation and reduce the deceleration speed; ② Power off and restart to see if there are any warnings.
AE	Need to restart warning	After completing certain functions, a restart is required	The phase sequence test, micro commutation completion, parameter reset and other functions need to be restarted, and the panel displays a warning;Check if the drive is performing the above functions and restart the drive.
AF	Encoder self-tuning warning	During the self-tuning process of the encoder (i.e. position angle self-learning process), a warning is displayed and automatically cleared after the tuning is completed.	Automatically clear after setting is completed

C3	Lack of phase warning	When Bit1 of parameter Pr5.08 is 1, the main power supply runs out and triggers a warning	The voltage OFF time between L1-L3 is greater than the set value Pr5.09. Check the wiring and increase the Pr5.09 parameter appropriately.

8.5 Reset method after troubleshooting

When the drive fails, the red light starts flashing. You can use debugging software to connect and confirm that the fault is good. By checking the fault list, determine the cause of the fault and whether the fault can be cleared. After troubleshooting, you can reset the drive in the following way:

(1) Fault types can be cleared:

Reset through the "Fault Reset" button on the upper computer.

Configure the IO input function as alarm clearing input (A-CLR) and reset the driver through IO input.

Select Alarm Clear (A_CLR) to reset the driver by operating the auxiliary function interface on the front panel.

Power off and restart the drive.

(2) Fault type cannot be cleared: restart the drive (restart: including disconnecting the DC power supply or directly restarting the upper computer interface).

When a warning appears on the drive, the front panel will flash and prompt a warning code. The reason for the warning can be determined by checking the warning list. After the warning is released, it will automatically return to normal after the warning latch time ends;When the warning lock time is indefinite, the drive needs to be powered off and restarted to restore normal operation.

9 Parameter List

【 Category 0 】 Basic Settings

Parameter No		Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
Classification	No.							
0	0	0x3000	Rotation direction setting	0~1	1	-	○	ALL
0	1	0x3002	Control mode setting	0~7	0	-	○	ALL
0	2	0x3004	Real time automatic adjustment of settings	0~6	1	-		ALL
0	3	0x3006	Real time automatic adjustment of rigidity settings	0~31	13	-		ALL
0	4	0x3008	Inertia ratio	0~20000	250	%		ALL
0	5	0x300A	Instruction pulse input selection	0-2	0	-	○	P
0	6	0x300C	Command pulse rotation direction setting	0~1	0	-	○	P
0	7	0x300E	Command pulse input mode setting	0-3	1	-	○	P
0	8	0x3010	Number of command pulses per revolution of the motor	0~224	10000	pluse	○	P
0	9	0x3012	The first instruction is divided into multiple frequency molecules	0~230	0	-	○	P
0	10	0x3014	Instruction multiplier denominator	1~230	10000	-	○	P
0	11	0x3016	The number of output pulses per revolution of the motor	1~2097152	2500	pluse/r	○	ALL
0	12	0x3018	Pulse output logic inversion/output source selection	0~3	0	-	○	ALL
0	13	0x301A	First torque limit	0~500	350	%		ALL
0	14	0x301C	Setting for excessive positional deviation	0~230	100000	Instruction unit		P
0	15	0x301E	Absolute encoder setting	0~4	1	-	○	ALL
0	16	0x3020	Regenerated electricity	0~3	3	-	○	ALL

Parameter No Classification	Parameter No No.	Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
			External obstruction setting					
0	17	0x3022	Manufacturer's use	0~4	0	-	-	-
0	18	0x3024	Manufacturer's use	0~2	0	-	-	-
0	19	0x3026	Manufacturer's use	0	1			
0	20	0x3028	Positive and negative pulse sequence input IDLE level state	0~1	0		○	P

【 Category 1 】 Gain Adjustment:

Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure

Parameter No Classification	Parameter No No.	Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
1	0	0x3100	Position 1 loop gain	0~30000	480	0.1/s		P
1	1	0x3102	1st speed loop gain	1~32767	270	0.1Hz		ALL
1	2	0x3104	Integration time constant of the first speed loop	1~10000	210	0.1ms		ALL
1	3	0x3106	First speed detection filter	0~2500	10	0.01ms		ALL
1	4	0x3108	The first torque filter	0~2500	40	0.01ms		ALL
1	5	0x310A	2nd position loop gain	0~30000	480	0.1/s		P
1	6	0x310C	Second speed loop gain	1~32767	270	0.1Hz		ALL
1	7	0x310E	Second speed integration time constant	1~10000	210	0.1ms		ALL
1	8	0x3110	Second speed detection filter	0~2500	10	0.01ms		ALL
1	9	0x3112	Second torque filter	0~2500	40	0.01ms		ALL
1	10	0x3114	Speed feedforward gain	0~4000	1000	0.10%		P

1	11	0x3116	Speed feedforward filter	0~6400	0	0.01ms		P
1	12	0x3118	Torque feedforward gain	0~2000	1000	0.10%		P/S
1	13	0x311A	Torque feedforward filter	0~6400	100	0.01ms		P/S
1	14	0x311C	2nd gain setting	0~1	1	-		ALL
1	15	0x311E	Position control switching mode	0~10	0	-		P
1	16	0x3120	Delay time for switching position control	0~10000	10	0.1ms		P
1	17	0x3122	Position control switching level	0~20000	0	-		P
1	18	0x3124	Delay during position control switching	0~20000	0	-		P
1	19	0x3126	Position gain switching time	0~10000	10	0.1ms		P
1	20	0x3128	PDFF Control Gain	0~1500	1000	0.1		ALL
1	21	0x312A	External deduction gain	0~1000	0	0.1		ALL
1	22	0x312C	Dual loop control enabled	0~1	0			ALL
1	23	0x312E	Dual loop control differential gain	0~1000	0	Hz		ALL
1	24	0x3E30	Dual loop control proportional gain	0~1000	0	Hz		ALL
1	25	0x3E32	Dual loop control integral gain	0~1000	0	Hz		ALL
1	26	0x3E34	Double loop control with additional gain	0~1000	0	Hz		ALL
1	27	0x3E36	Smooth filtering for speed detection	0~5	0			ALL

Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.

2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.

3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.

【 Category 2 】 Vibration control function:

Parameter No		Modbus address	name	set the scope	Standard factory settin	unit	Effective method	Related modes
Classification	No.							

					gs			
2	0	0x3200	Adaptive filter mode setting	0~6	1	-		P/S
2	1	0x3202	First notch frequency	50~5000	5000	Hz		ALL
2	2	0x3204	First notch width	0~20	2	-		ALL
2	3	0x3206	First notch depth	0~99	0	-		ALL
2	4	0x3208	Second notch frequency	50~5000	5000	Hz		ALL
2	5	0x320A	Second notch width	0~20	2	-		ALL
2	6	0x320C	Second notch depth	0~99	0	-		ALL
2	7	0x320E	3rd notch frequency	50~5000	5000	Hz		ALL
2	8	0x3210	Third notch width	0~20	2	-		ALL
2	9	0x3212	Depth of the third notch	0~99	0	-		ALL
2	10	0x3214	4th notch frequency	50~5000	5000	Hz		ALL
2	11	0x3216	4th notch width	0~20	2	-		ALL
2	12	0x3218	4th notch depth	0~99	0	-		ALL
2	13	0x321A	Switching and Selection of Vibration Control Filter	0~6	0	-		P
2	14	0x321C	The first damping frequency	0~3000	0	0.1Hz		P
2	15	0x321E	The first vibration damping	1~999	30	0.001		P
2	16	0x3220	Second damping frequency	0~3000	0	0.1Hz		P
2	17	0x3222	2nd damping system	1~999	30	0.001		P
2	18	0x3224	The third damping frequency	0~3000	0	0.1Hz		P
2	19	0x3226	The third damping system	1~999	30	0.001		P
2	20	0x3228	4th damping frequency	0~3000	0	0.1Hz		P
2	21	0x322A	4th damping system	1~999	30	0.001		P
2	22	0x322C	Instruction smoothing filter	0~10000	92	0.1ms		P/S
2	23	0x322E	Instruction FIR filter	0~10000	10	0.1ms		P
2	24	0x3230	5th notch frequency	50~5000	5000	Hz		ALL
2	25	0x3232	5th notch width	0~20	2	-		ALL
2	26	0x3234	5th notch depth	0~99	0	-		ALL
2	27	0x3236	Manufacturer's use	0~1000	0	-	-	-
2	28	0x3238	Manufacturer's use	0~1000	0	-	-	-
2	29	0x323A	Selection of V-shaped vibration suppression	0~1000	0	-	-	P
2	30	0x323C	V-shaped vibration suppression frequency	100~ 1000	300	Hz	-	P
2	31	0x323E	V-shaped vibration suppression gain	0~1000	200	%		P
2	32	0x3240	Model control selection	0~1	0	Hz		P
2	33	0x3242	The resonance frequency measurement results show that	0~5000	300	Hz		P

2	34	0x3244	The measurement results of low-frequency jitter frequency show	0~5000	100	0.1Hz		P

Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.

2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.

3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.

【 Category 3 】 Speed and torque control

Parameter No		Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
Classification	No.							
3	0	0x3300	Switching between internal and external speed settings	0~3	0	-		S
3	1	0x3302	Speed command direction designation selection	0~1	0	-		S
3	2	0x3304/0xC000	Speed command input gain	10~2000	500	(rpm)/V		S/T
3	3	0x3306	Reverse speed command input	0~1	1	-		S
3	4	0x3308/0xC002	Speed setting 1st speed	-20000~20000	0	rpm		S
3	5	0x330A/0xC004	Speed setting second speed	-20000~20000	0	rpm		S
3	6	0x330C/0xC006	Speed setting 3rd speed	-20000~20000	0	rpm		S
3	7	0x330E/0xC008	Speed setting 4th speed	-20000~20000	0	rpm		S
3	8	0x3310/0xC00A	Speed setting 5th speed	-20000~20000	0	rpm		S
3	9	0x3312/0xC00C	Speed setting 6th speed	-20000~20000	0	rpm		S
3	10	0x3314/0xC00	Speed setting 7th	-20000~20000	0	rpm		S

		E	speed					
3	11	0x3316/0xC010	Speed setting 8th speed	-20000~20000	0	rpm		S
3	12	0x3318/0xC100	Acceleration time setting	1~1000000	100	ms/krpm		S
3	13	0x331A/0xC102	Deceleration time setting	1~1000000	100	ms/krpm		S
3	14	0x331C/0xC104	S-shaped acceleration and deceleration setting	0~1000	0	ms		S
3	15	0x331E	Zero speed clamping function selection	0~3	0	-		S/T
3	16	0x3320/0xC012	Zero speed clamping level	10~20000	30	rpm		S/T
3	17	0x3322	Torque command selection	0~2	0	-		T
3	18	0x3324	Selection of torque command direction designation	0~1	0	-		T
3	19	0x3326	Torque command input gain	10~100	30	0.1V/100%		T
3	20	0x3328	Reverse torque command input	0~1	0	-		T
3	21	0x332A/0xC014	Speed limit value 1	0~20000	0	rpm		T
3	22	0x332C/0xC016	Speed limit value 2	0~20000	0	rpm		T

Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.

2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.

3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.

4. The rpm unit and ms/krpm unit parameters are given as reference with the rotating motor as the default unit. If it is a linear motor, its speed and acceleration/deceleration units correspond to mm/s and mm/s ^ 2.

[Category 4] I/F Monitor Settings

Parameter No		Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
Classification	No.							
4	0	0x3400	SI1 input selection	0~16777215	8553090	-	○	ALL
4	1	0x3402	SI2 input selection	0~16777215	8487297	-	○	ALL
4	2	0x3404	SI3 input selection	0~16777215	9539850	-	○	ALL
4	3	0x3406	SI4 input selection	0~16777215	394758	-	○	ALL
4	4	0x3408	Manufacturer's use	0~16777215	4108	-	○	ALL
4	10	0x3414	SO1 output selection	0~16777215	197379	-	○	ALL
4	11	0x3416	SO2 output selection	0~16777215	131586	-	○	ALL
4	12	0x3418	SO3 output selection	0~16777215	65793	-	○	ALL
4	31	0x343E	Positioning completion range	0~2097152	10	Instruction unit		P
4	32	0x3440	Positioning completed output setting	0~11	0	-		P
4	33	0x3442	INP retention time	0~30000	0	ms		P
4	34	0x3444/0xC018	zero speed	10~20000	50	rpm		ALL
4	35	0x3446/0xC01A	Consistent speed and width	10~20000	50	rpm		S/T
4	36	0x3448/0xC01C	Arrival speed	10~20000	1000	rpm		S/T
4	37	0x344A	Mechanical brake action setting when stopping	0~10000	0	ms		ALL
4	38	0x344C	Mechanical brake action setting during operation	0~32000	0	ms		ALL
4	39	0x344E/0x	Brake release speed	30~3000	30	rpm		ALL

		C01E	setting					
4	40	0x3450	Warning output selection 1	0~40	0	-		ALL
4	41	0x3452	Warning output selection 2	0~40	0	-		ALL
4	42	0x3454	Positioning completion range 2	0~2097152	10	-		P
4	43	0x3456	Analog dead zone	0~1000	0	mV		ALL
4	44	0x3458	Position comparison output pulse width setting	0~32767	0	0.1ms	○	P
4	45	0x345A	Position comparison output polarity selection	0~63	0	-	○	P
4	46	0x345C	Manufacturer's use	0~0	0	-	-	-
4	47	0x345E	Pulse output selection	0~7	0	-	○	ALL
4	48	0x3460	Position comparison value 1	-2147483648~2147483647	0	Instruction unit		P
4	49	0x3462	Position comparison value 2	-2147483648~2147483647	0	Instruction unit		P
4	50	0x3464	Position comparison value 3	-2147483648~2147483647	0	Instruction unit		P
4	51	0x3466	Position comparison value 4	-2147483648~2147483647	0	Instruction unit		P
4	51	0x3468	Position comparison value 5	-2147483648~2147483647	0	Instruction unit		P
4	53	0x346A	Position comparison value 6	-2147483648~2147483647	0	Instruction unit		P
4	54	0x346C	Position comparison value 7	-2147483648~2147483647	0	Instruction unit		P
4	55	0x346E	Position comparison value 8	-2147483648~2147483647	0	Instruction unit		P

4	56	0x3470	Position comparison output delay compensation amount	-32768~32767	0	0.1us		P
4	57	0x3472	Position comparison output allocation setting	-2147483648~2147483647	0	-		P
4	58	0x3474	Position comparison output direction setting	0~2	2	-		P

Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.

2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.

3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.

4. The rpm unit and ms/krpm unit parameters are given as reference with the rotating motor as the default unit. If it is a linear motor, its speed and acceleration/deceleration units correspond to mm/s and mm/s ^ 2.

【 Category 5 】 Extended Settings

Parameter No		Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
Classification	No.							
5	0	0x3500	The second instruction divides the frequency of molecules into multiples	0~230	0	-		P
5	1	0x3502	The third instruction divides the frequency molecule	0~230	0	-		P
5	2	0x3504	The fourth instruction divides the harmonic molecule	0~230	0	-		P
5	3	0x3506	Pulse output frequency division denominator	0~16777216	0	-	○	ALL
5	4	0x3508	Driver input prohibition setting	0~2	1	-	○	ALL
5	5	0x350A	Driver prohibition time	0~2	0	-	○	ALL

			sequence					
5	6	0x350C	Servo enable shutdown timing sequence	0~9	0	-		ALL
5	7	0x350E	Sequence when the power AC is turned off	0~9	0	-		ALL
5	8	0x3510	LV trigger selection when main power AC is turned off	0~3	1	-		ALL
5	9	0x3512	Main power AC shutdown detection time	20~2000	70	ms	○	ALL
5	10	0x3514	Alarm timing sequence	0~7	0	-		ALL
5	11	0x3516	Torque setting for instant stop	0~500	0	%		ALL
5	12	0x3518	Overload level setting	0~500	0	%		ALL
5	13	0x351A/0xC020	Speed level setting	0~20000	0	rpm		ALL
5	14	0x351C	Manufacturer's use	0~1000	10	-	-	-
5	15	0x351E	Control input signal reading setting	0~6	0	-	○	ALL
5	16	0x3520	Alarm Clear Input (A-CLR) Setting	0~1	0	-	○	ALL
5	17	0x3522	Counter clear (CL) input setting	0~4	3	-		P
5	18	0x3524	Invalid command pulse input prohibition (INH) setting	0~1	1	-		P
5	19	0x3526	Instruction pulse prohibition input (INH) reading setting	0~5	0	-	○	P
5	20	0x3528	Location setting unit selection	0~1	0	-	○	P
5	21	0x352A	Torque limit selection	0~6	1	-		P/S
5	22	0x352C	Second torque limit	0~500	500	%		P/S
5	23	0x352E	Manufacturer's use	0~4000	0	-	-	-
5	24	0x3530	Manufacturer's use	0~4000	0	-	-	-
5	25	0x3532	Positive torque limit during external input	0~500	500	%		P/S
5	26	0x3534	Negative direction torque limit during external input	0~500	500	%		P/S
5	27	0x3536	Manufacturer's use	10~100	30	0.1V/100		P/S

						%		
5	28	0x3538	Initial state of LED	0~42	1	-	○	ALL
5	29	0x353A	Manufacturer's use	0~7	2	-	○	-
5	30	0x353C	RS485 communication baud rate setting	0~7	2	-	○	ALL
5	31	0x353E	Axis number	0~127	1	-	○	ALL
5	32	0x3540	Command pulse input maximum setting/digital filter setting	250~8000	4000	1000pulse/s	○	P
5	33	0x3542	Effective pulse regeneration output limit	0~1	0	-	○	ALL
5	34	0x3544	High speed input filtering setting	0~10	1	-	○	ALL
5	35	0x3546	Front panel locking	0~1	0	-	○	ALL
5	36	0x3548	Manufacturer's use	0~500	0	-		-
5	37	0x354A	Modbus connection settings	0~2	0	-	○	ALL
5	38	0x354C	Modbus communication settings	0~5	0	-	○	ALL
5	39	0x354E	Manufacturer's use	0~10000	0	-	-	-
5	40	0x3550	Manufacturer's use	0~10000	0	-	-	-
5	41	0x3552	Manufacturer's use	0~0	0	-	-	-
5	42	0x3554	Manufacturer's use	-32768~32767	0	-	-	-
5	43	0x3556	Manufacturer's use	0~0	0	-	-	-
5	44	0x3558	Manufacturer's use	0~0	0	-	-	-
5	45	0x355A	Positive compensation value for quadrant bulge	-1000~1000	0	0.10%		P
5	46	0x355C	Negative compensation value for quadrant bulge	-1000~1000	0	0.10%		P
5	47	0x355E	Manufacturer's use	0~1000	0	-		-
5	48	0x3560	Manufacturer's use	0~64	0	-		-
5	49	0x3562	Manufacturer's use	0~1000	0	-		-
5	50	0x3564	Establishment time of quadrant bulge compensation	0~10000	0	0.1ms		P
5	51	0x3566	Quadrant bulge compensation holding time	0~10000	0	0.1ms		P
5	52	0x3568	Selection of motor overload	0~2	0	-		ALL

			protection function					
5	53	0x356A	Manufacturer's use	-2147483648~2147483647	0	-	-	-
5	54	0x356C	Manufacturer's use	-2147483648~2147483647	0	-	-	-
5	55	0x356E	Manufacturer's use	-2147483648~2147483647	0	-	-	-
5	56	0x3570/0xC106	Manufacturer's use	1~1000000	100	-	-	-
5	57	0x3572	Manufacturer's use	0~1000	0	-	-	-
5	58	0x3574	Manufacturer's use	-32768~32767	24591	-	-	-
5	59	0x3576	Manufacturer's use	-32768~32767	24592	-	-	-
5	60	0x3578	Manufacturer's use	-32768~32767	16421	-	-	-
5	61	0x357A	Manufacturer's use	-32768~32767	24613	-	-	-
5	62	0x357C	Manufacturer's use	-32768~32767	17429	-	-	-
5	63	0x357E	Manufacturer's use	-32768~32767	17418	-	-	-
5	64	0x3580	Manufacturer's use	-32768~32767	17427	-	-	-
5	65	0x3582	Manufacturer's use	-32768~32767	17419	-	-	-

5	66	0x3584	Manufacturer's use	0~10000	0	-	-	-
5	67	0x3586	Manufacturer's use	0~10000	0	-	-	-
5	68	0x3588	Manufacturer's use	0~10000	0	-	-	-
5	69	0x358A	Manufacturer's use	-1000~1000	0	-	-	-
5	70	0x358C	Manufacturer's use	-1000~1000	0	-	-	-
5	71	0x358E	Manufacturer's use	-1000~1000	0	-	-	-
5	72	0x3590	Manufacturer's use	-1000~1000	0	-	-	-
5	73	0x3592	Manufacturer's use	0~10000	0	-	-	-
5	74	0x3594	Manufacturer's use	0~10000	0	-	-	-
5	75	0x3596/0xC022	Manufacturer's use	-20000~20000	0	-	-	-
5	76	0x3598	Manufacturer's use	0~10000	0	-	-	-
5	77	0x359A	Manufacturer's use	-1000~1000	0	-	-	-
5	78	0x359C	Manufacturer's use	-1000~1000	0	-	-	-
5	79	0x359E	Manufacturer's use	-32768~32767	17410	-	-	-
5	80	0x35A0	Manufacturer's use	-32768~32767	17411	-	-	-
5	81	0x35A2	Manufacturer's use	-32768~32767	16398	-	-	-
5	82	0x35A4	Manufacturer's use	-32768~32767	16402	-	-	-
5	83	0x35A6	Manufacturer's use	-32768~32767	16411	-	-	-
5	84	0x35A8	Manufacturer's use	-32768~32767	16405	-	-	-

TIPS Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.

2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.

3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.
4. The rpm unit and ms/krpm unit parameters are given with reference to the rotating motor as the default unit. If it is a linear motor, its speed and acceleration/deceleration units correspond to mm/s and mm/s ^ 2.

【 Category 6 】 Special Settings

5	85	0x35AA	Manufacturer's use	-32768~32767	16406	-	-	-
5	86	0x35AC	Manufacturer's use	-32768~32767	0	-	-	-

Parameter No		Modbus address	name	set the scope	Standard out Factory settings	unit	Effective method	Related modes
Classification	No.							
6	0	0x3600	Manufacturer's use	0~0	0	-	-	-
6	1	0x3602	Manufacturer's use	0~0	0	-	-	-
6	2	0x3604/0xC024	Setting for excessive speed deviation	0~20000	0	rpm		P/S
6	3	0x3606	Manufacturer's use	0~0	0	-	-	-
6	4	0x3608/0xC026	JOG trial operation command speed	0~500	300	rpm		ALL
6	5	0x360A	Position 3 gain effective time	0~10000	0	0.1ms		P
6	6	0x360C	Position 3 gain multiplier	50~1000	100	%		P
6	7	0x360E	Torque command added value	-100~100	0	%		P/S
6	8	0x3610	Positive direction torque compensation value	-100~100	0	%		P
6	9	0x3612	Negative direction torque compensation value	-100~100	0	%		P
6	10	0x3614	Function extension settings	0~2147483647	16	-	○	ALL
6	11	0x3616	Current response setting	10~300	100	%	○	ALL
6	12	0x3618	Manufacturer's use	0~0	0	-	-	-
6	13	0x361A	Second inertia ratio	0~20000	250	%		ALL
6	14	0x361C	Immediate stop time upon alarm	0~1000	200	ms		ALL

6	15	0x361E/0xC028	Second Speed Level Setting	0~20000	0	rpm		ALL
6	16	0x3620	Manufacturer's use	0~1	0	-	-	-
6	17	0x3622	Front panel parameter writing selection	0~1	0	-	○	ALL
6	18	0x3624	Manufacturer's use	0~100	0	-	-	-
6	19	0x3626	Manufacturer's use	0~0	0	-	-	-
6	20	0x3628	Manufacturer's use	0~0	0	-	-	-
6	21	0x362A	Manufacturer's use	0~0	0	-	-	-
6	22	0x362C	AB phase output type external displacement sensor AB phase regeneration method selection	0~1	0	-	○	F
6	23	0x362E	Manufacturer's use	-100~100	0	-	-	-
6	24	0x3630	Load variation compensation filter	10~2500	53	0.01ms		P/S
6	25	0x3632	Manufacturer's use	0~0	0	-	-	-
6	26	0x3634	Manufacturer's use	0~0	0	-	-	-
6	27	0x3636	Warning lock (hold) time selection	0~10	5	s	○	ALL
6	28	0x3638	Multi stage/zero return control mode selection	0~2	0	-	○	P
6	29	0x363A	Manufacturer's use	0~0	0	-	-	-
6	30	0x363C	Manufacturer's use	0~1	0	-	-	-
6	31	0x363E	Manufacturer's use	0~3	1	-	-	-
6	32	0x3640	Manufacturer's use	-32768~32767	0	-	-	-
6	33	0x3642	Manufacturer's use	1000~3000	1000	-	-	-
6	34	0x3644	Manufacturer's use	0~30000	0	-	-	-
6	35	0x3646	Manufacturer's use	0~32000	10	-	-	-
6	36	0x3648	Dynamic brake operation input	0~1	0	–	○	ALL
6	37	0x364A	Manufacturer's use	0~1000	0	-	-	-
6	38	0x364C	Warning blocking setting	-32768~32767	4	–	○	ALL
6	39	0x364E	Manufacturer's use	-32768~32	0	–	–	-

				767				
6	40	0x3650	Manufacturer's use	0~0	0	-	-	-
6	41	0x3652	Manufacturer's use	0~1000	0	-	-	-
6	42	0x3654	Manufacturer's use	0~2500	0	-	-	-
6	43	0x3656	Manufacturer's use	0~1000	0	-	-	-
6	44	0x3658	Manufacturer's use	0~0	0	-	-	-
6	45	0x365A	Manufacturer's use	0~0	0	-	-	-
6	46	0x365C	Manufacturer's use	0~0	0	-	-	-
6	47	0x365E	Function Expansion Setting 2	-32768~32767	1	-	○	ALL
6	48	0x3660	Adjust the filter	0~2000	11	0.1ms		P/S
6	49	0x3662	Manufacturer's use	0~99	15	-		-
6	50	0x3664	Viscous friction compensation gain	0~10000	0	0.1%/(1000rpm)		P/S
6	51	0x3666	Instant stop completion waiting time	0~10000	0	ms		ALL
6	52	0x3668	Manufacturer's use	0~95	0	-	-	-
6	53	0x366A	Manufacturer's use	0~95	0	-	-	-
6	54	0x366C	Manufacturer's use	0~1	0	-	-	-
6	55	0x366E	Manufacturer's use	0~0	0	-	-	-
6	56	0x3670	Manufacturer's use	0~0	0	-	-	-
6	57	0x3672	Detection time of torque saturation anomaly protection	0~5000	0	ms		P/S
6	58	0x3674	Manufacturer's use	-2147483648~2147483647	0	-	-	-
6	59	0x3676	Manufacturer's use	0~0	0	-	-	-
6	60	0x3678	Manufacturer's use	0~1000	0	-	-	-
6	61	0x367A	Manufacturer's use	0~3000	0	-	-	-
6	62	0x367C	Manufacturer's use	0~1000	0	-	-	-
6	63	0x367E	Manufacturer's use	0~3000	0	-	-	-
6	64	0x3680	Manufacturer's use	0~1000	0	-	-	-
6	65	0x3682	Manufacturer's use	0~3000	0	-	-	-
6	66	0x3684	Manufacturer's use	0~3000	0	-	-	-
6	67	0x3686	Manufacturer's use	0~1000	0	-	-	-
6	68	0x3688	Manufacturer's use	0~3000	0	-	-	-
6	69	0x368A	Manufacturer's use	0~1000	0	-	-	-

6	70	0x368C	Manufacturer's use	0~3000	0	-	-	-
6	71	0x368E	Manufacturer's use	0~1000	0	-	-	-
6	72	0x3690	Manufacturer's use	0~1000	0	-	-	-
6	73	0x3692	Manufacturer's use	0~2500	0	-	-	-
6	74	0x3694	Manufacturer's use	0~5000	0	-	-	-
6	75	0x3696	Manufacturer's use	0~5000	0	-	-	-
6	76	0x3698	Manufacturer's use	0~8	0	-	-	-

Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.

2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.

3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.

4. The parameters of rpm unit and ms/krpm unit are given with reference to the rotating motor as the default unit. If it is a linear motor, its speed and acceleration/deceleration units correspond to mm/s and mm/s ^ 2, while corresponding to the Modbus address used.

【 Category 7 】 Zero Return Parameter Setting

Parameter No		EtherCAT address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
Classification	No.							
7	0	0x3702	Zero return method selection (38 types in total)	0~39	0	-		P
7	1	0x3704 /0xC108	Return to zero acceleration	1~1000000	100	ms/krpm		P
7	2	0x3706 /0xC02A	The first zero speed	0~20000	30	rpm		P
7	3	0x3708 /0xC02C	Second Zero Speed	0~1000	15	rpm		P
7	4	0x370A	Return to zero bias	-2147483648~21	0	Instruction unit		P

				47483647				
7	5	0x370C	Collision current	0~500	0	%		P
7	6	0x3714	Duration of collision current	0~20000	0	ms		P
7	7	0x3716	Z-trip maximum value protection	-2147483648~2147483647	0	Instruction unit		P

【 Category 8 】 Self tuning parameter setting

Parameter No		Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
Classification	No.							
8	0	0x3B2A	Manufacturer's use	0~0	0	-	-	-
8	1	0x3B2C	Manufacturer's use	0~0	0	-	-	-
8	2	0x3B2E	Manufacturer's use	0~0	0	-	-	-
8	3	0x3B30	Manufacturer's use	0~0	0	-	-	-
8	4	0xA416	Manufacturer's use	0~0	0	-	-	-
8	5	0x3B34	Manufacturer's use	0~0	0	-	-	-
8	6	0x3B36	Manufacturer's use	0~0	0	-	-	-
8	7	0x3B38	Manufacturer's use	0~0	0	-	-	-
8	8	0x3B3A	Manufacturer's use	0~0	0	-	-	-
8	9	0x3B3C	Manufacturer's use	0~0	0	-	-	-
8	10	0x3B3E	Manufacturer's use	0~0	0	-	-	-
8	11	0x3B40	Manufacturer's use	0~0	0	-	-	-
8	12	0x3B42	Manufacturer's use	0~0	0	-	-	-

Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.

2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.

3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.

【 Category 9 】 Performance tuning parameter setting

Parameter No		Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
Classification	No.							
9	0	0x3900	Carrier frequency selection	0~2	0	-		ALL
9	1	0x3902	Synchronization cycle selection	0~6	2	-		ALL
9	2	0x3904	Current loop control mode	0~2	0	-		ALL
9	3	0x3906	Cross decoupling ratio	0~150	100	%		ALL
9	4	0x3908	Compensation coefficient for back electromotive force	0~150	100	%		ALL
9	5	0x390A	Dead zone compensation coefficient	0~150	100	%		ALL
9	6	0x390C	Weak magnetic control gain	10~1000	100	%		ALL
9	7	0x390E	Simulation function selection	0~2147483647	0	-		ALL
9	8	0x3910	Simulate load torque	0~500	0	%		ALL
9	9	0x3912	Simulate resonant frequency	300~2000	0	Hz		ALL

Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.

2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.

3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.

【 Category 10 】 Motor and Encoder Parameter Setting

Parameter No		Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
Classification	No.							
10	0	0x3A00	Motor brand	0~20	1	-	○	ALL
10	1	0x3A02	Motor model	0~50	1	-	○	ALL
10	2	0x3A04	Motor Type	0~3	0	-	○	ALL
10	3	0x3A06	Rated power of motor	1~20000	75	0.01kW	○	ALL
10	4	0x3A08	Rated current of motor	1~32767	50	0.1A	○	ALL
10	5	0x3A0A/0xC032	Rated speed of motor	1~30000	3000	rpm	○	ALL
10	6	0x3A0C/0xC034	Maximum speed of motor	1~30000	6500	rpm	○	ALL
10	7	0x3A0E	number of pole pairs	1~255	5	Pn	○	ALL
10	8	0x3A10	Rated torque of motor	1~3276700	2390	0.001N.m	○	ALL
10	9	0x3A12	Motor coil phase resistance	1~100000	50	0.01Ω	○	ALL
10	10	0x3A14	Direct axis phase inductance of motor	1~100000	290	0.01mH	○	ALL
10	11	0x3A16	Motor cross axis phase inductance	1~100000	290	0.01mH	○	ALL
10	12	0x3A18	Motor rotor moment of inertia	1~3276700	182	kgCm^2	○	ALL
10	13	0x3A1A	Motor back electromotive force constant	1~2000	28	v/krpm	○	ALL

10	14	0x3A1C	Motor load simulation inertia ratio	0~20000	250	%	○	ALL
10	15	0x3A1E	encoder type	0~11	0	-	○	ALL
10	16	0x3A20	Single cycle resolution of communication encoder	10~32	17	-	○	ALL
10	17	0x3A22	Multi cycle resolution of communication encoder	0~30	0	-	○	ALL
10	18	0x8436	Actual resolution of communication encoder (for shift only)	10~32	17	-	○	ALL
10	19	0x3A40	Incremental (ABZ) encoder resolution	-2147483648~2147483647	10000	pluse	○	ALL
10	20	0x82F0	Direct drive magnetic pole spacing	0~2147483647	2400	0.01mm	○	ALL
10	21	0x82F2	Direct drive grating ruler resolution	1~2147483647	500	0.001um	○	ALL
10	22	0x82F6	Number of pulses per magnetic pole in direct drive	1~2147483647	10000	pluse	○	ALL
10	23	0x3A42	Reversing mode	0~4	0	-	○	ALL
10	24	0x3A2C	Encoder commutation current	1~200	100	%	○	ALL
10	25	0x3A3E	Smooth commutation time	10~500	100	ms	○	ALL
10	26	0x3A24	Encoder zero position angle (electrical angle)	0~36000	0	°	○	ALL
10	27	0x3A26	Encoder malfunction enabled	0~1	1	-	○	ALL

10	28	0x3A28	Maximum deviation of encoder	100~100000	100	-	○	ALL
10	29	0x3A2A	Encoder fitting alarm enable	0~1	0	-	○	ALL
10	30	0x3A2E	Current loop gain coefficient Kp	1~9999	100	0.01	○	ALL
10	31	0x3A30	Current loop integral coefficient Ki	1~9999	1000	0.1	○	ALL
10	32	0x3A36	Enable input phase loss detection	0~2	0	-	○	ALL
10	33	0x3A3C	U and W phase sequence exchange	0~1	0	-	○	ALL
10	34	0x3A34	dead time	1000~10000	2000	ns	○	ALL
10	35	0x3A46	Enable circuit detection of the brake module	0~1	0	-	○	ALL
10	36	0x3A3A	Manufacturer's use	1~100	100	-	○	ALL
10	37	0x3A32	Manufacturer's use	1~10	0	-	○	ALL

Attention

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.

2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.

3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.

4. The parameters of rpm unit and ms/krpm unit are given with reference to the rotating motor as the default unit. If it is a linear motor, its speed and acceleration/deceleration units correspond to mm/s and mm/s ^ 2, while corresponding to the Modbus address used.

【 Category 11 】 Application Function Group Parameter Setting

Parameter No		Modbus address	name	set the scope	Standard	unit	Effective method	Related modes
Classif	No.							

ication					factory settings			
11	x	-	Manufacturer's use	internal settings	-	-	-	-

Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.

2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.

3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.

[Category 12] Parameter Setting for Single Function Group

Parameter No		Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
Classification	No.							
12	0	0x90B6	Manufacturer's use	-	-	-	○	-
12	1	0x90B8	Manufacturer's use	-	-	-	○	-
12	3	0x90BC	Manufacturer's use	-	-	-	○	-
12	4	0x90BE	Manufacturer's use	-	-	-	○	-
12	6	0x8728	Manufacturer's use	0~4	0	-		ALL
12	7	0x872A	Manufacturer's use	0~4	0	-		ALL
12	8	0x872C	Manufacturer's use	0~5	0	-		ALL
12	9	0x3A4E	Manufacturer's use	0~2	1	-		ALL
12	10	0x8434	Clear the alarm and reset the direction to enable	0~1	0	-		ALL
12	11	0x909E	Power on delay reading encoder time	5~50	15	0.1s		ALL
12	12	0x372C	Manufacturer's use	-	-	-	○	-

12	13	0x90B4	Manufacturer's use	0~4	0	-		ALL
12	14	0x371C	Manufacturer's use	-	-	-	○	-
12	15	0x8500	Manufacturer's use	-	-	-	○	-
12	16	0x8502	Manufacturer's use	-	-	-	○	-
12	17	0x8504	Manufacturer's use	0~4	0	-		ALL
12	18	0x8506	Manufacturer's use	0~4	0	-		ALL
12	19	0x8508	Manufacturer's use	0~4	0	-		ALL

Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.
2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.
3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.

[Category 13] Parameter Setting for Single Function Group

Parameter No		Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
Classification	No.							
13	x	xxx	Manufacturer's use	0~4	0	-		ALL

Note:

The parameters marked with "O" in the "Effective Method" item will take effect after power failure and restart after parameter changes.
2. The items represented by "related modes", ALL: represents all modes, P: position control, S: speed control, T: torque control.
3. The parameters for "manufacturer use" should not be changed arbitrarily by customers.

[Category 15] Parameter Setting for Single Function Group

Parameter No		Modbus address	name	set the scope	Standard factory settings	unit	Effective method	Related modes
Classification	No.							
15	0	0x8200	Multi stage control mode	0~1	0	-		P
15	1	0x8202	Multi level absolute position mode	0~2	0	-		P
15	2	0x8204	Multi level Modbus trigger	0~1	0	-		P
15	3	0x8206	Multi segment position number	0~31	0	-		P
15	4	0x8208/0xC120	Multi level relative position 1	-9223370000000000000~9223370000000000000	0	pluse		P
15	5	0x820A/0xC122	Multi level relative position 2	-9223370000000000000~9223370000000000000	0	pluse		P
15	6	0x820C/0xC124	Multi level relative position 3	-9223370000000000000~9223370000000000000	0	pluse		P
15	7	0x820E/0xC126	Multi level relative position 4	-9223370000000000000~9223370000000000000	0	pluse		P
15	8	0x8210/0xC128	Multi level relative position 5	-9223370000000000000~9223370000000000000	0	pluse		P
15	9	0x8212/0xC12A	Multi level relative position 6	-9223370000000000000~9223370000000000000	0	pluse		P
15	10	0x8214/0xC12C	Multi level relative	-9223370000000000000~9223	0	pluse		P

			position 7	370000000000000				
15	11	0x8216/0xC12E	Multi level relative position 8	-9223370000000000000~9223370000000000000	0	pluse		P
15	12	0x8218/0xC130	Multi level relative position 9	-9223370000000000000~9223370000000000000	0	pluse		P
15	13	0x821A/0xC132	Multi level relative position 10	-9223370000000000000~9223370000000000000	0	pluse		P
15	14	0x821C/0xC134	Multi level relative position 11	-9223370000000000000~9223370000000000000	0	pluse		P
15	15	0x821E/0xC136	Multi level relative position 12	-9223370000000000000~9223370000000000000	0	pluse		P
15	16	0x8220/0xC138	Multi level relative position 13	-9223370000000000000~9223370000000000000	0	pluse		P
15	17	0x8222/0xC13A	Multi level relative position 14	-9223370000000000000~9223370000000000000	0	pluse		P
15	18	0x8224/0xC13C	Multi level relative position 15	-9223370000000000000~9223370000000000000	0	pluse		P
15	19	0x8226/0xC13E	Multi level relative position 16	-9223370000000000000~9223370000000000000	0	pluse		P
15	20	0x8228/0xC140	Multi level relative position 17	-9223370000000000000~9223370000000000000	0	pluse		P
15	21	0x822A/0xC142	Multi level relative position 18	-9223370000000000000~9223370000000000000	0	pluse		P
15	22	0x822C/0xC144	Multi level relative position 19	-9223370000000000000~9223370000000000000	0	pluse		P
15	23	0x822E/0xC146	Multi level relative position 20	-9223370000000000000~9223370000000000000	0	pluse		P
15	24	0x8230/0x	Multi level	-	0	plus		P

		C148	relative position 21	9223370000000000000~9223370000000000000		e		
15	25	0x8232/0xC14A	Multi level relative position 22	-9223370000000000000~9223370000000000000	0	pluse		P
15	26	0x8234/0xC14C	Multi level relative position 23	-9223370000000000000~9223370000000000000	0	pluse		P
15	27	0x8236/0xC14E	Multi level relative position 24	-9223370000000000000~9223370000000000000	0	pluse		P
15	28	0x8238/0xC150	Multi level relative position 25	-9223370000000000000~9223370000000000000	0	pluse		P
15	29	0x823A/0xC152	Multi level relative position 26	-9223370000000000000~9223370000000000000	0	pluse		P
15	30	0x823C/0xC154	Multi level relative position 27	-9223370000000000000~9223370000000000000	0	pluse		P
15	31	0x823E/0xC156	Multi level relative position 28	-9223370000000000000~9223370000000000000	0	pluse		P
15	32	0x8240/0xC158	Multi level relative position 29	-9223370000000000000~9223370000000000000	0	pluse		P
15	33	0x8242/0xC15A	Multi level relative position 30	-9223370000000000000~9223370000000000000	0	pluse		P
15	34	0x8244/0xC15C	Multi level relative position 31	-9223370000000000000~9223370000000000000	0	pluse		P
15	35	0x8246/0xC15E	Multi level relative position 32	-9223370000000000000~9223370000000000000	0	pluse		P
15	36	0x8248/0xC160	Multi level absolute position 1	-9223370000000000000~9223370000000000000	0	pluse		P
15	37	0x824A/0xC162	Multi level absolute position 2	-9223370000000000000~9223370000000000000	0	pluse		P

15	38	0x824C/0xC164	Multi level absolute position 3	-9223370000000000000~9223370000000000000	0	pluse		P
15	39	0x824E/0xC166	Multi level absolute position 4	-9223370000000000000~9223370000000000000	0	pluse		P
15	40	0x8250/0xC168	Multi level absolute position 5	-9223370000000000000~9223370000000000000	0	pluse		P
15	41	0x8252/0xC16A	Multi level absolute position 6	-9223370000000000000~9223370000000000000	0	pluse		P
15	42	0x8254/0xC16C	Multi level absolute position 7	-9223370000000000000~9223370000000000000	0	pluse		P
15	43	0x8256/0xC16E	Multi level absolute position 8	-9223370000000000000~9223370000000000000	0	pluse		P
15	44	0x8258/0xC170	Multi level absolute position 9	-9223370000000000000~9223370000000000000	0	pluse		P
15	45	0x825A/0xC172	Multi level absolute position 10	-9223370000000000000~9223370000000000000	0	pluse		P
15	46	0x825C/0xC174	Multi level absolute position 11	-9223370000000000000~9223370000000000000	0	pluse		P
15	47	0x825E/0xC176	Multi level absolute position 12	-9223370000000000000~9223370000000000000	0	pluse		P
15	48	0x8260/0xC178	Multi level absolute position 13	-9223370000000000000~9223370000000000000	0	pluse		P
15	49	0x8262/0xC17A	Multi level absolute position 14	-9223370000000000000~9223370000000000000	0	pluse		P
15	50	0x8264/0xC17C	Multi level absolute position 15	-9223370000000000000~9223370000000000000	0	pluse		P
15	51	0x8266/0xC17E	Multi level absolute	-9223370000000000000~9223	0	pluse		P

			position 16	370000000000000				
15	52	0x8268/0xC180	Multi level absolute position 17	-9223370000000000000~9223370000000000000	0	pluse		P
15	53	0x826A/0xC182	Multi level absolute position 18	-9223370000000000000~9223370000000000000	0	pluse		P
15	54	0x826C/0xC184	Multi level absolute position 19	-9223370000000000000~9223370000000000000	0	pluse		P
15	55	0x826E/0xC186	Multi level absolute position 20	-9223370000000000000~9223370000000000000	0	pluse		P
15	56	0x8270/0xC188	Multi level absolute position 21	-9223370000000000000~9223370000000000000	0	pluse		P
15	57	0x8272/0xC18A	Multi level absolute position 22	-9223370000000000000~9223370000000000000	0	pluse		P
15	58	0x8274/0xC18C	Multi level absolute position 23	-9223370000000000000~9223370000000000000	0	pluse		P
15	59	0x8276/0xC18E	Multi level absolute position 24	-9223370000000000000~9223370000000000000	0	pluse		P
15	60	0x8278/0xC190	Multi level absolute position 25	-9223370000000000000~9223370000000000000	0	pluse		P
15	61	0x8272A/0xC192	Multi level absolute position 26	-9223370000000000000~9223370000000000000	0	pluse		P
15	62	0x827C/0xC194	Multi level absolute position 27	-9223370000000000000~9223370000000000000	0	pluse		P
15	63	0x827E/0xC196	Multi level absolute position 28	-9223370000000000000~9223370000000000000	0	pluse		P
15	64	0x8280/0xC198	Multi level absolute position 29	-9223370000000000000~9223370000000000000	0	pluse		P
15	65	0x8282/0x	Multi level	-	0	plus		P

		C19A	absolute position 30	9223370000000000000~9223370000000000000		e		
15	66	0x8284/0xC19C	Multi level absolute position 31	-9223370000000000000~9223370000000000000	0	pluse		P
15	67	0x8286/0xC19E	Multi level absolute position 32	-9223370000000000000~9223370000000000000	0	pluse		P
15	68	0x8288/0xC03A	Multi level speed 1	-20000~20000	0	rpm		P
15	69	0x828A/0xC03C	Multi level speed 2	-20000~20000	0	rpm		P
15	70	0x828C/0xC03E	Multi level speed 3	-20000~20000	0	rpm		P
15	71	0x828E/0xC040	Multi level speed 4	-20000~20000	0	rpm		P
15	72	0x8290/0xC042	Multi level speed 5	-20000~20000	0	rpm		P
15	73	0x8292/0xC044	Multi level speed 6	-20000~20000	0	rpm		P
15	74	0x8294/0xC046	Multi level speed 7	-20000~20000	0	rpm		P
15	75	0x8296/0xC048	Multi level speed 8	-20000~20000	0	rpm		P
15	76	0x8298/0xC04A	Multi level speed 9	-20000~20000	0	rpm		P
15	77	0x829A/0xC04C	Multi level speed 10	-20000~20000	0	rpm		P
15	78	0x829C/0xC04E	Multi level speed 11	-20000~20000	0	rpm		P
15	79	0x829E/0xC050	Multi level speed 12	-20000~20000	0	rpm		P
15	80	0x82A0/0xC052	Multi level speed 13	-20000~20000	0	rpm		P
15	81	0x82A2/0xC054	Multi level speed 14	-20000~20000	0	rpm		P
15	82	0x82A4/0xC056	Multi level speed 15	-20000~20000	0	rpm		P
15	83	0x82A6/0xC058	Multi level speed 16	-20000~20000	0	rpm		P

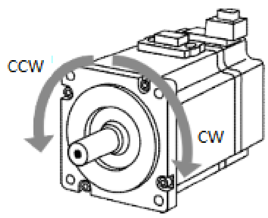
15	84	0x82A8/0xC05A	Multi level speed 17	-20000~20000	0	rpm		P
15	85	0x82AA/0xC05C	Multi level speed 18	-20000~20000	0	rpm		P
15	86	0x82AC/0xC05E	Multi level speed 19	-20000~20000	0	rpm		P
15	87	0x82AE/0xC060	Multi level speed 20	-20000~20000	0	rpm		P
15	88	0x82B0/0xC062	Multi level speed 21	-20000~20000	0	rpm		P
15	89	0x82B2/0xC064	Multi level speed 22	-20000~20000	0	rpm		P
15	90	0x82B4/0xC066	Multi level speed 23	-20000~20000	0	rpm		P
15	91	0x82B6/0xC068	Multi level speed 24	-20000~20000	0	rpm		P
15	92	0x82B8/0xC06A	Multi level speed 25	-20000~20000	0	rpm		P
15	93	0x82BA/0xC06C	Multi level speed 26	-20000~20000	0	rpm		P
15	94	0x82BC/0xC06E	Multi level speed 27	-20000~20000	0	rpm		P
15	95	0x82BE/0xC070	Multi level speed 28	-20000~20000	0	rpm		P
15	96	0x82C0/0xC072	Multi level speed 29	-20000~20000	0	rpm		P
15	97	0x82C2/0xC074	Multi level speed 30	-20000~20000	0	rpm		P
15	98	0x82C4/0xC076	Multi level speed 31	-20000~20000	0	rpm		P
15	99	0x82C6/0xC078	Multi level speed 32	-20000~20000	0	rpm		P
15	100	0x369A	Rotation value	0~2147483647	0	pluse		P
15	101	0x8726	Multi level relative position unit selection	0~2	0	-		P

10 Detailed description of 10 parameters

10.1 Pr00 group parameters

serial number Pr0.00*	name	Rotation direction setting			Effective method	Power on again	data range	0~1
	Modbus address	0x3000	unit	-	Related modes	ALL	factory settings	1

When viewed from the motor side, the motor rotates in the positive direction.
When the positive direction command is given, the motor rotates in the CW direction (clockwise when viewed from the shaft side)
1: When the forward direction command is given, the motor rotates in the CCW direction (counterclockwise when viewed from the shaft side)
When the direction of rotation changes, the shape of the servo drive output pulse and the positive or negative monitoring parameters will not change



Factory set value

set value	command direction	Motor rotation direction	Positive drive input prohibited	Negative direction drive input prohibited
0	positive direction	CW direction	effective	-
	negative direction	CCW direction	-	effective
【 1 】	positive direction	CCW direction	effective	-
	negative direction	CW direction	-	effective

serial number Pr0.01*	name	Control mode setting			Effective method	Power on again	data range	0~7
	Modbus address	0x3002	unit	-	Related modes	ALL	factory settings	0

Set the control mode to be used.
When setting the composite modes of 3, 4, 5, and 7, it is necessary to set one DI terminal function as (C-MODE);According to the control mode switching input, control modes 1 and 2 can be switched.
When C-MODE (IO invalid) is open circuit: select the first mode;
When C-MODE (IO invalid) is short circuited: select the second mode;
The logic setting of the C-MODE input mentioned above is normally open.When set to normally closed, switch between open/short circuit.

Special Instructions for Mode 7:
Mainly used for the slow wire cutting process of spark machines, it actually switches between speed and torque modes. Unlike normal switching, it is used through another DI (FWD). This mode can choose whether to set the speed limit to 0 or set the speed to 0 in speed mode. The analog port settings for speed and torque mode are also different from those for conventional ports.The main application instructions are as follows:

1. Silk transportation stage:
2. Running in torque mode, during which the motor shaft is locked, the FWD signal (a physical DI signal) is 0, and the maximum output torque is the torque value corresponding to the analog quantity;The analog input also comes from the analog port 1 (default is analog port 2), which detects the FWD forward signal. If the signal is 0, the speed limit value in torque mode is 0, and the motor is locked, but the torque output torque is the torque corresponding to the analog signal;
3. 2. Silk reduction stage
4. Running in torque mode, check whether the FWD signal is valid. If it is valid, the speed limit value comes from the parameter speed limit (other limit sources are invalid) 12RPM;
5. 3. Thread stage
6. Running in speed mode, the analog value comes from analog port 1. During operation, a sensor will detect whether the threading is normal. The threading port will be manually blocked, and the system will detect the sensor signal. If it is found that the threading is not successful, it will give forward and reverse analog voltage, causing the load shaft to run back and forth until threading is successful;When switching to analog speed mode, check whether the FWD signal is valid. If it is valid, output the speed command value corresponding to the analog signal. When the FWD signal is invalid, it does not respond to the analog speed value and the input is locked to 0.

set value	content	
	Mode 1	Mode 2
0	position	-
1	speed	-
2	torque	-
3※1	position	speed
4※1	position	torque
5※1	speed	torque
6	Manufacturer's use	
7※1	Special motion mode (switching between speed and torque modes)	

serial number Pr0.02	name	Real time automatic adjustment of settings			Effective method	Effective immediately	data range	0~6
	Modbus address	0x3004	unit	-	Related modes	ALL	factory settings	1

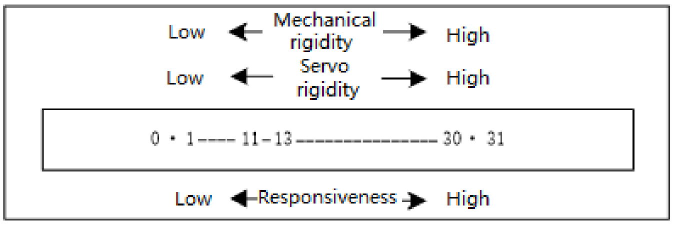
Set the action mode for real-time automatic adjustment.Please refer to the instructions for "Real time automatic gain adjustment" in the servo adjustment section for use.

set value	pattern	Instructions
0	invalid	The real-time automatic adjustment function is invalid.
【1】	Standard response mode	A model that values stability.No offset load friction compensation is performed and no gain switching is used.
2	Positioning response mode	Emphasize the mode of positioning.Used for screw driven equipment with horizontal axis unbiased load and low friction.
3	Vertical axis response mode	In positioning mode, compensating for the offset load of the vertical axis is convenient for suppressing positioning and setting delays.
4	Friction compensation response mode	In vertical axis mode, it is used for belt drive shafts with high friction, etc., to shorten the positioning and setting time.
5	Load characteristic measurement	Do not change the basic gain setting and friction compensation setting, only infer the load characteristics.Used in conjunction with the upper computer.
6	Suitable for gain mode	Suitable for use when adjusting the rigidity setting after the gain is completed.

serial number Pr0.03	name	Real time automatic adjustment of mechanical rigidity settings			Effective method	Effective immediately	data range	0~31
	Modbus	0x3006	unit	-	Related	ALL	factory	13

	address				modes		settings	

Set the responsiveness when real-time automatic adjustment is effective.



Note:

As the set value increases, the speed responsiveness increases and the servo rigidity also improves, but it becomes more prone to vibration.Please change the set value from low to high while confirming the action.

2. Because the control gain is updated when it stops, if the motor does not stop and the gain is extremely low or continuous input of commands in the same direction, changing Pr0.03 "Real time automatic adjustment of mechanical rigidity setting" will result in a situation where the change cannot be reflected.In this case, there may be abnormal noise or vibration based on the rigidity setting reflected after stopping.Please temporarily stop the motor when the rigidity changes, confirm that the rigidity setting has been accurately reflected, and then proceed to the next action.

serial number Pr0.04	name	Inertia ratio			Effective method	Effective immediately	data range	0~20000
	Modbus address	0x3008	unit	%	Related modes	ALL	factory settings	250

Set the first inertia ratio.

Set the ratio of the load inertia to the rotor inertia of the motor.

$$\boxed{Pr0.04=(\text{load inertia}/\text{rotor inertia}) \times 100\ \text{"\%"}}$$

When the real-time automatic adjustment is effective, the inertia ratio is estimated in real-time and saved in EEPROM approximately every 30 minutes.

Note:

The setting unit for Pr1.01 and Pr1.06 is (Hz) when the inertia ratio is set correctly.When the inertia ratio of Pr0.04 is larger than the actual value, the setting unit of the speed loop gain will increase. When the inertia ratio of Pr0.04 is smaller than the actual value, the setting unit of the speed loop gain will decrease.

serial number Pr0.05*	name	Instruction pulse input selection			Effective method	Power on again	data range	0~2
	Modbus address	0x300A	unit	-	Related modes	ALL	factory settings	0

Ω 6-DP does not support differential input, simply select 0

set value	content	Interface PIN NO	Signal name
0	Optocoupler input Corresponding to two types of long line drive/open collector Long line drive (maximum allowable input frequency: 500kpps) Open collector (maximum allowable input frequency: 200kpps)	Refer to the hardware wiring diagram	OPC1 PULS1 PULS2 OPC2 SIGN1 SIGN2
1	Long line drive dedicated input Long term drive (maximum allowed input frequency: 4Mpps)	Refer to the hardware wiring diagram	PULSH1 PULSH2 SIGNH1 SIGNH2
2	Optocoupler input Open collector (maximum allowable input frequency: 200kpps)	Refer to the hardware wiring diagram	OPC1 PULS1 PULS2 OPC2 SIGN1 SIGN2

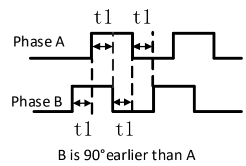
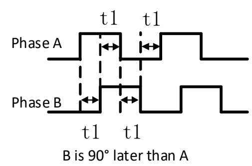
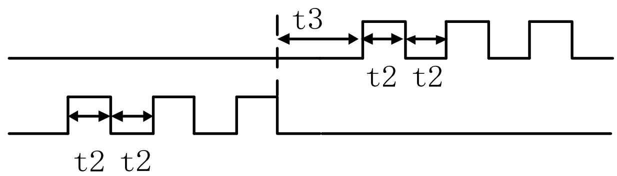
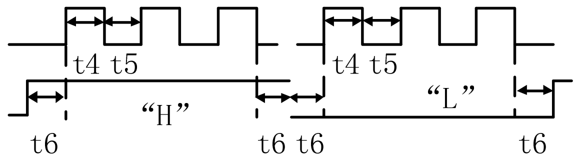
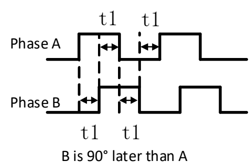
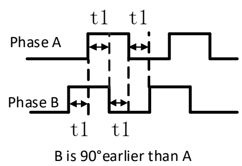
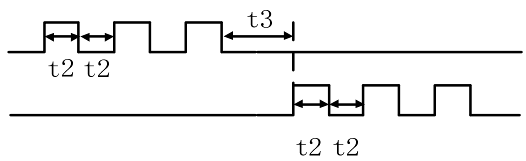
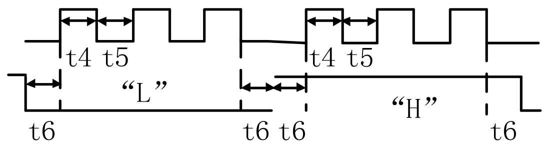
serial number Pr0.06*	name	Command pulse Rotation direction setting			Effective method	Power on again	data range	0~1
	Modbus address	0x300C	unit	-	Related modes	P	factory settings	0
serial number Pr0.07*	name	Command pulse input mode setting			Effective method	Power on again	data range	0~3
	Modbus address	0x300E	unit	-	Related modes	P	factory settings	1

The combination table of Pr0.06 "Command Pulse Rotation Direction Setting" and Pr0.07 "Command Pulse Input Mode Setting" is shown in the following figure.

Pulse counting is performed at the edge of the arrow in the table.

Input form of command pulse

.06 t value for ruction se rotation ection)	Pr0.07 (Command pulse input mode setting value)	Command pulse form	signal name	Positive direction command	Negative direction instruction

0		0 or 2	90° difference 2-phase pulse (Phase A+Phase B)	PULS SIGN		
		【1】	Square pulse train ＋ Negative direction pulse train	PULS SIGN		
		3	pulse train ＋ symbol	PULS SIGN		
1		0 or 2	90° difference 2-phase pulse (Phase A+Phase B)	PULS SIGN		
		【1】	Square pulse train ＋ Negative direction pulse train	PULS SIGN		
		3	pulse train ＋ symbol	PULS SIGN		

The instruction pulse input signal allows for the maximum input frequency and minimum necessary time width

Input I/F for PULS/IGN signals		allow input highest frequency	Minimum necessary time width (μ s)					
			t1	t2	t3	t4	t5	t6
PULSH1、2	When AB	16Mpps	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625

SIGNH1、2	phase input, after 4 harmonics							
	Except for AB phase input	4Mpps	0.25	0.125	0.125	0.125	0.125	0.125
PULSH1、2 SIGNH1、2	line driver interface	500kpps	2	1	1	1	1	0.5
	open collector interface	200kpps	5	2.5	2.5	2.5	2.5	2.5
Please control the start and end time of the instruction pulse input signal to be below 0.1 μ s. When the parameter Pr0.07=0 or 2, if the parameter Pr0.08=10000, the 2-phase pulse will rotate once when 2500 pulses are input respectively. When parameter Pr0.07=1 or 3, if parameter Pr0.08=10000, because only one of PULS and SIGN is a pulse, it will run once by inputting 10000 pulses.								

serial number Pr0.08*	name	The motor rotates once per revolution The number of instruction pulses			Effective method	Power on again	data range	0~16777216
	Modbus address	0x3010	unit	pluse	Related modes	P	factory settings	10000
Set the command pulse for each rotation of the motor. When this setting value is 0, Pr0.09 "first instruction multiplier numerator" and Pr0.10 "instruction multiplier denominator" are valid.								

serial number Pr0.09*	name	The first instruction component Frequency doubling molecule			Effective method	Power on again	data range	0~230
	Modbus address	0x3012	unit	-	Related modes	P	factory settings	0
The molecule that sets the instruction pulse input for frequency division processing, namely the electronic gear ratio molecule. Pr0.08 is valid when the number of command pulses per revolution of the motor is 0.								

serial number Pr0.10*	name	Instruction multiplier denominator			Effective method	Power on again	data range	1~230
	Modbus address	0x3014	unit	-	Related modes	P	factory settings	10000

Set the denominator of the instruction pulse input multiplication processing, which is the denominator of the electronic gear ratio. Pr0.08 is valid when the number of command pulses per revolution of the motor is 0.

The relationship between Pr0.08, Pr0.09, and Pr0.10 during position control

Pr0.08	Pr0.09	Pr0.10	Instruction division frequency processing
1~8388608	— (No impact)	— (No impact)	Command Pulse Input → $\frac{\text{Encoder Resolution}}{\text{Pr0.08 Setting Value}}$ → Position Command Unrelated to the settings of Pr0.09 and 0.10, the above figure is processed based on the set value of Pr0.08.
0	0	1~1073741824	Command Pulse Input → $\frac{\text{Encoder Resolution}}{\text{Pr0.10 Setting Value}}$ → Position Command When both Pr0.08 and Pr0.09 are 0, perform the above graph processing based on the set value of Pr0.10.
	1~1073741824	1~1073741824	Command Pulse Input → $\frac{\text{Pr0.09 Setting Value}}{\text{Pr0.10 Setting Value}}$ → Position Command When Pr0.08 is 0 and Pr0.09 ≠ 0, perform the above graph processing based on the set values of Pr0.09 and 0.10.

TIPS Note:

Although the values of the denominator and numerator can be set to any value, their action cannot be guaranteed when extreme division or multiplication ratios are set.Please select a frequency division/multiplication ratio range between 1/1000 and 8000 times.

serial number Pr0.11*	name	The motor outputs the number of pulses per revolution			Effective method	Power on again	data range	1~2097152
	Modbus address	0x3016	unit	P/r	Related modes	ALL	factory settings	2500
Set the pulse output resolution based on the number of output pulses for each rotation of OA and OB.								
serial number Pr0.13	name	First torque limit			Effective method	Effective immediately	data range	0~500
	Modbus address	0x301A	unit	%	Related modes	ALL	factory settings	350

Set the first limit value for the output torque of the motor.

serial number Pr0.14	name	Setting for excessive positional deviation			Effective method	Effective immediately	data range	1~1073741824
	Modbus address	0x301C	unit	Instruction unit	Related modes	P	factory settings	100000
Set the position deviation range to be too large through the instruction unit (at the factory). Change the setting unit to encoder unit through Pr5.20 (position setting unit selection).In this case, please set the position control to the number of encoder feedback pulses. When this parameter is 0, Err24.0 (position deviation protection) is invalid. Notice: For instructions on "instruction unit" and "encoder unit", please refer to parameter "Pr5.20". This position deviation compares the filtered position instruction with the actual position feedback deviation. This parameter is valid for position control in the upper computer software.								

serial number Pr0.15*	name	Absolute encoder setting			Effective method	Power on again	data range	0~4
	Modbus address	0x301E	unit	-	Related modes	ALL	factory settings	1

Set the usage method for absolute encoders.

set value	function
0	Used as an absolute encoder
【 1 】	Used as an incremental encoder
2	Used as an absolute encoder, but can ignore multi turn count overflow
3	Manufacturer's use (do not set)
4	When the motor operates in multiple stages, it is used in absolute position mode, with positive, negative, and shortest paths

Pr0.15=1 is used as an incremental encoder (the following protection functions are detected as invalid: Er40.0 absolute system shutdown protection;Er41.0 absolute counter overflow protection;Er45.0 Absolute Multi Loop Counter Protection

Pr0.15=When the motor is running in multiple stages, it is used in absolute position mode, positive, negative, and shortest path;For detailed instructions, please refer to the "Multi level Control Mode"

serial number Pr0.13	name	First torque limit			Effective method	Effective immediately	data range	0~500
	EtherCAT address	-	unit	%	Related modes	ALL	factory settings	350
Set the first limit value for the output torque of the motor.								

serial number Pr0.14	name	Setting for excessive positional deviation			Effective method	Effective immediately	data range	1~1073741824
	EtherCAT	-	unit	Instruction	Related	P	factory	100000

	address			unit	modes		settings	

Set the position deviation range to be too large through the instruction unit (at the factory).
Change the setting unit to encoder unit through Pr5.20 (position setting unit selection).In this case, please set the position control to the number of encoder feedback pulses.
When this parameter is 0, Err24.0 (position deviation protection) is invalid.
Notice: For instructions on "instruction unit" and "encoder unit", please refer to parameter "Pr5.20". This position deviation compares the filtered position instruction with the actual position feedback deviation.

serial number Pr0.15*	name	Absolute encoder setting			Effective method	Power on again	data range	0~4
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	1

Set the usage method for absolute encoders.

set value	function
0	Used as an absolute encoder
【 1 】	Used as an incremental encoder
2	Used as an absolute encoder, but can ignore multi turn count overflow
3	Manufacturer's use (do not set)
4	When the motor operates in multiple stages, it is used in absolute position mode, with positive, negative, and shortest paths

Pr0.15 = 4， For special use during motor multi-stage operation, EtherCAT bus servo does not support multi-stage operation. Please do not set this parameter to 4.

serial number Pr0.16*	name	Manufacturer's use			Effective method	Power on again	data range	0~3
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	3

Do not set

serial number Pr0.17*	name	Manufacturer's use			Effective method	Power on again	data range	0~4
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	0

Do not set

serial number Pr0.18*	name	Manufacturer's use			Effective method	Power on again	data range	0~2
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	0

Do not set

10.2 Pr01 group parameters

serial number Pr1.00	name	Position 1 loop gain			Effective method	Effective immediately	data range	0~30000
	EtherCAT address	-	unit	0.1/s	Related modes	P	factory settings	480
Determine the responsiveness of the position control system. Increasing the position loop gain can shorten the positioning time.However, please note that setting too high a value can cause vibration.								

serial number Pr1.01	name	1st speed loop gain			Effective method	Effective immediately	data range	1~32767
	EtherCAT address	-	unit	0.1Hz	Related modes	ALL	factory settings	270
Determine the responsiveness of the speed loop. In order to improve the position loop gain and enhance the overall responsiveness of the servo system, it is necessary to increase the speed loop gain value.However, please note Setting the value too high can cause vibration. Note: When the inertia ratio of Pr0.04 is set correctly, the setting unit of Pr1.01 is Hz.								

serial number Pr1.02	name	Integration time constant of the first speed loop			Effective method	Effective immediately	data range	1~10000
	EtherCAT address	-	unit	0.1ms	Related modes	ALL	factory settings	210
Set the integration time constant for the speed loop.ms The smaller the set value, the faster the deviation approaches zero when stopping. If set to "10000", there will be no integration effect.								

serial number Pr1.03	name	First speed detection filter			Effective method	Effective immediately	data range	0~2500
	EtherCAT address	-	unit	0.01ms	Related modes	ALL	factory settings	10
The time constant of the speed feedback low-pass filter (LPF) can be set. The larger the set value, the larger the time constant. Although it can reduce motor noise, the responsiveness will also decrease.								

serial number	name	The first torque filter	Effective method	Effective immediately	data range	0~2500

Pr1.04	EtherCAT address	-	unit	0.01ms	Related modes	ALL	factory settings	40
Set the time constant of the delay filter that has been added to the torque command section. Can suppress vibrations caused by torsional resonance.								

serial number Pr1.05	name	2nd position loop gain			Effective method	Effective immediately	data range	0~30000
	EtherCAT address	-	unit	0.1/s	Related modes	P	factory settings	480
Determine the responsiveness of the position control system. Increasing the position loop gain can shorten the positioning time.However, please note that setting too high a value can cause vibration.								

serial number Pr1.06	name	Second speed loop gain			Effective method	Effective immediately	data range	1~32767
	EtherCAT address	-	unit	0.1Hz	Related modes	ALL	factory settings	270
Determine the responsiveness of the speed loop. In order to improve the position loop gain and enhance the overall responsiveness of the servo system, it is necessary to increase the speed loop gain value.However, please note Setting the value too high can cause vibration. Note: When the inertia ratio of Pr0.04 is set correctly, the setting unit of Pr1.01 is Hz.								

serial number Pr1.07	name	Integration time constant of the second speed loop			Effective method	Effective immediately	data range	1~10000
	EtherCAT address	-	unit	0.1ms	Related modes	ALL	factory settings	210
Set the integration time constant for the speed loop. The smaller the set value, the faster the deviation approaches zero when stopping. If set to "10000", there will be no integration effect.								

serial number Pr1.08	name	Second speed detection filter			Effective method	Effective immediately	data range	0~2500
	EtherCAT address	-	unit	0.01ms	Related modes	ALL	factory settings	10
The time constant of the speed feedback low-pass filter (LPF) can be set. If the set value is large, the time constant will also be large. Although it can reduce motor noise, the responsiveness will also decrease.								

serial number	name	Time constant of the second torque filter	Effective method	Effective immediately	data range	0~2500

Pr1.09	EtherCAT address	-	unit	0.01ms	Related modes	ALL	factory settings	40
Set the time constant of the delay filter that has been added to the torque command section. Can suppress vibrations caused by torsional resonance.								

serial number Pr1.10	name	Speed feedforward gain			Effective method	Effective immediately	data range	0~4000
	EtherCAT address	-	unit	0.1%	Related modes	P/F	factory settings	1000
The value obtained by multiplying the ratio of the calculated speed command in the internal position command with this parameter is added to the speed command from the position control processing.								

serial number Pr1.11	name	Speed feedforward filter			Effective method	Effective immediately	data range	0~6400
	EtherCAT address	-	unit	0.01ms	Related modes	P	factory settings	0
Set the time constant of the first-order delay filter related to the speed feedforward input. Example of using speed feedforward When the speed feedforward filter is set to 50 (0.5 ms), gradually increase the speed feedforward gain to activate the speed feedforward.must The position deviation during the action in the speed state decreases according to the value of the speed feedforward gain as shown in the following formula. $\text{Position deviation [command unit]} = \text{Command speed [command/s]} / \text{Position loop gain [1/s]} * (100 - \text{Speed feedforward gain[\%]}/100$								

serial number Pr1.12	name	Torque feedforward gain			Effective method	Effective immediately	data range	0~2000
	EtherCAT address	-	unit	0.1%	Related modes	P/S	factory settings	1000
The ratio of the calculated speed command in the internal position command to this parameter is added to the speed command from the speed control processing. By increasing the torque feedforward gain, the position deviation can approach 0 during certain acceleration and deceleration. Therefore, under ideal conditions where the external torque does not move, when driving in the trapezoidal speed model, the position deviation can be made close to 0 throughout the entire action interval.								

serial number Pr1.13	name	Torque feedforward filter			Effective method	Effective immediately	data range	0~6400
	EtherCAT address	-	unit	0.01ms	Related modes	P/S	factory settings	100

Due to the involvement of torque feedforward input, a time constant for the delay filter needs to be set once. When the torque feedforward filter is set to 50 (0.5ms), gradually increase the speed feedforward gain to activate the torque feedforward.

<Example of using torque feedforward>

The use of torque feedforward requires the correct setting of inertia ratio.

By gradually increasing the torque feedforward gain while setting the torque feedforward filter to around 50 (0.5ms), the torque feedforward becomes effective.

By increasing the torque feedforward gain, the position deviation can approach 0 during certain acceleration and deceleration. Therefore, under ideal conditions where the external disturbance torque does not act, when driving under the trapezoidal speed model, the position deviation can be made close to 0 throughout the entire action interval.

Note:

In fact, there will definitely be external interference torque, so the position deviation cannot be zero.

In addition, like speed feedforward, although the larger the constant of the torque feedforward filter, the smaller the action sound, the greater the positional deviation of the acceleration change point.

<table>
<tr><td rowspan="2">serial number Pr1.14</td><td>name</td><td colspan="3">2nd gain setting</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~1</td></tr>
<tr><td>EtherCAT address</td><td>-</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>1</td></tr>
</table>

Use the gain switching function to set the optimal adjustment.

set value	Gain selection and switching
0	According to the first fixed and gain switching input (GAIN), switch the speed loop action to PI action/P action. GAIN input optocoupler OFF → PI action GAIN input optocoupler ON → P action * When the logic setting of the above GAIN input is normally open.When set to normally closed, OFF/ON is the opposite.
【 1 】	The gain switching between the first gain (Pr1.00~Pr1.04) and the second gain (Pr1.05~Pr1.09) is effective.

Related page: For the switching conditions between the first fixed gain and the second gain, please refer to the adjustment section "Gain Switching Function".

serial number Pr1.15	name	Position control switching mode			Effective method	Effective immediately	data range	0~10
	EtherCAT address	3115h-00h	unit	-	Related modes	P	factory settings	0

Set the triggering conditions for gain switching during position control.

set value	switching condition	Gain switching conditions
0	Fixed to the first gain	Fixed to the first gain (Pr1.00~Pr1.04)
1	Fixed to the second gain	Fixed to the second gain (Pr1.05~Pr1.09).
3	Large torque command	• When the absolute value of the torque command exceeds (level+hysteresis) [%] in the previous first gain, it transitions to the second gain. • When the absolute value of the torque command in the previous second gain is less than (level hysteresis) [%] during the delay time, it returns to the first gain.
5	High speed command	• Effective during position control. • When the absolute value of the speed command exceeds (level+hysteresis) [r/min] in the previous first gain, it transitions to the second gain. • In the previous second gain, if the absolute value of the speed command is less than (level hysteresis) [r/min] and continues during the delay time, it returns to the first gain.
6	Large positional deviation	• Effective during position control. • When the absolute value of the position deviation exceeds (level+hysteresis) [pulse] in the previous first gain, it transitions to the second gain. • In the previous second gain, if the absolute value of the position deviation is less than (level delay) [pulse] and persists during the delay time, it returns to the first gain. The unit of level and delay [pulse] is set using the encoder resolution during position control.
7	There is a location command	• Effective during position control. • If the position instruction is not 0 in the previous first gain, it will be transferred to the second gain. • In the previous second gain, if the state of the position instruction being 0 persists during the delay time, it returns to the first gain.
8	Positioning not yet completed	• Effective during position control. • If the positioning is not completed in the previous first gain, transfer to the second gain.

			• When the positioning completion state persists during the delay time in the previous second gain, it returns to the first gain.
	9	Actual speed is high	• Effective during position control. • When the absolute value of the actual speed exceeds (level+hysteresis) [r/min] in the previous first gain, it transitions to the second gain. • In the previous second gain, if the absolute value of the actual speed is less than (level hysteresis) [r/min] during the delay time, it returns to the first gain.
	10	Position command+ actual speed	• Effective during position control. • If the position instruction is not 0 in the previous first gain, it will be transferred to the second gain. • In the previous second gain, when the state of position instruction being 0 persists during the delay time and the absolute value of the actual speed is less than (level hysteresis) [r/min], it returns to the first gain.

serial number Pr1.16	name	Delay time for switching position control			Effective method	Effective immediately	data range	0~10000
	EtherCAT address	-	unit	0.1ms	Related modes	P	factory settings	accessibility
When controlling the position, if Pr1.15 (position control switching mode) is 3, 5~10, when switching from the second gain to the first gain, set the time from triggering detection to actual gain switching.								

serial number Pr1.17	name	Position control switching level			Effective method	Effective immediately	data range	0~20000
	EtherCAT address	-	unit	-	Related modes	P	factory settings	0
When controlling the position, if Pr1.15 (position control switching mode) is set to 3, 5, 6, 9, or 10, set the trigger judgment level. The unit varies depending on the switching mode settings. Attention: Please set the level ≥ hysteresis.								

serial number Pr1.18	name	Delay during position control switching			Effective method	Effective immediately	data range	0~20000
	EtherCAT address	-	unit	-	Related modes	P	factory settings	0
When controlling the position, if Pr1.15 (position control switching mode) is set to 3, 5, 6, 9, or 10, set the delay for triggering the judgment. The unit varies depending on the switching mode settings. Note:								

When the level is less than hysteresis, reset hysteresis=level internally.

serial number Pr1.19	name	Position gain switching time			Effective method	Effective immediately	data range	0~10000
	EtherCAT address	-	unit	0.1ms	Related modes	P	factory settings	10

When controlling the position, if the difference between Pr1.00 (first position loop gain) and Pr1.05 (second position loop gain) is large, the rapid increase in position loop gain can be suppressed.

When the position loop gain increases, the time gain changes after the set value.

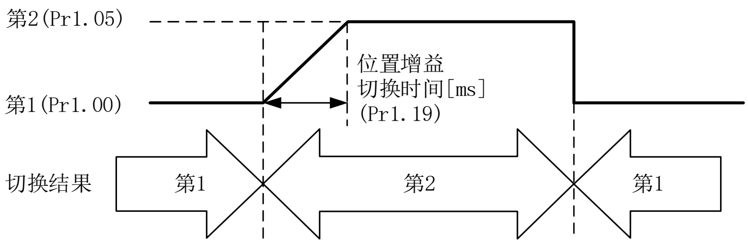
Regarding the Switching Time of Position Gain

During position control, in order to mitigate torque fluctuations and vibrations caused by rapid changes in position loop gain during gain switching, Pr1.19 "Position Gain Switching Time" is set to increase the position loop gain, which can slow down gain changes during switching and reduce vibrations.

Note:

When switching due to a decrease in position loop gain, it is not related to the setting of this parameter and should be switched immediately.

For example, in the case where the first (Pr1.00) is greater than the second (Pr1.05)



serial number Pr1.20	name	Pdff control gain			Effective method	Effective immediately	data range	100~1500
	EtherCAT address	-	unit	0.1%	Related modes	ALL	factory settings	1000

Set the pdff gain percentage.

Introducing differential feedforward control to solve the problem of poor DC stiffness in PI control, and appropriately setting the PDFF gain is beneficial for suppressing overshoot.

serial number Pr1.21	name	External deduction gain			Effective method	Effective immediately	data range	0~1500
	EtherCAT address	-	unit	0.1%	Related modes	ALL	factory settings	0

Pseudo differential feedback control gain, default 0%.

10.3 Pr02 group parameters

serial number Pr2.00	name	Adaptive filter mode setting			Effective method	Effective immediately	data range	0~6
	EtherCAT address	-	unit	-	Related modes	P/S	factory settings	1

Set the resonance frequency estimated by the adaptive filter and the estimated action.

set value	content	
0	Adaptive Filter: Invalid	The associated parameters of the third and fourth filters remain at their current values
【1】	Adaptive filter: 1 effective	One adaptive filter is effective, and the associated parameters of the third notch filter are updated based on the adaptation result
2	Adaptive filters: 2 effective	Two adaptive filters are effective, and the associated parameters of the third and fourth notch filters are updated based on the adaptation results
3	Resonance frequency measurement mode	Measure the resonance frequency, and the measurement results can be confirmed by the upper computer. The associated parameters of the third and fourth notch filters remain at their current values
4	Adaptation result clearance	The associated parameters of the third and fourth notch filters are invalid, and the adaptation results are cleared
5	Manufacturer's use	Do not set
6	Manufacturer's use	Do not set

serial number Pr2.01	name	First notch frequency			Effective method	Effective immediately	data range	50~5000
	EtherCAT address	-	unit	Hz	Related modes	ALL	factory settings	5000

Set the center frequency of the first notch filter.

Note: When the set value is 5000, the function of the notch filter is invalid.

serial number Pr2.02	name	Selection of the first notch width			Effective method	Effective immediately	data range	0~20
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	2

Set the frequency width of the first notch filter.

Note: The larger the set value, the wider the notch width.Generally, please use the factory settings.

<table>
<tr><td rowspan="2">serial number Pr2.03</td><td>name</td><td colspan="3">Selection of the first notch depth</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~99</td></tr>
<tr><td>EtherCAT address</td><td>-</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set the frequency depth of the first notch filter.
Note: The larger the set value, the shallower the notch depth.The phase delay decreases.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr2.04</td><td>name</td><td colspan="3">Second notch frequency</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>50~5000</td></tr>
<tr><td>EtherCAT address</td><td>-</td><td>unit</td><td>Hz</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>5000</td></tr>
<tr><td colspan="9">Set the center frequency of the second notch filter.
Note: When the set value is 5000, the function of the notch filter is invalid.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr2.05</td><td>name</td><td colspan="3">Selection of the second notch width</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~20</td></tr>
<tr><td>EtherCAT address</td><td>-</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>2</td></tr>
<tr><td colspan="9">Set the frequency width of the second notch filter.
Note: The larger the set value, the wider the notch width.Generally, please use the factory settings.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr2.06</td><td>name</td><td colspan="3">Selection of the second notch depth</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~99</td></tr>
<tr><td>EtherCAT address</td><td>-</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set the frequency depth of the second notch filter.
Note: The larger the set value, the shallower the notch depth.The phase delay decreases.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr2.07</td><td>name</td><td colspan="3">3rd notch frequency</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>50~5000</td></tr>
<tr><td>EtherCAT address</td><td>-</td><td>unit</td><td>Hz</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>5000</td></tr>
<tr><td colspan="9">Automatically set the first resonant frequency inferred by the adaptive filter.
Attention: If the resonance point cannot be found, please set it to 5000.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr2.08</td><td>name</td><td colspan="3">Selection of the third notch width</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~20</td></tr>
<tr><td>EtherCAT address</td><td>-</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>2</td></tr>
<tr><td colspan="9">Set the frequency width of the third notch filter.
Note: The larger the set value, the wider the notch width.Generally, please use the factory settings.</td></tr>
</table>

When using the adaptive filter function, the parameter values are automatically set.

serial number Pr2.09	name	Selection of the third notch width			Effective method	Effective immediately	data range	0~99
	Modbus address	0x3212	unit	-	Related modes	ALL	factory settings	0
Set the frequency depth of the third notch filter. Note: The larger the set value, the shallower the notch depth.The phase delay decreases. When using the adaptive filter function, the parameter values are automatically set.								

serial number Pr2.10	name	4th notch frequency			Effective method	Effective immediately	data range	50~5000
	EtherCAT address	-	unit	Hz	Related modes	ALL	factory settings	5000
Automatically set the second resonant frequency inferred by the adaptive filter. Attention: If the resonance point cannot be found, please set it to 5000.								

serial number Pr2.11	name	Selection of 4th notch width			Effective method	Effective immediately	data range	0~20
	Modbus address	0x3216	unit	-	Related modes	ALL	factory settings	2
Set the frequency width of the fourth notch filter. Note: The larger the set value, the wider the notch width.Generally, please use the factory settings. When using the adaptive filter function, the parameter values are automatically set.								

serial number Pr2.12	name	Selection of the fourth notch depth			Effective method	Effective immediately	data range	0~99
	Modbus address	0x3218	unit	-	Related modes	ALL	factory settings	0
Set the frequency depth of the fourth notch filter. Note: The larger the set value, the shallower the notch depth.The phase delay decreases. When using the adaptive filter function, the parameter values are automatically set.								

serial number Pr2.13	name	Vibration control filter Switch Selection			Effective method	Effective immediately	data range	0~6
	Modbus address	0x321A	unit	-	Related modes	P	factory settings	0
Set the switching method for the 4-channel filters in vibration control. When the set value is 0: use the 1st and 2nd damping filters								

When the setting value is 1-2: switch through external inputs (VS-SEL1, VS-SEL2)

set value	VS-SEL1	VS-SEL2	The first vibration control	Second vibration control	The third vibration control	4th vibration control
0	-	-	O	O		
1	-	OFF	O		O	
	-	ON		O		O
2	OFF	OFF	O			
	OFF	ON		O		
	ON	OFF			O	
	ON	ON				O

When the setting value is 3: switch according to the instruction direction

set value	Position instruction direction	The first vibration control	Second vibration control	The third vibration control	4th vibration control
3	positive direction	O		O	
	negative direction		O		O

When the setting value is between 4 and 6: switch between effective/ineffective control mode through 2 degrees of freedom

Position control (2 degrees of freedom control ineffective)

set value	VS-SEL1	The first vibration control	Second vibration control	The third vibration control	4th vibration control
4	-	O	O	O	
5. 6	Same as the set value of 0, the 1st and 2nd dampers are effective				

Position control (2 degrees of freedom control effective)

set value	VS-SEL1	The first vibration control	Second vibration control
4	-	O	O
5	OFF	O	
	ON		O

set value	Position instruction direction	The first vibration control	Second vibration control
6	positive direction	O	
	negative direction		O

Attention: The switching of vibration control is executed every 0.1ms during the positioning completion output when the instruction pulse transitions from 0 state to non-zero instruction.

When the damping frequency is low, if the positioning completion range is large, there will be accumulated

pulse residue after performing damping, and the switch will quickly return to the original position, so the motor speed may run higher than the current command speed.

serial number Pr2.14	name	The first damping frequency			Effective method	Effective immediately	data range	0~3000
	Modbus address	0x321C	unit	0.1Hz	Related modes	P	factory settings	0
Set the first frequency of vibration control for mechanical end shaking, calibrated in units of 0.1Hz. The effective frequency range is 0.1~300Hz. Please refer to [End Vibration Suppression] when using.								

serial number Pr2.15	name	The first damping coefficient			Effective method	Effective immediately	data range	1~999
	Modbus address	0x321E	unit	0.001	Related modes	P	factory settings	30
Set the damping coefficient of the first damping control for mechanical end shaking, calibrated at 0.001. The effective range of damping coefficient is 0.001~0.999, and the larger the damping ratio, the stronger the effect. Please refer to [End Vibration Suppression] when using.								

serial number Pr2.16	name	Second damping frequency			Effective method	Effective immediately	data range	0~3000
	Modbus address	0x3220	unit	0.1Hz	Related modes	P	factory settings	0
Set the second frequency of vibration control for mechanical end shaking, calibrated in units of 0.1Hz. The effective frequency range is 0.1~300Hz. Please refer to [End Vibration Suppression] when using.								

serial number Pr2.17	name	2nd damping coefficient			Effective method	Effective immediately	data range	1~999
	Modbus address	0x3222	unit	0.001	Related modes	P	factory settings	30
Set the damping coefficient of the second damping control for mechanical end shaking, calibrated at 0.001. The effective range of damping coefficient is 0.001~0.999, and the larger the damping ratio, the stronger the effect. Please refer to [End Vibration Suppression] when using.								

serial number Pr2.18	name	The third damping frequency			Effective method	Effective immediately	data range	0~3000
	Modbus address	0x3224	unit	0.1Hz	Related modes	P	factory settings	0

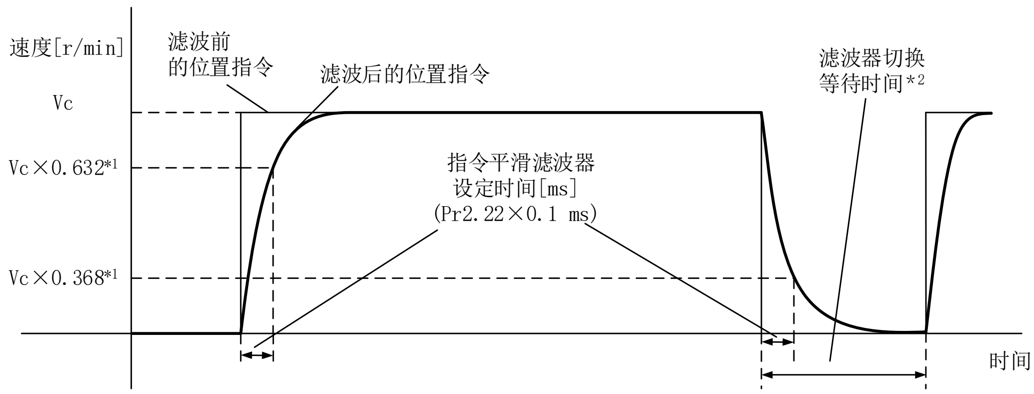
Set the third frequency of vibration control for mechanical end shaking, calibrated in units of 0.1Hz.
The effective frequency range is 0.1~300Hz.
Please refer to [End Vibration Suppression] when using.

<table>
<tr><td rowspan="2">serial number Pr2.19</td><td>name</td><td colspan="3">3rd damping coefficient</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>1~999</td></tr>
<tr><td>Modbus address</td><td>0x3226</td><td>unit</td><td>0.001</td><td>Related modes</td><td>P</td><td>factory settings</td><td>30</td></tr>
<tr><td colspan="9">Set the damping coefficient of the third damping control for mechanical end shaking, calibrated at 0.001.
The effective range of damping coefficient is 0.001~0.999, and the larger the damping ratio, the stronger the effect.
Please refer to [End Vibration Suppression] when using.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr2.20</td><td>name</td><td colspan="3">4th damping frequency</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~3000</td></tr>
<tr><td>Modbus address</td><td>0x3228</td><td>unit</td><td>0.1Hz</td><td>Related modes</td><td>P</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set the fourth frequency of vibration control for mechanical end shaking, calibrated in units of 0.1Hz.
The effective frequency range is 0.1~300Hz.
Please refer to [End Vibration Suppression] when using.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr2.21</td><td>name</td><td colspan="3">4th damping coefficient</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>1~999</td></tr>
<tr><td>Modbus address</td><td>0x322A</td><td>unit</td><td>0.001</td><td>Related modes</td><td>P</td><td>factory settings</td><td>30</td></tr>
<tr><td colspan="9">Set the damping coefficient of the fourth damping control for mechanical end shaking, calibrated at 0.001.
The effective range of damping coefficient is 0.001~0.999, and the larger the damping ratio, the stronger the effect.
Please refer to [End Vibration Suppression] when using.</td></tr>
</table>

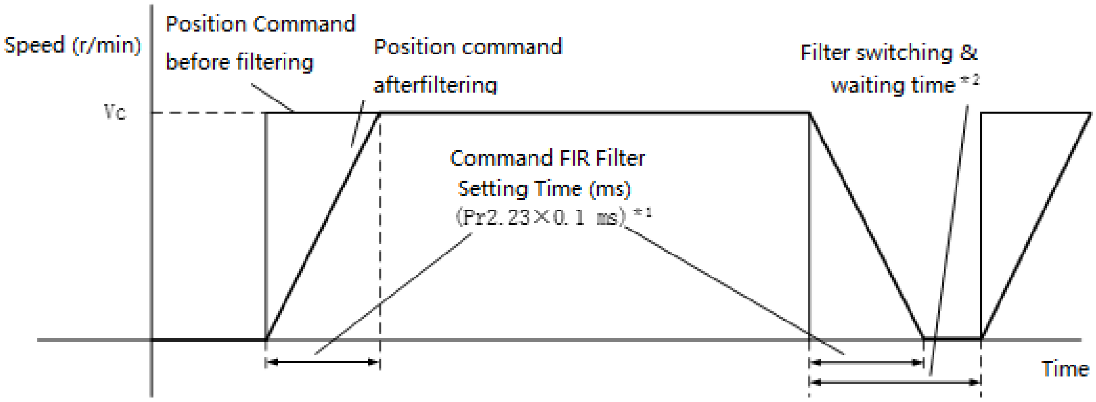
<table>
<tr><td rowspan="2">serial number Pr2.22</td><td>name</td><td colspan="3">Instruction smoothing filter</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~10000</td></tr>
<tr><td>Modbus address</td><td>0x322C</td><td>unit</td><td>0.1ms</td><td>Related modes</td><td>P/S/F</td><td>factory settings</td><td>92</td></tr>
<tr><td colspan="9">During position control
Set the time constant of the first-order delay filter corresponding to the position instruction.
1. The actual filter constant for (set value x 0.1ms) has a maximum absolute error of 0.4ms if it is less than 100ms, and a maximum relative error of 0.2% if it exceeds 20ms.</td></tr>
</table>



2. The switching of Pr2.22 "instruction smoothing filter" is performed when the instruction pulse transitions from 0 state to a state other than 0 at regular intervals (0.1 ms) during the positioning completion output.
If the filtering time constant is small and the positioning completion range is large, there will be accumulated pulse residues in the filter at the above time (the difference between the position command before filtering and the position command after filtering, and the area is calculated by time integration). After switching, it will quickly return to its original position, so the motor will operate at a higher speed than the previous command. Please note.
3. Change Pr2.22 "Instruction Smoothing Filter" until it is suitable for situations where internal calculations may experience delays. During this period, there is a possibility that the change will be retained when the switching time reaches * 2.
When in the 2-degree-of-freedom control mode (Pr6.47 bit0=1), Pr2.22 is the time constant of the 2-degree-of-freedom instruction response filter.The maximum value is limited to 2000 (=200.0 ms)

serial number Pr2.23	name	Instruction FIR filter			Effective method	Effective immediately	data range	0~10000
	Modbus address	0x322E	unit	0.1ms	Related modes	P	factory settings	10

During position control
Set the FIR filter time constant for the corresponding instruction.
During speed control
When in 2-degree-of-freedom control mode (P6.47 bit0=1), set the corresponding FIR filter time constant.
Set the arrival time of Vc according to the square wave command corresponding to the target speed Vc, as shown in the following figure.



For the actual moving average time (set value x 0.1 ms), if it is less than 10 ms, the maximum absolute error is 0.2 ms, and if it exceeds 10 ms, the maximum relative error is 1.6%.

2. Please make the Pr2.23 "Instruction FIR Filter" change after the instruction pulse has stopped, that is, after the filter waiting for switching time.When the waiting switching time of the filter is below 10 ms, it is (set value x 0.1 ms+0.25 ms), and when it is above 10 ms, it is (set value x 0.1 ms x 1.05).When changing Pr2.23 'Instruction FIR Filter' during instruction pulse input, the change content cannot be immediately reflected, and the subsequent no instruction pulse state is updated after the filter waiting for switching time to continue.

3. Starting from changing Pr2.23 "Instruction FIR Filter" until it is applicable to situations where internal calculations may experience delays, there is a possibility that the change will be retained at the switching time of * 2 during this period.

serial number Pr2.24	name	5th notch frequency			Effective method	Effective immediately	data range	50~5000
	Modbus address	0x3230	unit	Hz	Related modes	ALL	factory settings	5000

Set the center frequency of the 5th notch filter.
Note: When the set value is 5000, the function of the notch filter is invalid.

serial number Pr2.25	name	Selection of the 5th notch width			Effective method	Effective immediately	data range	0~20
	Modbus address	0x3232	unit	-	Related modes	ALL	factory settings	2

Set the frequency width of the 5th notch filter.
Note: The larger the set value, the wider the notch width.Generally, please use the factory settings.

serial number Pr2.26	name	Selection of the 5th notch depth			Effective method	Effective immediately	data range	0~99
	Modbus address	0x3234	unit	-	Related modes	ALL	factory settings	0

Set the frequency depth of the 5th notch filter.

Note: The larger the set value, the shallower the notch depth.The phase delay decreases.

serial number Pr2.27	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1000
	Modbus address	0x3236	unit	-	Related modes	P	factory settings	0
Do not set								

serial number Pr2.28	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1000
	Modbus address	0x3238	unit	-	Related modes	P	factory settings	0
Do not set								

serial number Pr2.29	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1000
	Modbus address	0x323A	unit	-	Related modes	P	factory settings	0
Do not set								

serial number Pr2.30	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1000
	Modbus address	0x323C	unit	-	Related modes	P	factory settings	0
Do not set								

10.4 Pr03 group parameters

serial number Pr3.00	name	Switching between internal and external speed settings			Effective method	Effective immediately	data range	0~3
	Modbus address	0x3300	unit	-	Related modes	S	factory settings	0
Holding an internal speed setting function that can be easily controlled with just contact input.								

set value	Speed setting method
0	Simulated Speed Command (SPR), currently does not support analog input
1	Internal speed setting from 1st speed to 4th speed (Pr3.04~Pr3.07)
2	Internal speed setting 1st to 3rd speed (Pr3.04~Pr3.06), simulated speed command (SPR)
3	Internal speed setting from 1st speed to 8th speed (Pr3.04~Pr3.11)

Pr3.00 "Speed Setting Internal and External Switching" and the Relationship between Internal Command Speed Selection 1-3 States and Speed Command Selection

set value	Internal instruction speed selection 1 (INTSPD1)	Internal instruction speed selection 2 (INTSPD2)	Internal instruction speed selection 3 (INTSPD3)	Speed command choice
1	OFF	OFF	no impact	First speed
	ON	OFF		Second speed
	OFF	ON		Third speed
	ON	ON		4th speed
2	OFF	OFF	no impact	First speed
	ON	OFF		Second speed
	OFF	ON		Third speed
	ON	ON		Simulate speed command
3	Same as' Pr3.00=1 '		OFF	1st to 4th speed
	OFF	OFF	ON	5th speed
	ON	OFF	ON	6th speed
	OFF	ON	ON	7th speed
	ON	ON	ON	8th speed

serial number Pr3.01	name	Speed command direction Specify selection			Effective method	Effective immediately	data range	0~1
	Modbus address	0x3302	unit	-	Related modes	S	factory settings	0

The method for specifying the positive/negative direction of the speed command.

set value	Internal speed setting value (1st speed to 8th speed)	Speed command symbol selection (VC-SIGN)	Speed command direction
0	+	no impact	positive direction
	-	no impact	negative direction
1	Symbols have no impact	OFF	positive direction
	Symbols have no impact	ON	negative direction

serial number Pr3.02	name	Speed command input gain			Effective method	Effective immediately	data range	10~2000
	Modbus address	0x3304	unit	(rpm)/V	Related modes	S/T	factory settings	500

Set the transformation gain from the voltage applied to the simulated speed command (SPR) to the motor command speed.

Note:

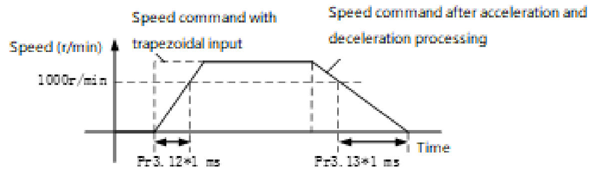
Analog speed input is currently not supported, and this parameter setting is invalid.

serial number Pr3.03	name	Speed command Input inversion			Effective method	Effective immediately	data range	0~1
	Modbus address	0x3306	unit	-	Related modes	S	factory settings	1
Set the polarity of the voltage applied to the simulated speed command (SPR). Note: Analog speed input is currently not supported, and this parameter setting is invalid.								

serial number Pr3.04~ Pr3.11	name	Speed setting first speed ~Speed setting 8th speed			Effective method	Effective immediately	data range	-20000~ 20000
	Modbus address	0x3308/0xC002 ~0x3316/0xC010	unit	rpm	Related modes	S	factory settings	0
Set the 1st to 8th speeds of the internal command speed.								

serial number Pr3.12	name	Acceleration time setting			Effective method	Effective immediately	data range	1~1000000
	Modbus address	0x3318 /0xC100	unit	ms/ krpm	Related modes	S	factory settings	100

serial number Pr3.13	name	Deceleration time setting			Effective method	Effective immediately	data range	1~1000000
	Modbus address	0x331A/ 0xC102	unit	ms/ krpm	Related modes	S	factory settings	100
Set the acceleration/deceleration time for the acceleration/deceleration processing of speed command input. When the trapezoidal speed command has been input, set the time for the speed command to reach 1000r/min to Pr3.12 "Acceleration Time Setting".In addition, the time for the speed command to decrease from 1000r/min to 0r/min is set to Pr3.13 "deceleration time setting". If the target value of the speed command is Vc [r/min], the time required for acceleration and deceleration can be calculated using the following formula: Acceleration time [ms]=Vc/1000 × Pr3.12 × 1ms Deceleration time [ms]=Vc/1000 × Pr3.13 × 1ms								



Notice:

The acceleration and deceleration determination of the speed command, where the difference between the selected speed command and the speed command after acceleration and deceleration is in the same direction as the speed command after acceleration and deceleration as "acceleration" and in the negative direction as "deceleration".

This parameter is valid during software debugging on the upper computer.

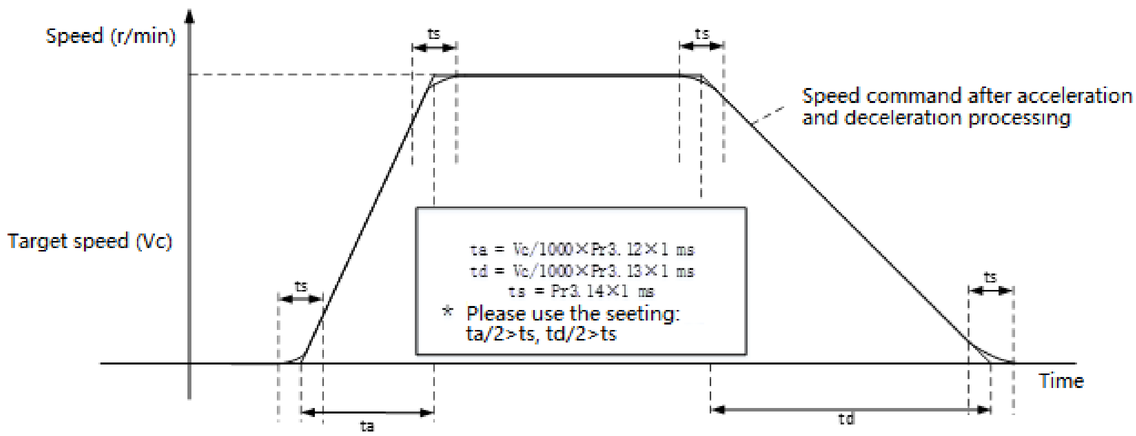
The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s ^ 2, respectively. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.

serial number Pr3.14	name	Addition and subtraction of S characters Speed setting			Effective method	Effective immediately	data range	0~1000
	Modbus address	0x331C	unit	ms	Related modes	S	factory settings	0

Set the S-shaped time for acceleration and deceleration processing of speed command input.

For the acceleration and deceleration times set in Pr3.12 "Acceleration Time Setting" and Pr3.13 "Deceleration Time Setting", the time width centered around the acceleration and deceleration inflection point is set as an S-shaped time.

This parameter is valid during speed mode debugging in the upper computer software testing mode, and is invalid in other modes.



serial number	name	Zero speed clamping function selection	Effective	Effective immediately	data range	0~3

Pr3.15					method			
	Modbus address	0x331E	unit	-	Related modes	S/T	factory settings	0

Set zero speed clamping function.

set value	Function of ZEROPD input (26 pin)
0	Invalid zero speed clamp input can be ignored.
1	When the ZEROPD input signal is ON * 1, the speed command is forcibly set to 0.
2	When the zero speed clamp (ZEROPD) input signal is ON * 1, the speed command is forcibly and the actual motor speed is one When it is lower than Pr3.16 "zero speed clamping level", switch to position control and perfor locking at this position.Switching positions The basic actions outside of the setting are the same as the set value 1.

Note: Because the factory setting is logic normally closed, the function is activated by opening the terminal (input signal is ON).Please refer to P.3-40 "Control Input".

serial number Pr3.16	name	Zero speed clamping level			Effective method	Effective immediately	data range	10~20000
	Modbus address	0x3320	unit	rpm	Related modes	S/T	factory settings	30

Set the timing for position control when switching to Pr3.15 'Zero Speed Clamping Function Selection' and setting it to 2.

serial number Pr3.17	name	Torque command selection			Effective method	Effective immediately	data range	0~2
	Modbus address	0x3322	unit	-	Related modes	T	factory settings	0

Select the input position for torque command and speed limit value.

set value	Torque command input	Speed limit input
0	Analog input 1 * 1 (AI1, resolution of 12 bits)	parameter value （Pr3.21）
1	Analog input 2 (AI2, resolution of 12 bits)	Analog Input 1 (AI1, resolution of 12 bits)
2	Analog input 1 * 1 (AI1, resolution of 12 bits)	parameter value （Pr3.21、Pr3.22）

TIPS Note:

Analog speed and torque input are currently not supported, and this parameter setting is invalid.

<table>
<tr><td rowspan="2">serial number Pr3.18</td><td>name</td><td colspan="3">Selection of torque command direction designation</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~1</td></tr>
<tr><td>Modbus address</td><td>0x3324</td><td>unit</td><td>-</td><td>Related modes</td><td>T</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">The method for specifying the positive/negative direction of torque command selection.
TIPS Note:
Analog speed and torque input are currently not supported, and this parameter setting is invalid.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr3.19</td><td>name</td><td colspan="3">Torque command input gain</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>10~100</td></tr>
<tr><td>Modbus address</td><td>0x3326</td><td>unit</td><td>0.1V/100%</td><td>Related modes</td><td>T</td><td>factory settings</td><td>30</td></tr>
<tr><td colspan="9">TIPS Note:
Analog speed and torque input are currently not supported, and this parameter setting is invalid.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr3.20</td><td>name</td><td colspan="3">Reverse torque command input</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~1</td></tr>
<tr><td>Modbus address</td><td>0x3328</td><td>unit</td><td>-</td><td>Related modes</td><td>T</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set the polarity of the voltage applied to the simulation command (TRQR).
TIPS Note:
Analog speed and torque input are currently not supported, and this parameter setting is invalid.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr3.21</td><td>name</td><td colspan="3">Speed limit value 1</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~20000</td></tr>
<tr><td>Modbus address</td><td>0x332A</td><td>unit</td><td>rpm</td><td>Related modes</td><td>T</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set the speed limit value for torque control.
In torque control, the speed limit value is used to control it not to exceed the set speed.
The speed limit value when Pr3.17=2 is the forward direction command.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr3.22</td><td>name</td><td colspan="3">Speed limit value 2</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0
20000</td></tr>
<tr><td>Modbus address</td><td>0x332C</td><td>unit</td><td>rpm</td><td>Related modes</td><td>T</td><td>factory settings</td><td>0</td></tr>
</table>

The speed limit value when Pr3.17=2 is the negative direction command.

Pr3.17	Pr3.21	Pr3.22	Pr3.15	Zero speed clamping （ZEROSPD）	Speed limit value
0	0~20000	no impact	0	no impact	Pr3.21 set value
			1~2	OFF	Pr3.21 set value
				ON	0
2	0~20000	0~20000	0	no impact	Pr3.21 set value
					Pr3.22 set value
	0~20000	0~20000	1~2	OFF	Pr3.21 set value
					Pr3.22 set value
	0~20000	0~20000	1~2	ON	0

serial number Pr3.23*	name	Manufacturer's use			Effective method	Power on again	data range	0-6
	Modbus address	0x332E	unit	-	Related modes	F	factory settings	0

Please do not set.

serial number Pr3.24*	name	Manufacturer's use			Effective method	Power on again	data range	0-16777216
	Modbus address	0x3330	unit	-	Related modes	F	factory settings	0

serial number Pr3.25*	name	Manufacturer's use			Effective method	Power on again	data range	1-16777216
	Modbus address	0x3332	unit	-	Related modes	F	factory settings	1

Manufacturer's use

serial number Pr3.26*	name	Manufacturer's use			Effective method	Power on again	data range	0-3
	Modbus address	0x3334	unit	-	Related modes	F	factory settings	0

Manufacturer's use

serial number Pr3.27*	name	Manufacturer's use			Effective method	Power on again	data range	0-1
	Modbus	0x3336	unit	-	Related	F	factory	0

	address				modes		settings	

serial number Pr3.28*	name	Manufacturer's use			Effective method	Power on again	data range	1-134217728
	Modbus address	0x3338	unit	Instruction unit	Related modes	F	factory settings	16000
Manufacturer's use								

serial number Pr3.29*	name	Manufacturer's use			Effective method	Power on again	data range	0-100
	Modbus address	0x333A	unit	circle	Related modes	F	factory settings	0
Manufacturer's use								

10.5 Pr04 group parameters

serial number Pr4.00*	name	SI1 input selection			Effective method	Power on again	data range	0~16777215
	Modbus address	0x3400	unit	-	Related modes	ALL	factory settings	00323232h (3289650)

Set the function allocation for SI1 input.

This parameter is set using hexadecimal to represent the standard. * 5

But when inputting parameters, they need to be converted to decimal.Set each control mode in hexadecimal as shown below.

00---- **** h: Position control

00-- * * -- h: Speed control

00 * * ----------- h: Torque control

Please set the function number in the '* *' section.Please refer to the table below for the function numbers.The logical setting is also included in the function number.

signal name	symbol	Functional symbols	
		Normally Open	normally closed
Invalid	-	00h	Cannot be set
Positive direction drive prohibits input	POT	01h	81h
Negative direction drive prohibits input	NOT	02h	82h
Servo open input * 1	SRV-ON	03h	83h
Alarm Clear	A-CLR	04h	Cannot be set

	Control mode switching input * 2	C-MODE	05h	85h	
	Gain switching input	GAIN	06h	86h	
	Deviation counter reset input * 3	CL	07h	Cannot be set	
	Command pulse input prohibited * 4	INH	08h	88h	
	Torque limit switching input	TL-SEL	09h	89h	
	Vibration control switching input 1	VS-SEL1	0Ah	8Ah	
	Vibration control switching input 2	VS-SEL2	0Bh	8Bh	
	Instruction division frequency switching input 1	DIV1	0Ch	8Ch	
	Instruction division frequency switching input 2	DIV2	0Dh	8Dh	
	Internal command speed selection 1 input	INTSPD1	0Eh	8Eh	
	Internal command speed selection 2 inputs	INTSPD2	0Fh	8Fh	
	Internal command speed selection with 3 inputs	INTSPD3	10h	90h	
	Zero speed clamp input	ZEROSPD	11h	91h	
	Speed command symbol input	VC-SIGN	12h	92h	
	Torque command symbol input	TC-SIGN	13h	93h	
	Forced alarm input	E-STOP	14h	94h	
	Inertia ratio switching input	J-SEL	15h	95h	
	Dynamic brake switch input	DB_SEL	16h	96h	
	Near origin input	HOME	21h	A1h	
	Selective IO control trigger	STB	24h	A4h	
	Internal position control 0	B-SEL0	25h	A5h	
	Internal Position Control 1	B-SEL1	26h	A6h	

Internal Position Control 2	B-SEL2	27h	A7h
Internal Position Control 3	B-SEL3	28h	A8h
Internal Position Control 4	B-SEL4	29h	A9h
Return to zero and enable input	HOME-ST	30h	B0h
Probe 1	PROBE1	31h	B1h
Probe 2	PROBE2	32h	B2h
Flybeat IO Enable	P_CMP	17h	97h

Note:

1. Do not set it as a functional model other than the one listed in the table.
2. The same function cannot be assigned multiple signals.Otherwise, Err33.0 "I/F input duplicate allocation exception 1" and Err33.1 "I/F input duplicate allocation exception 2" will occur.
3. Please note that the front panel displays in decimal format.
4. It is necessary to allocate the servo connection input signal (SRV-ON).If no allocation is made, the servo cannot be started.

When using the control mode switching input (C-MODE), it is necessary to set all modes.

6. Control input pins with invalid settings do not affect the action.
7. Functions used in multiple control modes (such as servo on input, warning clearing function, etc.) must be assigned to the same pin and combined with logic.If not set correctly, Err33.0 "I/F Input Duplicate Allocation Exception 1", Err33.1 "I/F Input Duplicate Allocation Exception 2", Err33.2 "I/F Input Function Model Exception 1", Err33.3 "I/F: Input Function Model Exception 2" will occur.

serial number Pr4.01*	name	SI2 input selection			Effective method	Power on again	data range	0 00FFFFFFh
	Modbus address	0x3402	unit	-	Related modes	ALL	factory settings	00818181h (8487297)

serial number Pr4.02*	name	SI3 input selection			Effective method	Power on again	data range	0 00FFFFFFh
	Modbus address	0x3404	unit	-	Related modes	ALL	factory settings	00828282h (8553090)

serial number Pr4.03*	name	SI4 input selection			Effective method	Power on again	data range	0 00FFFFFFh
	Modbus address	0x3406	unit	-	Related modes	ALL	factory settings	00222222h （2236962）

serial number Pr4.04*	name	SI5 input selection			Effective method	Power on again	data range	0 00FFFFFFh
	Modbus address	0x3408	unit	-	Related modes	ALL	factory settings	00202020h (2105376)

serial number Pr4.05*	name	Manufacturer's use			Effective method	Power on again	data range	0 00FFFFFFh
	Modbus address	0x340A	unit	-	Related modes	ALL	factory settings	00212121h （2171169）
Manufacturer's use								

serial number Pr4.10*	name	SO1 output selection			Effective method	Power on again	data range	0 00FFFFFFh
	Modbus address	0x3414	unit	-	Related modes	ALL	factory settings	00030303h （197379）

Set the function allocation for SO1 output.

This parameter is set using hexadecimal to represent the standard. ＊[1]

After representing in hexadecimal, set each control mode as follows.

00---- **** h: Position control

00-- * * -- h: Speed control

00 * * ----------- h: Torque control

Please set the function number in the '* *' section.Please refer to the table below for the function numbers

Function Number	signal name	symbol
00h	invalid	-
01h	Servo alarm output	ALM
02h	Servo preparation output	S-RDY
03h	External brake release signal	BRK-OFF
04h	Positioning completed	INP
05h	Speed reaches output	AT-SPEED
06h	Signal output in torque limitation	TLC
07h	Zero speed detection signal	ZSP
08h	Consistent speed output	V-COIN
09h	Warning output 1	WARN1

0Ah	Warning output 2	WARN2
0Bh	Is there any output of the position command	P-CMD
0Ch	Positioning completed 2	INP2
0Dh	Output within speed limit	V-LIMIT
0Eh	Alarm attribute output	ALM-ATB
0Fh	Is there any output of speed command	V-CMD
10h	Servo connection status output	SRV-ST
14h	Position comparison output	CMP-OUT
22h	Return to origin completion status	HOME-CMP
23h	Workstation detection output 0	B-CTRL0
24h	Workstation detection output 1	B-CTRL1
25h	Workstation detection output 2	B-CTRL2
26h	Workstation detection output 3	B-CTRL3
27h	Workstation detection output 4	B-CTRL4

The output signal can allocate the same function to complex signals.
Set invalid control output pins and keep the output transistor in the OFF state.
Do not set values other than the function numbers listed in the table above.

TIPS Note:

<Example of Change>
When the standard factory setting is changed from "external brake release signal" (full mode) to "warning output 1", it is "00090909h".
Related page: Chapter 2.14.1
<Example of Change>
When the standard factory setting is changed from "external brake release signal" (full mode) to "warning output 1", it is

「00090909h」。
Using the installation and debugging software 'Ω Master',
The above settings can be easily operated.
* The front panel is represented in decimal, please note.

serial number Pr4.11*	name	SO2 output selection			Effective method	Power on again	data range	0 00FFFFFFh
	Modbus address	0x3416	unit	-	Related modes	ALL	factory settings	00101010h （1052688）

serial number Pr4.12*	name	SO3 output selection			Effective method	Power on again	data range	0 00FFFFFFh
	Modbus address	0x3418	unit	-	Related modes	ALL	factory settings	00010101h （65793）

serial number Pr4.13*	name	Manufacturer's use			Effective method	Power on again	data range	0 00FFFFFFh
	Modbus address	0x341A	unit	-	Related modes	ALL	factory settings	00040404h （263172）

serial number Pr4.14*	name	Manufacturer's use			Effective method	Power on again	data range	0 00FFFFFFh
	Modbus address	0x341C	unit	-	Related modes	ALL	factory settings	00070707h （460551）
Manufacturer's use								

serial number Pr4.16	name	Manufacturer's use			Effective method	Effective immediately	data range	0~28
	Modbus address	0x3420	unit	-	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr4.17	name	Manufacturer's use			Effective method	Effective immediately	data range	0~214748364
	Modbus address	0x3422	unit	-	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr4.18	name	Manufacturer's use			Effective method	Effective immediately	data range	0~28
	Modbus address	0x3424	unit	-	Related modes	ALL	factory settings	4

Manufacturer's use								
serial number Pr4.19	name	Manufacturer's use			Effective method	Effective immediately	data range	0~214748364
	Modbus address	0x3426	unit	-	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr4.20	name	Manufacturer's use			Effective method	Effective immediately	data range	0~3
	Modbus address	0x3428	unit	-	Related modes	ALL	factory settings	0

serial number Pr4.21	name	Manufacturer's use			Effective method	Effective immediately	data range	0~2
	Modbus address	0x342A	unit	-	Related modes	ALL	factory settings	0

serial number Pr4.22	name	Manufacturer's use			Effective method	Effective immediately	data range	-10000 ~10000
	Modbus address	0x342C	unit	mV	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr4.23	name	Manufacturer's use			Effective method	Effective immediately	data range	0~6400
	Modbus address	0x342E	unit	0.01ms	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr4.24	name	Manufacturer's use			Effective method	Effective immediately	data range	0~100
	Modbus address	0x3430	unit	0.1V	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr4.25	name	Manufacturer's use			Effective method	Effective immediately	data range	- 10000~10000
	Modbus address	0x3432	unit	mV	Related modes	ALL	factory settings	0

Manufacturer's use

serial number Pr4.26	name	Manufacturer's use			Effective method	Effective immediately	data range	0~6400
	Modbus address	0x3434	unit	0.01ms	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr4.27	name	Manufacturer's use			Effective method	Effective immediately	data range	0~100
	Modbus address	0x3436	unit	0.1V	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr4.31	name	Positioning completion range			Effective method	Effective immediately	data range	0 2097152
	Modbus address	0x343E	unit	Instruction unit	Related modes	P	factory settings	10

Set the deviation range of the output position of the positioning completion signal (INP1).

Note:

The setting unit at the factory is the instruction unit, but it can be changed to the encoder unit using Pr5.20 "Position Setting Unit Selection".However, in this case, the unit for Pr0.14 'excessive position deviation setting' was also changed simultaneously.

Notice: For instructions on "instruction unit" and "encoder unit", please refer to Pr5.20.

serial number Pr4.32	name	Positioning completed output setting			Effective method	Effective immediately	data range	0~11
	Modbus address	0x3440	unit	-	Related modes	P	factory settings	0

Select the output conditions for positioning completion signal (INP)

lue	The action of locating the completion signal
	Set to ON when the position deviation is below Pr4.31 (positioning completion range).
6	When there is no position command and the position deviation is below Pr4.31 (positioning completion rang turn it on.
7	If there is no position command and the zero speed detection signal is ON, and the position deviation is bel Pr4.31 (positioning completion range), set it On ON.

3.	8	When there is no position command and the position deviation is below Pr4.31 "positioning completion range", it is turned on. Afterwards, it remains on until Pr4.33 "INP holding time" has passed.After the INP holding time, refer to the position at this time Set the INP output to ON/OFF in case of positional deviation.
4.	9	After the positioning determination delay time set in Pr4.33 "INP holding time" for the change from presence to absence of position command, the positioning completion determination begins. When there is no position command and the position deviation is below Pr4.31 "positioning completion range", it is turned on.
5.	10	After the change of position command from 'yes' to' no ', the positioning judgment is based on the' INP holding time 'set in the positioning completion range Pr4.33 After the set delay time has passed, the positioning completion judgment begins.When there is no position command or the position deviation is below Pr4.31 "positioning completion range", it will be turned on.
	11	When not enabled, do not output. When enabled and there is no position command, if the position deviation is less than the set value and continues for Pr4.33 (holding time), output the positioning completion signal.

TIPS Note:

The presence or absence of position commands is determined by filtering the position commands with a set value of 1-5, and by filtering the position commands with a set value of 6-10.

5: The change of position command from yes to no, including servo upper computer software operation;

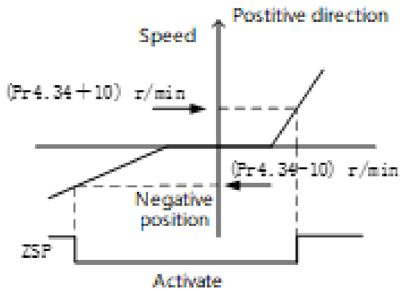
serial number Pr4.33	name	INP retention time			Effective method	Effective immediately	data range	0~30000
	Modbus address	0x3442	unit	ms	Related modes	P	factory settings	0

Set the hold time for Pr4.32 when the "positioning completion output setting" is set to 3.

set value	The action of locating the completion signal
0	Keep the duration infinitely long until the next instruction is received, and continue to maintain the ON state.
1~30000	Only set the value [ms] to remain in the ON state.However, if a position command is received while holding, it will become OFF state.

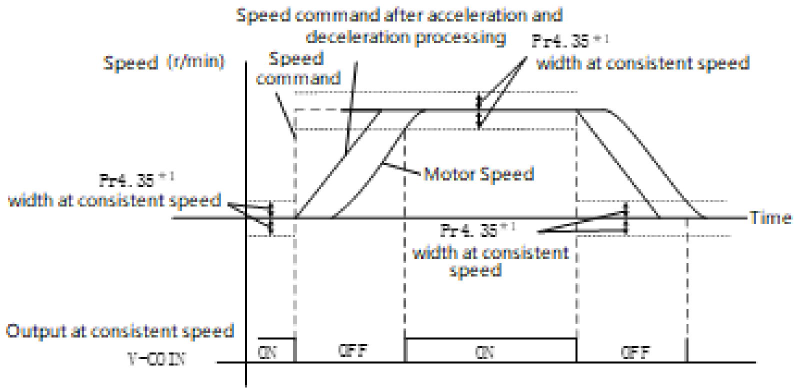
serial number Pr4.34	name	zero speed			Effective method	Effective immediately	data range	10~20000
	Modbus address	0x3444	unit	rpm	Related modes	ALL	factory settings	50

Set the timing of zero degree detection output signal (ZSP or TCL) by rotating at a speed of [r/min].
When the speed of the motor is lower than the set speed of parameter Pr4.34, it outputs a zero speed detection signal (ZSP).
The setting of Pr4.34 is independent of the direction of motor rotation.
Positive/negative effects.There is a delay of 10 [r/min].
The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.

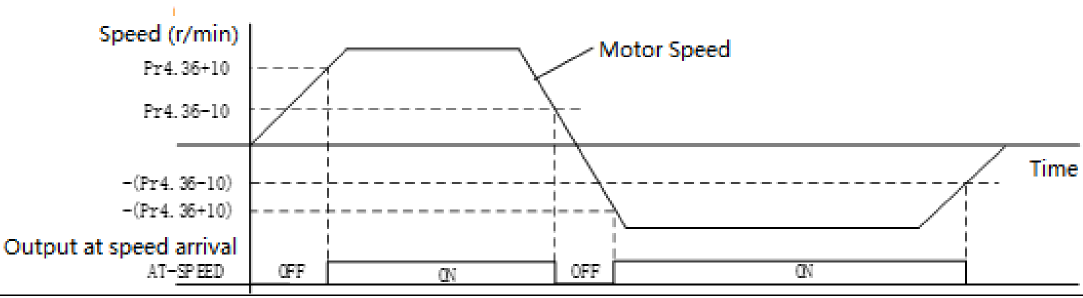


serial number Pr4.35	name	Consistent speed and width			Effective method	Effective immediately	data range	10~20000
	Modbus address	0x3446	unit	rpm	Related modes	S/T	factory settings	50

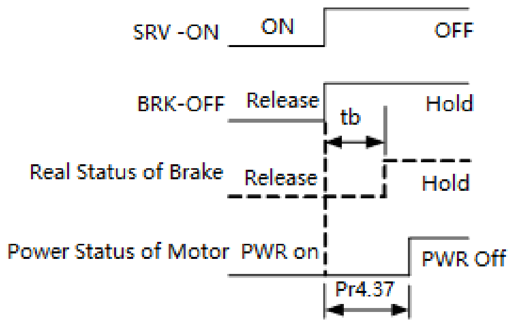
Set the detection timing for consistent speed output (V-COIN).
If the difference between the speed command and the motor speed is below this set value, the output speed will be consistent (V-COIN).



In order to maintain a hysteresis of 10 r/min, the actual detection width for consistent speed detection is as follows:
The time when the speed is consistent and the output is OFF → ON (Pr4.35-10) r/min
Time from ON to OFF (Pr4.35+10) r/min
The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.

<table>
<tr><td rowspan="2">serial number Pr4.36</td><td>name</td><td colspan="3">Arrival speed</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>10~20000</td></tr>
<tr><td>Modbus address</td><td>0x3448</td><td>unit</td><td>rpm</td><td>Related modes</td><td>S/T</td><td>factory settings</td><td>1000</td></tr>
<tr><td colspan="9">Set the timing for detecting the speed reaching the output (AT-SPEED).
When the motor speed exceeds this set value, the output speed reaches the output (AT-SPEED).
Detected a lag of 10r/min.
The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.
</td></tr>
</table>

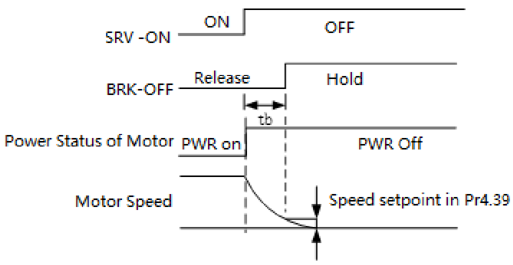
<table>
<tr><td rowspan="2">serial number Pr4.37</td><td>name</td><td colspan="3">Mechanical control when stopping
Action setting of actuator</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~10000</td></tr>
<tr><td>Modbus address</td><td>0x344A</td><td>unit</td><td>ms</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">When the servo enable is turned off while the motor is stopped, set the time for the brake release signal (BRK-OFF) to be turned off (brake held) until the motor is not powered on (servo free).
To prevent small movements/drops of the motor (workpiece) caused by response delay (t_b) of the brake.
The setting of Pr4.37 is $\geq t_b$
In practice, after the brake is activated, it is set to the servo enabled closed state.
Note: This value is used to set the PWM off delay time after the motor stops;If the motor needs to stop freely, please set this value to 0;</td></tr>
</table>



serial number Pr4.38	name	Mechanical mechanism during action Action setting of actuator			Effective method	Effective immediately	data range	0~32000
	Modbus address	0x344C	unit	ms	Related modes	ALL	factory settings	0

When the servo enable is turned off during motor rotation, set the time from the detection of the servo enable on input signal (SRV-ON) being turned off to the external brake release signal (BRK-OFF) being turned off. Designed to prevent brake degradation caused by motor rotation.

The servo enable shutdown method during motor rotation is as follows. The time tb in the following figure is the set time of Pr4.38 or the smaller time value when the motor rotation speed drops below the set speed of Pr4.39.



Note: This value is used to set the delay time for holding the brake DO off after enabling DI to be disconnected;If the motor needs to stop freely, please set this value to 0;

serial number Pr4.39	name	Brake release Speed setting			Effective method	Effective immediately	data range	30~3000
	Modbus address	0x344E	unit	rpm	Related modes	ALL	factory settings	30

Set the speed value when the brake is released

The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.

serial number Pr4.40	name	Warning output selection 1			Effective method	Effective immediately	data range	0~40
	Modbus address	0x3450	unit	-	Related modes	ALL	factory settings	0

serial number Pr4.41	name	Warning output selection 2			Effective method	Effective immediately	data range	0~40
	Modbus address	0x3452	unit	-	Related modes	ALL	factory settings	0

Use warning outputs 1 and 2 to select the type of warning to output.

set value	Warning Name	content
0	—	OR output for all warnings
1	Overload warning	Over 85% of the load rate protection level
3	Battery warning	When the battery voltage is below 3.2V, a battery warning is triggered
4	Limit signal warning	After touching the limit signal, trigger the limit signal warning
15	High temperature warning for servo chamber	Chamber temperature exceeding threshold triggers warning
16	Servo waiting to restart warning	The servo has undergone parameter reset, phase sequence testing, and other related operations, requiring a warning to restart the servo
17	Encoder self-tuning warning	During the encoder self-tuning process (i.e. position angle self-learning process), a warning is displayed, but after the tuning is completed, there is no warning.

serial number Pr4.42	name	Positioning completion range 2			Effective method	Effective immediately	data range	0 2097152
	Modbus address	0x3454	unit	Instruction unit	Related modes	P	factory settings	10

Set the time for the position deviation output of positioning completion signal 2 (INP2).

INP2 is not affected by Pr4.32 "Positioning completion output setting", and is set to ON when the position deviation remains below this set value. (It is not judged based on the presence or absence of position commands.)

Note: The setting unit at the factory is the command unit, but it can be changed to the encoder unit through Pr5.20 "Position Setting Unit Selection".In this case, the unit of Pr0.14 'excessive position deviation setting' will also be changed together.

Notice: Please refer to "Pr5.20" for instructions on "instruction units" and "encoder units".

serial number Pr4.43	name	Analog dead zone			Effective method	Effective immediately	data range	0~1000
	Modbus address	0x3456	unit	mV	Related modes	ALL	factory settings	0
Set the analog dead zone voltage, and when the voltage is lower than this value, the analog output is 0.								

serial number Pr4.44	name	Position comparison output Pulse width setting			Effective method	Effective immediately	data range	0～32767
	Modbus address	0x3458	unit	0.1ms	Related modes	P	factory settings	0
Set the pulse width for position comparison output.At 0 o'clock, the pulse does not output.								

serial number Pr4.45	name	Location comparison loss Status selection			Effective method	Effective immediately	data range	0～63
	Modbus address	0x345A	unit	-	Related modes	P	factory settings	0

Each output terminal uses a bit to set the position and compare the polarity of the output.

Set bit

bit	content
0	SO1
1	SO2
2	SO3

Set value:

0: In pulse output, SO1-3 output optocouplers are turned on;

1: In pulse output, SO1-3 outputs optocouplers OFF;

serial number Pr4.46	name	Manufacturer's use			Effective method	Effective immediately	data range	0～0
	Modbus address	0x345C	unit	-	Related modes	ALL	factory settings	0

serial	name	Pulse output selection	Effective	Effective	data range	0～7

number Pr4.47				method	immediately			
	Modbus address	0x345E	unit	-	Related modes	ALL	factory settings	0
Select the output signal from the encoder output/position comparison output terminal. Attention: Currently, differential output position comparison output is not supported, therefore, this parameter setting is invalid.								

serial number Pr4.48	name	Position comparison value 1		Effective method	Effective immediately	data range	-2147483648~2147483647
	Modbus address	0x3460	unit	Instruction unit	Related modes	P	factory settings	0
Set the comparison value for position comparison 1.								

serial number Pr4.49	name	Position comparison value 2		Effective method	Effective immediately	data range	-2147483648~2147483647
	Modbus address	0x3462	unit	Instruction unit	Related modes	P	factory settings	0
Set the comparison value for position comparison 2.								

serial number Pr4.50	name	Position comparison value 3		Effective method	Effective immediately	data range	-2147483648~2147483647
	Modbus address	0x3464	unit	Instruction unit	Related modes	P	factory settings	0
Set the comparison value for position comparison 3.								

serial number Pr4.51	name	Position comparison value 4		Effective method	Effective immediately	data range	-2147483648~2147483647
	Modbus address	0x3466	unit	Instruction unit	Related modes	P	factory settings	0
Set the comparison value for position comparison 4.								

serial number Pr4.52	name	Position comparison value 5		Effective method	Effective immediately	data range	-2147483648~2147483647
	Modbus address	0x3468	unit	Instruction unit	Related modes	P	factory settings	0
Set the comparison value for position comparison 5.								

serial number Pr4.53	name	Position comparison value 6		Effective method	Effective immediately	data range	-2147483648~2147483647
	Modbus	0x346A	unit	Instruction	Related	P	factory	0

	address			unit	modes		settings	
Set the comparison value for position comparison 6.								

serial number Pr4.54	name	Position comparison value 7			Effective method	Effective immediately	data range	-2147483648~ 2147483647
	Modbus address	0x346C	unit	Instruction unit	Related modes	P	factory settings	0
Set the comparison value for position comparison 7.								

serial number Pr4.55	name	Position comparison value 8			Effective method	Effective immediately	data range	-2147483648~ 2147483647
	Modbus address	0x346E	unit	Instruction unit	Related modes	P	factory settings	0
Set the comparison value for position comparison 8.								

serial number Pr4.56	name	Location comparison loss Delay compensation amount			Effective method	Effective immediately	data range	-32768~32767
	Modbus address	0x3470	unit	0.1us	Related modes	P	factory settings	0
Compare the output delay based on the compensation position of the circuit.								

serial number Pr4.57	name	Location comparison loss Allocation setting			Effective method	Effective immediately	data range	-2147483648~ 2147483647
	Modbus address	0x3472	unit	-	Related modes	P	factory settings	0

Use a bit to set the corresponding output terminals for comparing positions 1 to 8.Multiple comparison values can be set at one output terminal.

bit0 ～ 3	Position comparison 1 corresponds to the output port value
bit4 ～ 7	Position comparison 2 corresponds to the output port value
bit8 ～ 11	Position comparison 3 corresponds to the output port value
bit12 ～ 15	Position comparison 4 corresponds to the output port value
bit16 ～ 19	Position comparison 5 corresponds to output port values
bit20 ～ 23	Position comparison 6 corresponds to the output port value
bit24 ～ 27	Position comparison 7 corresponds

	to the output port value
bit28 ～ 31	Position comparison 8 corresponds to the output port value

When using the universal output (SO1~SO4) or high-speed output SO5/SO6 as the position comparison output (CMP-OUT), please set the functions of Pr4.10~Pr4.15.
The output of the set value 0000 is invalid
0001 assigned to SO1
0010 allocated to SO2
0011 assigned to SO3
0100 allocated to SO4
0101 assigned to SO5
0110 assigned to SO6
In addition to the above, the manufacturer should use (do not set).

serial number Pr4.58	name	Position comparison output Direction setting			Effective method	Effective immediately	data range	0~2
	Modbus address	0x3474	unit	-	Related modes	P	factory settings	0

Set position comparison output trigger direction
0: Triggered in the positive direction, not triggered in the negative direction;
1: Negative direction triggered, positive direction not triggered;
2: Bidirectional triggering.

serial number Pr4.58	name	Position comparison output direction setting			Effective method	Effective immediately	data range	0~2
	EtherCAT address	-	unit	-	Related modes	P	factory settings	0

Set position comparison output trigger direction
0: Triggered in the positive direction, not triggered in the negative direction;
1: Negative direction triggered, positive direction not triggered;
2: Bidirectional triggering.

10.6 Pr05 group parameters

serial number Pr5.00	name	The second instruction divides the frequency of molecules into multiples			Effective method	Effective immediately	data range	0~230
	Modbus	0x3500	unit	-	Related	P	factory	0

	address				modes		settings	
serial number Pr5.01	name	The third instruction divides the frequency molecule			Effective method	Effective immediately	data range	$0\sim2^{30}$
	Modbus address	0x3502	unit	-	Related modes	P	factory settings	0
serial number Pr5.02	name	The fourth instruction divides the harmonic molecule			Effective method	Effective immediately	data range	$0\sim2^{30}$
	Modbus address	0x3504	unit	-	Related modes	P	factory settings	0

Set the second to fourth molecules for frequency division processing of instruction pulse input.
When Pr0.08 "the number of command pulses per rotation of the motor" is 0, it is considered valid.
When the set value under position control is 0, the encoder resolution is set to numerator.
Multiple gear ratios can be set and used through IO switching.

serial number Pr5.03*	name	Pulse output frequency division denominator			Effective method	Power on again	data range	0~16777216
	Modbus address	0x3506	unit	-	Related modes	ALL	factory settings	0

Set the denominator for pulse output frequency division.
When set to 0, the number of output pulses per 1 rotation of the motor is parameter Pr0.11;
When non-zero is set, the pulse output frequency division gear ratio is pr0.11/pr5.03;

serial number Pr5.04*	name	Driver input prohibition setting			Effective method	Power on again	data range	0~2
	Modbus address	0x3508	unit	-	Related modes	ALL	factory settings	1

Set the action of prohibiting input (POT, NOT) for the driver.

set value	action
0	POT → Positive direction drive prohibited NOT → Negative direction drive prohibited
【 1 】	POT and NOT are invalid
2	Either POT/NOT input will result in Err38.0 "Driver input prohibition protection"

Please configure this value reasonably: one signal can only adapt to one function, the return to zero collision limit function and the normal limit function. Under normal circumstances, only one of the two can be selected.

serial number Pr5.05*	name	Driver prohibition time sequence	Effective method	Power on again	data range	0~2

	Modbus address	0x350A	unit	-	Related modes	ALL	factory settings	0

When Pr5.04 "Drive Prohibit Input Setting" is set to 0, the state of deceleration after the input of drive inhibit inputs (POT, NOT) is stopped.
Detailed content of Pr5.05 'Driver prohibition timing'

Pr5.04	Pr5.05	Driver prohibition time sequence
0	0	Immediate shutdown - deceleration time is 0 (* 1)
	1	Rapid shutdown - deceleration time of 10ms/krpm (*
	2	Deceleration stop - Deceleration time is 100ms/krpm

*1. Immediate shutdown: During position control, position command=0;During speed control, the speed command is 0;During torque control, the speed limit value is 0.
*2. Rapid shutdown: refers to the situation where the servo does not accept the position command sent by the controller when the drive prohibition input (NOT, POT) signal is valid, and directly controls its rapid deceleration shutdown from the current speed, with a deceleration time of 10ms/krpm.At this point, the torque command value is limited by Pr5.11's "torque setting for immediate stop". As it does not respond to the controller's position command, the servo plans to slow down and stop. Based on its own planned deceleration, the speed is calculated back to the given position, and then the position deviation value is calculated. Therefore, there is no need to amplify the position deviation, and it can be set reasonably.
*3. Deceleration shutdown: refers to the situation where the servo does not accept the position command sent by the controller when the drive prohibition input (NOT, POT) signal is valid, and directly controls its deceleration shutdown from the current speed. The deceleration time is 100ms/krpm, which is 10 times longer than the rapid shutdown method.At this time, the torque command value is also limited by Pr5.11 "torque setting for immediate stop".The calculation method for Pr0.14 'excessive position deviation setting' is the same as the quick stop method, and there is no need to amplify the deviation. It can be set to a reasonable value.
Description of limit motion control: When the drive prohibition input signal is valid, if the controller continues to send instructions in the direction of drive prohibition, the servo will not respond to the position instructions issued by the controller. Based on the current speed and the set drive prohibition time sequence, the shutdown mode will be planned;In position control mode, when the controller continues to send motion commands exceeding 20 times the current stop position of the single turn encoder value (taking a rotating motor as an example), an alarm Err91.1 will be triggered. In speed mode, there is no position limit alarm.
When the drive prohibition input signal is valid, the controller can clear the static error between the position command and feedback through CL before sending the motion command in the opposite direction.

<table>
<tr><td rowspan="2">serial number Pr5.06</td><td>name</td><td colspan="3">Servo enable shutdown timing sequence</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~9</td></tr>
<tr><td>Modbus address</td><td>0x350C</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set the deceleration and stop states after the servo is turned off.</td></tr>
</table>

set value	Decelerating * 3	After stopping	position bias
0	Dynamic Brake (DB) Action	Dynamic Braking (DB) Action	Clear [*4]
1	Free operation (DB OFF)	Dynamic Braking (DB) Action	Clear [*4]
2	Dynamic Brake (DB) Action	Freedom (DB OFF)	Clear [*4]
3	Free operation (DB OFF)	Freedom (DB OFF)	Clear [*4]
4	Dynamic Brake (DB) Action	Dynamic Braking (DB) Action	Maintain [*2]
5	Free operation (DB OFF)	Dynamic Braking (DB) Action	Maintain [*2]
6	Dynamic Brake (DB) Action	Freedom (DB OFF)	Maintain [*2]
7	Free operation (DB OFF)	Freedom (DB OFF)	Maintain [*2]
8	Stop immediately [*1]	Dynamic Braking (DB) Action	Clear [*4]
9	Stop immediately [*1]	Freedom (DB OFF)	Clear [*4]

1. Immediate stop refers to stopping immediately in order to achieve control effects while the servo is enabled.At this time, the torque command is limited by Pr5.11 "torque setting for immediate stop".
2. When the servo is turned off and continuously sends position commands, or when the motor continues to operate and accumulates position deviation, Err24.0 "excessive position deviation protection" will occur.In addition, if the servo enable is turned on when the position deviation is too large, in order to control the deviation to 0, the motor may run rapidly.Please maintain sufficient positional deviation before use.
3. The so-called deceleration refers to the interval where the motor's operating state is reduced to a speed below 30r/min.When the speed drops below 30r/min and changes after stopping, it will not be affected by the motor speed but will follow the state after stopping.
4. Position deviation, always maintain a zero state.

Attention: When an error occurs during servo enable shutdown, follow Pr5.10 "Alarm Time Sequence" for action.In addition, if the power is turned off during the servo enable shutdown, it is necessary to follow Pr5.07 "Power Off Timing".

serial number Pr5.07	name	Sequence when the power AC is turned off			Effective method	Effective immediately	data range	0~9
	Modbus address	0x350E	unit	-	Related modes	ALL	factory settings	0

Set the state of deceleration and stopping after the power is cut off.

The setting value and action of Pr5.07, as well as the processing relationship of the deviation counter, are the same as Pr5.06 (power off timing).

TIPS Note:

When an alarm occurs while the power is turned off, follow the "Alarm Time Sequence" in Pr5.10.

When the power is turned off while the servo is turned on, Err13.1 "voltage abnormality due to insufficient power supply" will occur when Pr5.08 "LV trigger selection when power is turned off"=1. Therefore, please follow Pr5.10 "alarm timing sequence" for action.

serial	name	LV trigger selection when	Effectiv	Effective	data range	0~3

number Pr5.08		main power AC is turned off			e method	immediately		
	Modbus address	0x3510	unit	-	Related modes	ALL	factory settings	1

When the power alarm is triggered, choose whether to trigger the LV or enable the servo to turn off.

	set value	function
bit0	0	Based on Pr5.07, the servo enable is turned off, and when the power is tu again, it returns to servo on.
	1	Err13.1 (insufficient power supply voltage protection) detected.
bit1	0	The power off warning is only detected when the servo is enabled.
	1	The power off warning is constantly detected.

TIPS Note:

When Pr5.09 (power off detection time)=2000, this parameter is invalid.

When the setting time of Pr5.09 is too long and the voltage between P-N of the power rectifier drops below the specified value before detecting a circuit break, Err13.1 (power insufficient voltage protection) occurs regardless of the setting of Pr5.08.

When using, please select 0 or 1 mode;When there is a power shortage of two phases, the POWEROFF flag will be provided and no alarm will be triggered;1: When the power supply is missing two phases, the POWEROFF flag will not be provided, but an alarm Err13.1 will be triggered;

serial number Pr5.09*	name	Main power AC shutdown detection time			Effective method	Power on again	data range	20~2000
	Modbus address	0x3512	unit	ms	Related modes	ALL	factory settings	70

Set the time required to detect a power outage when it persists.

When set to 2000, the power off detection is invalid.

serial number Pr5.10	name	Alarm timing sequence			Effective method	Effective immediately	data range	0~7
	Modbus address	0x3514	unit	-	Related modes	ALL	factory settings	0

Set the state during deceleration and after stopping when an alarm occurs.

set value	Decelerating * 3	After stopping	position bias
0	Dynamic Brake (DB) Action	Dynamic Brake (DB) Action	Maintain * 1
1	Free operation (DB OFF)	Dynamic Brake (DB) Action	Maintain * 1
2	Dynamic Brake (DB) Action	Freedom (DB OFF)	Maintain * 1
3	Free operation (DB OFF)	Freedom (DB OFF)	Maintain * 1
4	Action A: Stop immediately	Dynamic Brake (DB) Action	Maintain * 1

	Action B: DB action [*2]		
5	Action A: Stop immediately Action B: DB action [*2]	Dynamic Brake (DB) Action	Maintain [*1]
6	Action A: Stop immediately Action B: DB action [*2]	Freedom (DB OFF)	Maintain [*1]
7	Action A: Stop immediately Action B: DB action [*2]	Freedom (DB OFF)	Maintain [*1]

1. Position deviation is maintained in the event of an alarm and cleared when the alarm is cleared.
2. Actions A and B indicate whether to immediately stop when an alarm occurs. If the corresponding alarm for immediate stop occurs, and the set value is 4-7, then action A should be followed for immediate stop.If there is an alarm that does not immediately stop, it will not stop immediately, but instead become the dynamic brake (DB) action specified by action B, or become idle.Please maintain the power supply of the main circuit until the deceleration stops.
3. The so-called deceleration refers to the interval where the motor's operating state is reduced to a speed below 30r/min.

serial number Pr5.11	name	Torque setting for instant stop			Effective method	Effective immediately	data range	0~500
	Modbus address	0x3516	unit	%	Related modes	ALL	factory settings	0

Set torque limit for immediate stop.
Note: When the set value is 0, it applies to the torque limit during normal operation.

serial number Pr5.12	name	Overload level setting			Effective method	Effective immediately	data range	0~500
	Modbus address	0x3518	unit	%	Related modes	ALL	factory settings	0

Set overload level.When the set value is 0, the overload level setting becomes 115 [%].
Please set it to 0 during normal use.Only set the level when the overload level needs to be reduced.
There is no limit above 115%. When this parameter is less than or equal to 0 or greater than 115, it is limited to 115. At this time, if the load rate is greater than 115%, a warning will be displayed.It can only be used when the overload level needs to be reduced.For example, if set to 80% and the load rate is greater than 80%, a warning will be displayed.

serial number Pr5.13	name	Speed level setting			Effective method	Effective immediately	data range	0~20000
	Modbus address	0x351A	unit	rpm	Related modes	ALL	factory settings	0

If the motor speed exceeds this set value, Err26.0 "overspeed protection" will occur.
When the set value is 0, the overspeed level is 1.2 times the maximum motor speed.
The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor,

respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.

<table>
<tr><td rowspan="2">serial number Pr5.14</td><td>name</td><td colspan="3">Manufacturer's use</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~1000</td></tr>
<tr><td>Modbus address</td><td>0x351C</td><td>unit</td><td>-</td><td>Related modes</td><td>-</td><td>factory settings</td><td>10</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr5.15*</td><td>name</td><td colspan="3">Manufacturer's use</td><td>Effective method</td><td>Power on again</td><td>data range</td><td>0~6</td></tr>
<tr><td>Modbus address</td><td>0x351E</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Manufacturer's use</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr5.16*</td><td>name</td><td colspan="3">Manufacturer's use</td><td>Effective method</td><td>Power on again</td><td>data range</td><td>0~1</td></tr>
<tr><td>Modbus address</td><td>0x3520</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Manufacturer's use</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr5.17</td><td>name</td><td colspan="3">Counter clear (CL) input setting</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~4</td></tr>
<tr><td>Modbus address</td><td>0x3522</td><td>unit</td><td>-</td><td>Related modes</td><td>P</td><td>factory settings</td><td>3</td></tr>
</table>

Set the reset conditions for the bias counter to reset the input signal.

set value	Signal reading cycle
0	invalid
1	Level reset (no read filter)
2	Level reset (with read filter)
【 3 】	Edge reset (no read filter)
4	Edge reset (with read filter)

Please refer to the table below for the necessary signal width/bias reset timing of the deviation counter input (CL).

<table>
<tr><td>Pr5.17</td><td>CL signal width</td><td>Deviation reset timing</td></tr>
<tr><td>1</td><td>500 μ s or more</td><td rowspan="2">Continue to reset the bias counter when the reset input is in the ON state.</td></tr>
<tr><td>2</td><td>More than 1ms</td></tr>
<tr><td>3</td><td>More than 100 μ s</td><td rowspan="2">Only reset once when the bias counter reset input is in the OFF → ON edge state</td></tr>
<tr><td>4</td><td>More than 1ms</td></tr>
</table>

The OFF indicator for the reset input of the deviation counter indicates the OFF state of the input optocoupler, while the ON indicator indicates the ON state of the input optocoupler

<table>
<tr><td rowspan="2">serial number Pr5.18</td><td>name</td><td colspan="3">Invalid command pulse input prohibition (INH) setting</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~1</td></tr>
<tr><td>Modbus address</td><td>0x3524</td><td>unit</td><td>-</td><td>Related modes</td><td>P</td><td>factory settings</td><td>1</td></tr>
<tr><td colspan="9">Select the valid/invalid command pulse to prohibit input.</td></tr>
</table>

set value	INH
【 1 】	invalid
0	effective

<table>
<tr><td rowspan="2">serial number Pr5.19*</td><td>name</td><td colspan="3">Instruction pulse prohibition input (INH) reading setting</td><td>Effective method</td><td>Power on again</td><td>data range</td><td>0~5</td></tr>
<tr><td>Modbus address</td><td>0x3526</td><td>unit</td><td>-</td><td>Related modes</td><td>P</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Select the signal reading cycle that prohibits input of instruction pulses.
Note:
The reading cycle is long, and although the possibility of erroneous actions due to noise is reduced, the responsiveness of the corresponding signal input decreases.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr5.20*</td><td>name</td><td colspan="3">Location setting unit selection</td><td>Effective method</td><td>Power on again</td><td>data range</td><td>0~1</td></tr>
<tr><td>Modbus address</td><td>0x3528</td><td>unit</td><td>-</td><td>Related modes</td><td>P</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Select the setting unit with a positioning completion range and excessive positional deviation.</td></tr>
</table>

set value	Signal reading cycle
0	Instruction unit
1	encoder unit

Notice:

The instruction unit is one pulse input from the upper device as a unit of 1.

For this reason, the encoder unit is 1 pulse as the unit of 1.

The electronic gear ratio set for the instruction frequency division function (electronic gear) is R, as shown in the following relationship.

Instruction unit x R=Encoder unit

For example, the factory default state when using a 23 bit encoder, Because $R=\frac{2^{23}}{10000}$, the instruction unit $x\frac{2^{23}}{10000}$=encoder unit.

serial number Pr5.21	name	Torque limit selection			Effective method	Effective immediately	data range	0~6
	Modbus address	0x352A	unit	-	Related modes	P/S/T/F	factory settings	1

The selection method for setting torque limits.

set value	positive direction	negative direction
0	Manufacturer's use	
1	First torque limit (Pr0.13)	
2	First torque limit (Pr0.13)	Second torque limit (Pr5.22)
3	TL-SEL OFF → 1st torque limit (Pr0.13) TL-SEL ON → Second torque limit (Pr5.22)	
4	Manufacturer's use	
5	Manufacturer's use	
6	TL-SEL OFF	
	First torque limit (Pr0.13)	Second torque limit (Pr5.22)
	TL-SEL ON	
	Positive torque limit during external input (Pr5.25)	Negative direction torque limit during external i (Pr5.26)

When set to 0: used by the manufacturer;
When set to 1: positive=Pr0.13;Negative=- Pr0.13;
When set to 2: positive=Pr0.13;Negative=- P5.22;
When set to 3: it needs to be used in conjunction with the torque limit switching input in IO: when Off, forward=Pr0.13;Negative=- Pr0.13;When On, positive=Pr5.22;Negative=- P5.22;
When set to 4: used by the manufacturer;
When set to 5: used by the manufacturer;
When set to 6, it needs to be used in conjunction with the torque limit switching input in IO: When Off, forward=Pr0.13;Negative=- P5.22;On, positive=Pr5.25;Negative=- P5.26;

serial number Pr5.22	name	Second torque limit			Effective method	Effective immediately	data range	0~500
	Modbus address	0x352C	unit	%	Related modes	P/S/F	factory settings	500

Set the second torque limit value for the motor output torque.
In addition, the parameter values are limited by the maximum torque of the applicable motor.

serial number	name	Manufacturer's use	Effective method	Effective immediately	data range	0~4000

Pr5.23	Modbus address	0x352E	unit	-	Related modes	-	factory settings	0

serial number Pr5.24	name	Manufacturer's use			Effective method	Effective immediately	data range	0~4000
	Modbus address	0x3530	unit	-	Related modes	-	factory settings	0

serial number Pr5.25	name	Positive torque limit during external input			Effective method	Effective immediately	data range	0~500
	Modbus address	0x3532	unit	%	Related modes	P/S/F	factory settings	500
Set Pr5.21 "Torque Limit Selection"=6 to set the forward torque limit for TL-SEL input.								

serial number Pr5.26	name	Negative direction torque limit during external input			Effective method	Effective immediately	data range	0~500
	Modbus address	0x3534	unit	%	Related modes	P/S/F	factory settings	500
Set Pr5.21 "Torque Limit Selection"=6 for the negative direction torque limit when TL-SEL input is set.								

serial number Pr5.27	name	Manufacturer's use			Effective method	Effective immediately	data range	10~100
	Modbus address	0x3536	unit	0.1V/ 100%	Related modes	P/S/F	factory settings	30
Manufacturer's use								

serial number Pr5.28*	name	Manufacturer's use			Effective method	Power on again	data range	0~42
	Modbus address	0x3538	unit	-	Related modes	ALL	factory settings	1

serial number Pr5.29	name	Manufacturer's use			Effective method	Effective immediately	data range	0~7
	Modbus address	0x353A	unit	-	Related modes	-	factory settings	2

serial number Pr5.30*	name	RS485 communication baud rate setting			Effective method	Power on again	data range	0~7
	Modbus	0x353C	unit	-	Related	ALL	factory	2

	address				modes		settings	

Set the communication wave speed for RS485 communication.

set value	Baud rate
0	2400bps
1	4800bps
2	9600bps
3	19200bps
【 4 】	38400bps
5	57600bps
6	115200bps
7	230400bps

The baud rate and bit error rate are:
2400~38400bps ± 0.5%
57600~115200bps ± 2%.
Note: In non Modbus communication (Pr5.37=0),
If the set value is 7, the internal speed is 9600bps.

serial number Pr5.31*	name	Axis number			Effective method	Power on again	data range	0~127
	Modbus address	0x353E	unit	-	Related modes	ALL	factory settings	1

When controlling multiple axes, the server needs to identify which axis to communicate with when communicating with the upper host such as a computer.This parameter can be used to set the axis number.

serial number Pr5.32*	name	Command pulse input maximum setting/digital filter setting			Effective method	Effective immediately	data range	250~8000
	Modbus address	0x3540	unit	Kpulse /s	Related modes	P	factory settings	4000

This filter filters the pulse input signal to reduce interference;When the positioning is inaccurate and the motor can vibrate, this parameter must be set;The larger the value, the smaller the effect. It is recommended to set this value to 200.

serial number Pr5.33*	name	Pulse regeneration output limit setting			Effective method	Power on again	data range	0~1
	Modbus address	0x3542	unit	-	Related modes	ALL	factory settings	0

Set the detection of Err28.0 'pulse regeneration limit protection' to be valid/invalid.

set value	content
0	invalid
1	effective

serial	name	Manufacturer's use	Effective	Effective	data range	0-10

number Pr5.34					method	immediately		
	Modbus address	0x3544	unit	-	Related modes	ALL	factory settings	1
Manufacturer's use								

serial number Pr5.35*	name	Front panel locking			Effective method	Power on again	data range	0~1
	Modbus address	0x3546	unit	-	Related modes	ALL	factory settings	0

Lock the operation through the front panel.

set value	content
0	Unrestricted front panel operation
1	Front panel operation lock

serial number Pr5.36*	name	Manufacturer's use			Effective method	Power on again	data range	0~500
	Modbus address	0x3548	unit	-	Related modes	-	factory settings	0

serial number Pr5.37*	name	Modbus connection settings			Effective method	Power on again	data range	0~2
	Modbus address	0x354A	unit	-	Related modes	ALL	factory settings	0

Set value content
0 MINAS Standard Protocol
1 Modbus RTU (RS232 communication, 1:1 only)
2 Modbus RTU (RS485 communication, corresponding to 1: N)

serial number Pr5.38	name	Modbus communication settings			Effective method	Effective immediately	data range	0~5
	Modbus address	0x354C	unit	-	Related modes	ALL	factory settings	0

Set the parity (Even/Odd/None) and end bit length (1-bit/2-bit) for Modbus communication.

set value	content	set value	content
0	Even/1bit	3	Odd/2bit

	1	Even/2bit	4	None/1bit	
	2	Odd/1bit	5	None /2bit	

serial number Pr5.39-Pr5.44	name	Manufacturer's use			Effective method	Effective immediately	data range	-
	Modbus address	0x354E~0x3558	unit	-	Related modes	-	factory settings	0

serial number Pr5.45	name	Positive compensation value for quadrant bulge			Effective method	Effective immediately	data range	-1000~1000
	Modbus address	0x355A	unit	0.1%	Related modes	P	factory settings	0
Quadrant protrusion positive interpolation value, percentage of rated current. Compensated feedforward torque value at forward zero crossing.								

serial number Pr5.46	name	Negative compensation value for quadrant bulge			Effective method	Effective immediately-	data range	-1000~1000
	Modbus address	0x355C	unit	0.1%	Related modes	P	factory settings	0
Quadrant convex negative interpolation value, percentage of rated current. When crossing the zero point in reverse, the compensated feedforward torque value does not need to consider the sign during reverse compensation. Setting 30% can indicate a negative compensation of 30% of the rated torque.								

serial number Pr5.47	name	Manufacturer's use			Effective method	-	data range	0~1000
	Modbus address	0x355E	unit	-	Related modes	-	factory settings	0
Manufacturer's use, please do not set								

serial number Pr5.48	name	Manufacturer's use			Effective method	-	data range	0~10000
	Modbus address	0x3560	unit	-	Related modes	-	factory settings	0
Manufacturer's use, please do not set								

serial number Pr5.49	name	Manufacturer's use			Effective method	-	data range	0~10000
	Modbus address	0x3562	unit	-	Related modes	-	factory settings	0

Manufacturer's use, please do not set

serial number Pr5.50	name	Establishment time of quadrant bulge compensation			Effective method	Effective immediately	data range	0~10000
	Modbus address	0x3564	unit	0.1ms	Related modes	P	factory settings	0
The establishment time of quadrant bulge compensation is the time required for the current to rise to the compensation value Set the torque Slope time for compensating torque from 0 to Pr5.45 or Pr5.46 torque compensation values.								

serial number Pr5.51	name	Quadrant bulge compensation holding time			Effective method	Effective immediately	data range	0~10000
	Modbus address	0x3568	unit	0.1ms	Related modes	P	factory settings	0
Quadrant bulge compensation holding time, unit: 0.1ms, which is the time to maintain the compensation value Set the holding time for the compensation torque to maintain the pr5.45 or Pr5.46 torque compensation value.								

serial number Pr5.52	name	Manufacturer's use			Effective method	Effective immediately	data range	0~2
	Modbus address	0x356A	unit	-	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr5.53-Pr5.86	name	Manufacturer's use			Effective method	Effective immediately	data range	
	Modbus address	0x356C~0x35AC	unit	-	Related modes	ALL	factory settings	

10.7 Pr06 group parameters

serial number Pr6.00	name	Manufacturer's use			Effective method	Effective immediately	data range	0~100
	Modbus address	0x3600	unit	0.1V/100%	Related modes	P/S/F	factory settings	0
Manufacturer's use								

serial number Pr6.01	name	Manufacturer's use			Effective method	Effective immediately	data range	0~0
	Modbus	0x3602	unit	-	Related	-	factory	0

	address				modes		settings	

serial number Pr6.02	name	Setting for excessive speed deviation			Effective method	Effective immediately	data range	0~20000
	Modbus address	0x3604	unit	rpm	Related modes	P/S/F	factory settings	0
If the speed deviation (the difference between the internal position command speed and the actual speed) exceeds this set value, Err24.2 (excessive speed deviation protection) will occur. For linear motors: When the set value is 0, the internal speed deviation threshold is 30% of the rated speed of the motor;When the set value is 20000, shield the speed deviation over limit alarm. For rotating motors: When the set value is 0, it indicates that the shielding speed deviation exceeds the limit alarm. The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.								

serial number Pr6.03	name	Manufacturer's use			Effective method	Effective immediately	data range	0~0
	Modbus address	0x3606	unit	-	Related modes	-	factory settings	0

serial number Pr6.04	name	Jog trial operation command speed			Effective method	Effective immediately	data range	0~500
	Modbus address	0x3608	unit	rpm	Related modes	ALL	factory settings	300
Set the command speed for JOG trial operation (speed control).								

serial number Pr6.05	name	Position 3 gain effective time			Effective method	Effective immediately	data range	0~10000
	Modbus address	0x360A	unit	0.1ms	Related modes	P	factory settings	0
Set the time for the third gain to become effective. When not in use, please set Pr6.05=0 and Pr6.06=100. Only effective when controlling the position.								

serial number Pr6.06	name	Position 3 gain multiplier			Effective method	Effective immediately	data range	50~1000
	Modbus address	0x360C	unit	%	Related modes	P	factory settings	100
The third gain is set based on the magnification of the first gain. Third gain=First gain multiplied by Pr6.06/100								

<table>
<tr><td rowspan="2">serial number Pr6.07</td><td>name</td><td colspan="3">Torque command added value</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>-100~100</td></tr>
<tr><td>Modbus address</td><td>0x360E</td><td>unit</td><td>%</td><td>Related modes</td><td>P/S/F</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set the offset load compensation value that is continuously added to the torque command using control modes other than torque control.
When the real-time automatic adjustment of the vertical axis mode is effective, update this parameter.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr6.08</td><td>name</td><td colspan="3">Positive direction torque compensation value</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>-100~100</td></tr>
<tr><td>Modbus address</td><td>0x3610</td><td>unit</td><td>%</td><td>Related modes</td><td>P</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">During position control, the dynamic friction compensation value is set to be added to the torque command when receiving positive position commands.
When the real-time automatic adjustment friction compensation mode is effective, update this parameter.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr6.09</td><td>name</td><td colspan="3">Negative direction torque compensation value</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>-100~100</td></tr>
<tr><td>Modbus address</td><td>0x3612</td><td>unit</td><td>%</td><td>Related modes</td><td>P</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">During position control, the dynamic friction compensation value is set to be added to the torque command when receiving negative direction position commands.
When the real-time automatic adjustment friction compensation mode is effective, update this parameter.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr6.10</td><td>name</td><td colspan="3">Function extension settings</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~2147483647</td></tr>
<tr><td>Modbus address</td><td>0x3614</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>16</td></tr>
<tr><td colspan="9">Each function is set in bit units.</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td rowspan="2">function</td><td colspan="2">set value</td></tr>
<tr><td>0</td><td>1</td></tr>
<tr><td>bit0</td><td>Unused</td><td colspan="2">Please fix position 0</td></tr>
<tr><td>bit1</td><td>Overload detection of shielded IGBT module</td><td>detection valid</td><td>Invalid detection</td></tr>
<tr><td>bit6</td><td>Block ABZ disconnection detection</td><td>invalid</td><td>effective</td></tr>
<tr><td>bit11</td><td>Encoder overheating abnormal protection detection</td><td>invalid</td><td>effective</td></tr>
<tr><td>Bit12</td><td>Servo fast power-off enable</td><td>effective</td><td>invalid</td></tr>
<tr><td>bit15</td><td>Slow stop function</td><td>invalid</td><td>effective</td></tr>
</table>

*The lowest bit is bit0
*When the encoder overheating warning occurs, Err15.1 "Encoder Overheating Abnormal Protection" occurs.

serial number Pr6.11	name	Current response setting			Effective method	Power on again	data range	10~300
	Modbus address	0x3616	unit	%	Related modes	ALL	factory settings	100

Make slight adjustments to the current response.
Improve current response by setting this parameter to 100%.

serial number Pr6.12	name	Manufacturer's use			Effective method	Effective immediately	data range	0~0
	Modbus address	0x3618	unit	-	Related modes	-	factory settings	0

serial number Pr6.13	name	Second inertia ratio			Effective method	Power on again	data range	0~20000
	Modbus address	0x361A	unit	%	Related modes	ALL	factory settings	250

Set the second inertia ratio.
Set the ratio of load inertia to motor rotor inertia.

Pr6.13=(load inertia/rotor inertia) × 100 "%"

Note:
When the inertia ratio is set correctly, the setting unit for Pr1.01 and Pr1.06 is (Hz).When the inertia ratio of Pr0.04 is larger than the actual value,
The larger the units set for the speed loop gain, the smaller the units set for the speed loop gain when the Pr0.04 inertia ratio is compared to reality.

serial number Pr6.14	name	Immediate stop time upon alarm			Effective method	Effective immediately	data range	0~1000
	Modbus address	0x361C	unit	ms	Related modes	ALL	factory settings	200

Set the allowable time to immediately stop the action when an alarm occurs.
If it exceeds this set value, it will become a mandatory alarm state.
When the set value is 0, it does not immediately stop, but immediately becomes an alarm stop state.
Note: To make the motor stop freely, set it to 0.

serial	name	Second Speed Level	Effective	Effective	data range	0~20000

number Pr6.15		Setting			method	immediately		
	Modbus address	0x361E	unit	rpm	Related modes	ALL	factory settings	0

If the motor speed exceeds this set value, Err26.1 "second overspeed protection" will occur.
When set to 0, it is 1.2 times the maximum speed of the motor.
The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.

serial number Pr6.16	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1
	Modbus address	0x3620	unit	-	Related modes	-	factory settings	0

serial number Pr6.17 *	name	Front panel parameter writing selection			Effective method	Power on again	data range	0~1
	Modbus address	0x3622	unit	-	Related modes	ALL	factory settings	0

Select the EEPROM writing rule for parameter changes on the front panel.

set value	Write selection
0	EEPROM writing is not performed simultaneously
1	Simultaneously writing EEPROM

serial number Pr6.18 *	name	Manufacturer's use			Effective method	Power on again	data range	0~100
	Modbus address	0x3624	unit	-	Related modes	ALL	factory settings	0

serial number Pr6.23	name	Manufacturer's use			Effective method	Effective immediately	data range	-100~100
	Modbus address	0x362E	unit	-	Related modes	-	factory settings	0
serial number Pr6.24	name	Load variation compensation filter			Effective method	Effective immediately	data range	10~2500
	Modbus address	0x3630	unit	0.01ms	Related modes	P/S	factory settings	53

Set the filter time constant corresponding to the load variation.

serial number Pr6.25-Pr6.26	name	Manufacturer's use			Effective method	Effective immediately	data range	0~0
	Modbus address	0x3632~0x3634	unit	-	Related modes	-	factory settings	0

serial number Pr6.27*	name	Warning lock (hold) time selection			Effective method	Power on again	data range	0~10
	Modbus address	0x3636	unit	s	Related modes	ALL	factory settings	5

Set the warning lock (hold) time.

set value	content	
0	Lock (hold) time infinite	
1	Lock (hold) time	1[s]
2		2[s]
3		3[s]
4		4[s]
【 5 】		5[s]
6		6[s]
7		7[s]
8		8[s]
9		9[s]
10		10[s]

serial number Pr6.28*	name	Multi stage/zero return control mode selection			Effective method	Power on again	data range	0~2
	Modbus address	0x3638	unit	-	Related modes	P	factory settings	0

Select multi-stage/zero return control mode.

set value	content
0	invalid
1	Modbus/PC mode
2	IO mode

serial number Pr6.29-Pr6.35	name	Manufacturer's use			Effective method	Effective immediately	data range	-
	Modbus address	0x363A~0x3646	unit	-	Related modes	-	factory settings	-

serial	name	Dynamic brake operation	Effective	Power on again	data range	0~1

number Pr6.36*		input			method			
	Modbus address	0x3648	unit	-	Related modes	ALL	factory settings	0

Set the validity/invalidity of the dynamic brake (DB) operation input through IO.

set value	content
0	invalid
1	effective

When Pr6.36 is set to valid, the dynamic brake switching input in the IO function needs to be configured in all three modes, otherwise IO alarms 332 and 333 (IO input function model abnormality) will occur

serial number Pr6.37	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1000
	Modbus address	0x364A	unit	-	Related modes	-	factory settings	0

serial number Pr6.38*	name	Warning blocking setting			Effective method	Power on again	data range	-32768~32767
	Modbus address	0x364C	unit	-	Related modes	ALL	factory settings	4

serial number Pr6.39	name	Warning shielding (mask) setting 2			Effective method	Power on again	data range	-32768~32767
	Modbus address	0x364E	unit	-	Related modes	ALL	factory settings	0

Warning blocking setting, when the corresponding bit is 1, the warning detection is invalid

warning sign	Warning Name	Corresponding bit	
		Pr6.38	Pr6.39
A0	Overload warning	Bit7	-
A2	Battery warning	Bit0	-
A3	Collision limit warning	Bit6	
AA	High temperature warning for servo chamber	-	Bit0
AE	Servo waiting to restart warning	-	-
AF	Encoder self-tuning warning	-	-

serial	name	Manufacturer's use	Effective	Effective	data range	-

number Pr6.40-Pr6.46					method	immediately		
	Modbus address	0x3650~0x365C	unit	-	Related modes	-	factory settings	0

serial number Pr6.47	name	Function Expansion Setting 2			Effective method	Power on again	data range	-32768~32767
	Modbus address	0x365E	unit	-	Related modes	ALL	factory settings	1

Each function is set in bit units.

	function	set value 0	set value 1
Bit0	2-degree-of-freedom control mode	invalid	effective
Bit11	Instant stop alarm extension	invalid	effective

*The lowest bit is bit0

serial number Pr6.48	name	Adjust the filter			Effective method	Effective immediately	data range	0~2000
	Modbus address	0x3660	unit	0.1ms	Related modes	P/S/F	factory settings	11

Set the constant of the adjustment filter for 2-degree-of-freedom control.

serial number Pr6.49	name	Manufacturer's use			Effective method	Effective immediately	data range	0~99
	Modbus address	0x3662	unit	-	Related modes	-	factory settings	15

serial number Pr6.50	name	Viscous friction compensation gain			Effective method	Effective immediately	data range	0~10000
	Modbus address	0x3664	unit	0.1%/（10000 r/min）	Related modes	P/S/F	factory settings	0

Multiply the command speed by this set value, and add the correction amount to the torque command.
The unit is [rated torque 0.1%/(10000 r/min)].
Please maintain the default settings.

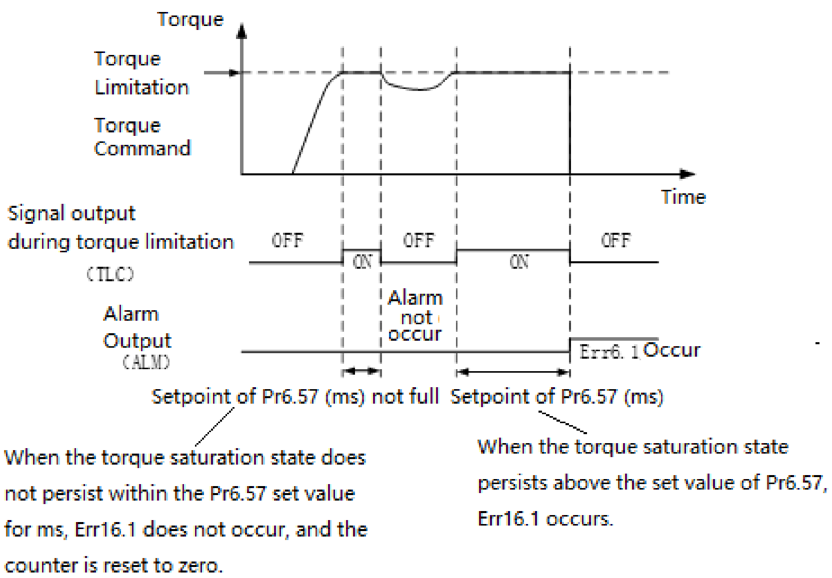
serial number Pr6.51	name	Instant stop completion waiting time			Effective method	Effective immediately	data range	0~10000
	Modbus address	0x3666	unit	ms	Related modes	ALL	factory settings	0

When a warning corresponding to immediate stop occurs, the brake release output (BRK-OFF) is set to OFF, and the motor is maintained energized for a certain period of time. Note: To make the motor stop freely, set it to 0.

serial number	name	Manufacturer's use			Effective method	Effective immediately	data range	-
Pr6.52~Pr6.56	Modbus address	0x3668~0x3670	unit	-	Related modes	-	factory settings	-

serial number	name	Detection time of torque saturation anomaly protection			Effective method	Effective immediately	data range	0~5000
Pr6.57	Modbus address	0x3672	unit	ms	Related modes	P/S/F	factory settings	0

Set the detection time for torque saturation anomaly protection.
When torque saturation occurs above the set time, Err16.1 "torque saturation abnormal protection" occurs.
When the set value is 0, this function is invalid and no alarm occurs.
For example, when set to 5000, Err16.1 occurs when the torque saturation state lasts for about 5 seconds.
During torque control, this function is invalid and Err16.1 does not occur.
When the warning is immediately stopped, this function is invalid and Err16.1 does not occur.



serial number	name	Manufacturer's use			Effective method	Effective immediately	data range	-2147483648~2147483647
Pr6.58	Modbus address	0x3674	unit	-	Related modes	ALL	factory settings	0

Manufacturer's use

<table>
<tr><td rowspan="2">serial number Pr6.59~ Pr6.76</td><td>name</td><td colspan="3">For internal use only</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>-</td></tr>
<tr><td>Modbus address</td><td>0x3676~0x3698</td><td>unit</td><td>-</td><td>Related modes</td><td>-</td><td>factory settings</td><td>-</td></tr>
<tr><td colspan="9">Do not set</td></tr>
</table>

10.8 Pr07 group parameters

<table>
<tr><td rowspan="2">serial number Pr7.00</td><td>name</td><td colspan="3">Zero return method selection (a total of 39 options)</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>0~39</td></tr>
<tr><td>Modbus address</td><td>0x3702</td><td>unit</td><td>-</td><td>Related modes</td><td>P</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">There are a total of 38 methods for zeroing: 35 standard 402 protocol modes for zeroing+3 special collision zeroing</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr7.01</td><td>name</td><td colspan="3">Return to zero acceleration</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>1~1000000</td></tr>
<tr><td>Modbus address</td><td>0x3704</td><td>unit</td><td>ms/krpm</td><td>Related modes</td><td>P</td><td>factory settings</td><td>100</td></tr>
<tr><td colspan="9">Zero acceleration setting, unit: ms/krpm
The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr7.02</td><td>name</td><td colspan="3">The first zero speed</td><td>Set effective</td><td>Effective immediately</td><td>data range</td><td>0~20000</td></tr>
<tr><td>Modbus address</td><td>0x3706</td><td>unit</td><td>rpm</td><td>Related modes</td><td>P</td><td>factory settings</td><td>30</td></tr>
<tr><td colspan="9">The first zero speed setting is the initial positioning speed in each zero mode, and the first zero speed can be slightly faster
The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.</td></tr>
</table>

<table>
<tr><td>serial</td><td>name</td><td>Second Zero Speed</td><td>Set</td><td>Effective</td><td>data range</td><td>0~1000</td></tr>
</table>

number Pr7.03					effective	immediately		
	Modbus address	0x3708	unit	rpm	Related modes	P	factory settings	15
The second zero speed setting is the precise positioning speed in each zero mode, and the second zero speed needs to be slowly achieved. The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.								

serial number Pr7.04	name	Return to zero bias			Set effective	Effective immediately	data range	-2147483648-2147483647
	Modbus address	0x370A	unit	Instruction unit	Related modes	P	factory settings	0
Zeroing bias refers to the process of following the normal zeroing logic, where the servo reaches the preset point and continues to move to the bias position, then resets to zero and completes the output zeroing process.								

serial number Pr7.05	name	Collision current			Set effective	Effective immediately	data range	0-500
	Modbus address	0x370C	unit	%	Related modes	P	factory settings	0
Collision current refers to the 36, 37, and 38 return to zero modes. After encountering the limit signal, the current reaches the collision current value and lasts for a period of time. The collision current is a percentage of the rated current.								

serial number Pr7.06	name	Duration of collision current			Set effective	Effective immediately	data range	0-20000
	Modbus address	0x3714	unit	ms	Related modes	P	factory settings	0
Linear motor collision backlash: When the zeroing mode is any one of 36, 37, or 38, and the motor's operating current is greater than the collision current and the duration is greater than the set value after encountering the limit signal, zeroing enters the next step and moves in reverse.								

serial number Pr7.07	name	Z-trip maximum value protection			Set effective	Effective immediately	data range	-2147483648-2147483647
	Modbus address	0x3716	unit	-	Related modes	P	factory settings	0
The maximum protection of z is used to determine whether the zero return Z signal is accurate. This value is generally set to the intermediate value between Z and 2Z.(Be careful not to set it exactly to Z or 2Z, take the								

middle value)

10.9 Pr08 group parameters

serial number Pr8.00	name	Manufacturer's use			Set effective	Effective immediately	data range	10~500
	EtherCAT address	-	unit	0.1%	Related modes	P	factory settings	50
Manufacturer's use, do not set.								

serial number Pr8.01	name	Manufacturer's use			Set effective	Effective immediately	data range	1~500
	EtherCAT address	-	unit	0.1%	Related modes	P	factory settings	10
Manufacturer's use, do not set.								

serial number Pr8.02	name	Manufacturer's use			Set effective	Effective immediately	data range	5~100
	EtherCAT address	-	unit	0.1%	Related modes	P	factory settings	20
Manufacturer's use, do not set.								

serial number Pr8.03	name	Manufacturer's use			Set effective	Effective immediately	data range	0~32767
	EtherCAT address	-	unit	-	Related modes	P	factory settings	0
Manufacturer's use, do not set.								

serial number Pr8.04	name	Manufacturer's use			Set effective	Effective immediately	data range	10~1000
	EtherCAT address	-	unit	Hz	Related modes	P	factory settings	50
Manufacturer's use, do not set.								

serial number Pr8.05	name	Manufacturer's use			Set effective	Effective immediately	data range	0~1000
	EtherCAT address	-	unit	Hz	Related modes	P	factory settings	100

Manufacturer's use, do not set.

serial number Pr8.06	name	Manufacturer's use			Set effective	Effective immediately	data range	5~1000
	EtherCAT address	-	unit	Hz	Related modes	P	factory settings	20
Manufacturer's use, do not set.								

serial number Pr8.07	name	Manufacturer's use			Set effective	Effective immediately	data range	1~2000
	EtherCAT address	-	unit	0.1Hz	Related modes	P	factory settings	100
Manufacturer's use, do not set.								

serial number Pr8.08	name	Manufacturer's use			Set effective	Effective immediately	data range	0~32767
	EtherCAT address	-	unit	0.01ms	Related modes	P	factory settings	0
Manufacturer's use, do not set.								

serial number Pr8.09	name	Manufacturer's use			Set effective	Effective immediately	data range	0~100
	EtherCAT address	-	unit	%	Related modes	P	factory settings	0
Manufacturer's use, do not set.								

serial number Pr8.10	name	Manufacturer's use			Set effective	Effective immediately	data range	1~100
	EtherCAT address	-	unit	-	Related modes	P	factory settings	10
Manufacturer's use, do not set.								

serial number Pr8.11	name	Manufacturer's use			Set effective	Effective immediately	data range	10~500
	EtherCAT address	-	unit	%	Related modes	P	factory settings	100
Manufacturer's use, do not set.								

serial number	name	Manufacturer's use	Set effective	Effective immediately	data range	0~150

Pr8.12	EtherCAT address	-	unit	%	Related modes	P	factory settings	92
Manufacturer's use, do not set.								

10.10 Pr09 group parameters

serial number Pr9.00	name	Carrier frequency selection			Set effective	Restart	data range	0~3
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	1

Frequency setting for glass loading.

set value	content
0	5KHz
【 1 】	10KHz
2	16KHz
3	20KHz

serial number Pr9.01	name	Synchronization cycle selection			Set effective	Take effect after restart	data range	0~6
	EtherCAT address	-	unit	us	Related modes	ALL	factory settings	2

Set the internal synchronization control cycle. If the bus is set, this parameter will automatically update or can be set independently.

set value	content
0	500us
1	1000us
【 2 】	2000us
3	4000us
4	5000us
5	8000us
6	10000us

serial number Pr9.02	name	Selection of Current Loop Control			Set effective	Effective immediately	data range	0~2
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	0

Set the control mode of the current loop:	
set value	**content**
0	PI+feedback decoupling control, default setting.
1	Complex vector decoupling control
2	Error based current prediction control

serial number	name	Cross decoupling compensation coefficient			Set effective	Effective immediately	data range	0~150
Pr9.03	EtherCAT address	-	unit	%	Related modes	ALL	factory settings	100
Set the proportional coefficient of cross decoupling control, in%, default to 100%. Full interface control can achieve better performance at high speeds.								

serial number	name	Compensation coefficient for back electromotive force			Set effective	Effective immediately	data range	0~150
Pr9.04	EtherCAT address	-	unit	%	Related modes	ALL	factory settings	100
Set the back electromotive force compensation coefficient, default to 100%.								

serial number	name	Dead zone compensation coefficient			Set effective	Effective immediately	data range	0~150
Pr9.05	EtherCAT address	-	unit	%	Related modes	ALL	factory settings	100
Set the proportional coefficient of the dead zone compensation voltage.								

serial number	name	Weak magnetic control gain			Set effective	Effective immediately	data range	0~1000
Pr9.06	EtherCAT address	-	unit	%	Related modes	ALL	factory settings	100
Set the gain coefficient for weak magnetic control.								

serial number	name	Simulation function options			Set effective	Effective immediately	data range	0~2147483647
Pr9.07	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	0
Internal use, please do not set.								

serial number Pr9.08	name	Simulated inertia ratio setting			Set effective	Effective immediately	data range	0~20000
	EtherCAT address	-	unit	%	Related modes	ALL	factory settings	250
Set the load inertia ratio of the simulated motor, not recommended for users to set, for internal use.								

serial number Pr9.09	name	Simulate load torque			Set effective	Effective immediately	data range	0~500
	EtherCAT address	-	unit	%	Related modes	ALL	factory settings	0
Set simulated load, not recommended for user settings, for internal use.								

serial number Pr9.10	name	Simulate anti resonant frequency			Set effective	Effective immediately	data range	0~2000
	EtherCAT address	-	unit	Hz	Related modes	ALL	factory settings	300
Simulate anti resonant frequency, not recommended for user settings, for internal use.								

serial number Pr9.11	name	Simulate resonant frequency			Set effective	Effective immediately	data range	0~10000
	EtherCAT address	-	unit	Hz	Related modes	ALL	factory settings	300
Simulate resonance frequency, not recommended for user settings, for internal use.								

serial number Pr9.12	name	Manufacturer's use			Set effective	Effective immediately	data range	0~1
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	0
Manufacturer's use, do not set.								

serial number Pr9.13	name	Manufacturer's use			Set effective	Power on again	data range	0~1
	EtherCAT address	-	unit	-	Related modes	P/V	factory settings	0
Manufacturer's use, do not set.								

serial number Pr9.14	name	Manufacturer's use			Set effective	Effective immediately	data range	10~1000
	EtherCAT	-	unit	%	Related	P/V	factory	100

	address				modes		settings	
Manufacturer's use, do not set.								

serial number Pr9.15	name	Manufacturer's use			Set effective	Effective immediately	data range	10~1000
	EtherCAT address	-	unit	%	Related modes	P	factory settings	100
Manufacturer's use, do not set.								

serial number Pr9.16	name	Manufacturer's use			Set effective	Effective immediately	data range	0~100
	EtherCAT address	-	unit	%	Related modes	P	factory settings	0
Manufacturer's use, do not set.								

serial number Pr9.17	name	Manufacturer's use			Set effective	Effective immediately	data range	1~10000
	EtherCAT address	-	unit	0.1ms	Related modes	P	factory settings	5
Manufacturer's use, do not set.								

10.11 Pr10 group parameters

serial number Pr10.00	name	Motor brand			Set effective	Power on again	data range	0~20
	Modbus address	0x3A00	unit	-	Related modes	ALL	factory settings	1
This parameter is used to set the series of motors. Ω 6 currently supports self identification of multiple rotating motors, and self identification of motors will automatically identify the motor brand;If it is a third-party or unrecognized motor, please configure this parameter to 0;								

serial number Pr10.01	name	Motor model			Set effective	Power on again	data range	0~50
	Modbus address	0x3A02	unit	-	Related modes	ALL	factory settings	1
This parameter is used to set the model of the motor. Ω 6 currently supports multiple motor models; If it is a third-party or unrecognized motor, please configure this parameter to 0;								

serial	name	Motor Type			Set	Power on again	data range	0~3

number Pr10.02					effective			
	Modbus address	0x3A04	unit	-	Related modes	ALL	factory settings	0

This parameter is used to set the type of motor

set value	content
0	rotating electric machine
1	linear motor
2	simulated motor
3	Voice Coil Motor

serial number Pr10.03	name	Rated power of motor			Set effective	Power on again	data range	1～20000
	Modbus address	0x3A06	unit	0.01kW	Related modes	ALL	factory settings	75

This parameter is the internal characteristic parameter of the motor.When using a custom motor, it is necessary to set it correctly according to the motor nameplate.
When using a self identifying motor, this parameter will be automatically identified.

serial number Pr10.04	name	Rated current of motor			Set effective	Power on again	data range	1～32767
	Modbus address	0x3A08	unit	0.1A	Related modes	ALL	factory settings	50

Set the rated current value of the motor to 5.0A by default. When using a custom motor, it is necessary to set it correctly according to the motor nameplate.
When using a self identifying motor, this parameter will be automatically identified.

serial number Pr10.05	name	Rated speed of motor			Set effective	Power on again	data range	1～30000
	Modbus address	0x3A0A	unit	rpm	Related modes	-	factory settings	3000

Set the value of the rated speed of the motor.When using a custom motor, it is necessary to set it correctly according to the motor nameplate.
When using a self identifying motor, this parameter will be automatically identified.
The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.

serial number	name	Maximum speed of motor	Set effective	Power on again	data range	1～30000

<table>
<tr><td>Pr10.06</td><td>Modbus address</td><td>0x3A0C</td><td>unit</td><td>rpm</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>6500</td></tr>
<tr><td colspan="9">Set the maximum speed value of the motor.When using a custom motor, it is necessary to set it correctly according to the motor nameplate.
When using a self identifying motor, this parameter will be automatically identified.
The default units for speed and acceleration parameters are given in rpm and ms/rpm for a rotating motor, respectively. For a linear motor, the default units are mm/s and mm/s. The display of speed and acceleration/deceleration units can be set as needed through the upper computer debugging software.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr10.07</td><td>name</td><td colspan="3">number of pole pairs</td><td>Set effective</td><td>Power on again</td><td>data range</td><td>1～255</td></tr>
<tr><td>Modbus address</td><td>0x3A0E</td><td>unit</td><td>Pn</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>5</td></tr>
<tr><td colspan="9">Set the numerical value of the number of motor poles.When using a custom motor, it is necessary to set it correctly according to the motor nameplate.
When using a self identifying motor, this parameter will be automatically identified.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr10.08</td><td>name</td><td colspan="3">Rated torque of motor</td><td>Set effective</td><td>Power on again</td><td>data range</td><td>1～3276700</td></tr>
<tr><td>Modbus address</td><td>0x3A10</td><td>unit</td><td>0.001N.m</td><td>Related modes</td><td>Power on again</td><td>factory settings</td><td>2390</td></tr>
<tr><td colspan="9">Set the rated torque value of the motor, which defaults to 2.390N. m;When using a custom motor, it is necessary to set it correctly according to the motor nameplate.
When using a self identifying motor, this parameter will be automatically identified.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr10.09</td><td>name</td><td colspan="3">Motor coil phase resistance</td><td>Set effective</td><td>Power on again</td><td>data range</td><td>1～100000</td></tr>
<tr><td>Modbus address</td><td>0x3A12</td><td>unit</td><td>0.01ohm</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>50</td></tr>
<tr><td colspan="9">This parameter is the internal characteristic parameter of the motor.When using a custom motor, this parameter needs to be set correctly according to the motor nameplate.When using a preset motor, this parameter is read-only.
Set the resistance of the motor coil, note that the resistance value here is the phase resistance;</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr10.10</td><td>name</td><td colspan="3">Direct axis phase inductance of motor</td><td>Set effective</td><td>Power on again</td><td>data range</td><td>1～100000</td></tr>
<tr><td>Modbus address</td><td>0x3A14</td><td>unit</td><td>0.01mH</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>290</td></tr>
<tr><td colspan="9">This parameter is the internal characteristic parameter of the motor.When using a custom motor, this parameter needs to be set correctly according to the motor nameplate.When using the preset motor, this parameter is read-only and defaults to 2.9mH.</td></tr>
</table>

Set the value of the direct axis inductance of the motor, with the inductance value being the phase inductance

<table>
<tr><td rowspan="2">serial number Pr10.11</td><td>name</td><td colspan="3">Motor cross axis phase inductance</td><td>Set effective</td><td>Power on again</td><td>data range</td><td>1～100000</td></tr>
<tr><td>Modbus address</td><td>0x3A16</td><td>unit</td><td>0.01mH</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>290</td></tr>
<tr><td colspan="9">This parameter is the internal characteristic parameter of the motor.When using a custom motor, this parameter needs to be set correctly according to the motor nameplate.When using the preset motor, this parameter is read-only and defaults to 2.9mH.
Set the value of the motor's cross axis inductance, where the inductance value is the phase inductance</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr10.12</td><td>name</td><td colspan="3">Motor rotor moment of inertia</td><td>Set effective</td><td>Power on again</td><td>data range</td><td>1～3276700</td></tr>
<tr><td>Modbus address</td><td>0x3A18</td><td>unit</td><td>kg.cm^2</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>182</td></tr>
<tr><td colspan="9">When using a custom motor, this parameter needs to be set correctly according to the motor nameplate.When using a preset motor, this parameter is read-only and defaults to 1.82kg.cm^2.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr10.13</td><td>name</td><td colspan="3">Motor back electromotive force constant</td><td>Set effective</td><td>Power on again</td><td>data range</td><td>1～2000</td></tr>
<tr><td>Modbus address</td><td>0x3A1A</td><td>unit</td><td>V/krpm</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>28</td></tr>
<tr><td colspan="9">Set the value of the motor back electromotive force constant. When using a custom motor, this parameter needs to be set correctly according to the motor nameplate.When using a preset motor, this parameter is read-only and defaults to 28V/krpm.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr10.14</td><td>name</td><td colspan="3">Motor load simulation inertia ratio</td><td>Set effective</td><td>Power on again</td><td>data range</td><td>0～20000</td></tr>
<tr><td>Modbus address</td><td>0x3A1C</td><td>unit</td><td>%</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>250</td></tr>
<tr><td colspan="9">This parameter represents the inertia ratio corresponding to the simulated load when using a simulated motor.</td></tr>
</table>

<table>
<tr><td rowspan="2">serial number Pr10.15</td><td>name</td><td colspan="3">encoder type</td><td>Set effective</td><td>Power on again</td><td>data range</td><td>0~11</td></tr>
<tr><td>Modbus address</td><td>0x3A1E</td><td>unit</td><td>-</td><td>Related modes</td><td>ALL</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">Set the encoder type used for the connected motor.</td></tr>
</table>

set value	encoder type
0	Tamagawa 2.5M Encoder
1	Nikon 2.5M Encoder

	2	Panasonic encoder
	3	ABZ encoder
	4	Tamagawa 4M Encoder
	5	Nikon 4M Encoder
	6	Singlinna 2.5M encoder
	7	Singlinna 4M encoder
	8	Tamagawa 1M Encoder
	9	Shengtaiqi encoder
	10	BiSS C encoder
	11	Analog to BissC protocol (non-2 integer order)

serial number Pr10.16	name	Single cycle resolution of communication encoder			Set effective	Power on again	data range	10～32
	Modbus address	0x3A20	unit	Bit	Related modes	ALL	factory settings	17
Set the resolution of the absolute position encoder used for single turn counting.								

serial number Pr10.17	name	Multi cycle resolution of communication encoder			Set effective	Power on again	data range	0～30
	Modbus address	0x3A22	unit	-	Related modes	ALL	factory settings	0
Set the multi turn counting resolution of the absolute position encoder used. For single turn absolute value encoders, this parameter needs to be set to 0.								

serial number Pr10.18	name	Actual resolution of communication encoder (for shift only)			Set effective	Power on again	data range	10～32
	Modbus address	0x8436	unit	-	Related modes	ALL	factory settings	17
Set the actual resolution of the communication encoder, only when the encoder needs to reduce the resolution, set this parameter. When using it specifically, set this parameter to the actual resolution of the motor, and set Pr10.16 and the single coil resolution of the communication encoder to the resolution to be shifted. For example, if the 24 bit resolution motor is shifted to 17 bit, set Pr10.18 to 24 and Pr10.16 to 17.								

serial number Pr10.19	name	Incremental (ABZ) encoder resolution			Set effective	Power on again	data range	-2^31～2^31
	Modbus address	0x3A40	unit	pluse	Related modes	ALL	factory settings	10000

Used to set the number of pulses required for one rotation of the incremental ABZ encoder.

serial number Pr10.20	name	Direct drive magnetic pole spacing			Set effective	Power on again	data range	0~2147483647
	Modbus address	0x82F0	unit	0.01mm	Related modes	ALL	factory settings	2400
Set the magnetic pole spacing of the linear motor to 24mm by default								

serial number Pr10.21	name	Direct drive grating ruler resolution			Set effective	Power on again	data range	1~2147483647
	Modbus address	0x82F2	unit	0.001um	Related modes	ALL	factory settings	500
Set the resolution of the grating ruler for the linear motor to 0.5um by default								

serial number Pr10.22	name	Number of pulses per magnetic pole in direct drive			Set effective	Power on again	data range	1~2147483647
	Modbus address	0x82F6	unit	pluse	Related modes	ALL	factory settings	10000
Set the number of pulses per magnetic pole of the linear motor, and this parameter takes effect when the distance between the direct drive magnetic poles is 0. If there is a decimal point between the magnetic pole spacing and the resolution of the grating ruler when calculating the number of pulses, this parameter needs to be used.								

serial number Pr10.23	name	Reversing mode			Set effective	Effective immediately	data range	0~4
	Modbus address	0x3A42	unit	-	Related modes	ALL	factory settings	0
Used to set the self-learning mode for power on angle. 0: Round trip motion commutation, mainly used for reversing the direction of rotating motors (before system enable, it is autonomously completed by the servo, and after micro motion is completed, the enable is dropped) 1: Smooth micro motion commutation, mainly used for linear motor commutation (before system enable, it is autonomously completed by the servo, and after micro motion is completed, the enable is dropped) 2: Hall commutation, mainly used for reversing linear motors with Hall effect 3: Enable reciprocating motion commutation, mainly used for reversing the rotation motor after system enablement (after system enablement, it is autonomously completed by the servo, and the enablement does not drop after micro motion is completed) 4: Enable smooth micro motion commutation, mainly used for linear motor commutation after system enablement (after system enablement, it is autonomously completed by the servo, and the enablement does not drop after micro motion is completed)								

serial number Pr10.24	name	Encoder commutation current			Set effective	Power on again	data range	1～200
	Modbus address	0x3A2C	unit	%	Related modes	ALL	factory settings	100

This parameter is used to set the given current magnitude under self-learning conditions, which is a percentage of the rated current of the motor.
When the load is heavy and the commutation mode is smooth micro motion, or when smooth micro motion is enabled and the electrical angle cannot be correctly recognized (alarm 990 commutation failure), this value can be appropriately increased.

serial number Pr10.25	name	Smooth commutation time			Set effective	Effective immediately	data range	10~500
	Modbus address	0x3A3E	unit	ms	Related modes	ALL	factory settings	100

Set the waiting time for smooth commutation.

serial number Pr10.26	name	Encoder zero position angle (electrical angle)			Set effective	Power on again	data range	0～36000
	Modbus address	0x3A24	unit	°	Related modes	ALL	factory settings	0.00

This parameter displays the zero point position angle of the motor encoder obtained through "position angle self-learning" for encoder zero point self-learning, which is commonly referred to as the electrical angle.

serial number Pr10.27	name	Encoder malfunction enabled			Set effective	Power on again	data range	0～1
	Modbus address	0x3A26	unit	-	Related modes	ALL	factory settings	1

Set whether to enable encoder self alarm except for "encoder connection error", in applications where the absolute position information of the motor rotor does not need to be saved after servo power failure.

serial number Pr10.28	name	Maximum deviation of encoder			Set effective	Power on again	data range	100～100000
	Modbus address	0x3A28	unit	inc	Related modes	ALL	factory settings	100

serial number Pr10.29	name	Encoder fitting alarm enable			Set effective	Power on again	data range	0～1
	Modbus address	0x3A2A	unit	-	Related modes	ALL	factory settings	0

Encoder fitting alarm enable.

set value	Encoder fitting alarm enable
0	invalid
1	effective

serial number Pr10.30	name	Current loop gain coefficient Kp			Set effective	Power on again	data range	1~9999
	Modbus address	0x3A2E	unit	0.01	Related modes	ALL	factory settings	100

The default value is 1. Adjusting this parameter is the same as adjusting Pr6.11 function, the larger the value, the faster the response

When using linear motors or DDR, this parameter needs to be slightly reduced to 0.5-0.7, and adjusted according to the actual situation

serial number Pr10.31	name	Current loop integral coefficient Ki			Set effective	Power on again	data range	1~9999
	Modbus address	0x3A30	unit	0.1	Related modes	ALL	factory settings	1000

The default value is 100, debug according to the actual situation

serial number Pr10.32	name	Manufacturer's use			Set effective	Power on again	data range	0~2
	Modbus address	0x3A36	unit	-	Related modes	ALL	factory settings	0

serial number P10.33	name	U and W phase sequence exchange			Set effective	Power on again	data range	0~1
	Modbus address	0x3A3C	unit	-	Related modes	ALL	factory settings	0

0: The phase sequence of U and W is not interchangeable;

1: U and W phase sequence exchange;

serial number P10.34	name	dead time			Set effective	Power on again	data range	1000~10000
	Modbus address	0x3A34	unit	ns	Related modes	ALL	factory settings	2000

Dead time setting, default is 2us.

Please do not change this parameter arbitrarily

serial	name	Enable circuit detection of	Set	Power on again	data range	0~1

number P10.35		the brake module			effective			
	Modbus address	0x3A46	unit	-	Related modes	ALL	factory settings	0
1: Open the brake module for detection								

serial number P10.36	name	Manufacturer's use			Set effective	Power on again	data range	0~100
	Modbus address	0x3A3A	unit	-	Related modes	ALL	factory settings	100
Do not set								

serial number P10.37	name	Manufacturer's use			Set effective	Power on again	data range	0~10
	Modbus address	0x3A32	unit	-	Related modes	ALL	factory settings	0
Do not set								

10.12 Pr11 group parameters

serial number Pr11.0	name	Manufacturer's use			Effective method	Effective immediately	data range	0~7
	Modbus address	0x8408	unit	-	Related modes	ALL	factory settings	0
Manufacturer's use.								

serial number Pr11.1	name	Manufacturer's use			Effective method	Effective immediately	data range	0~7
	Modbus address	0x840A	unit	-	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr11.2	name	Manufacturer's use			Effective method	Effective immediately	data range	0~7
	Modbus address	0x840C	unit	-	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr11.3	name	Manufacturer's use			Effective method	Effective immediately	data range	0~7
	Modbus address	0x840E	unit	-	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr11.4	name	Manufacturer's use			Effective method	Effective immediately	data range	0~7
	Modbus address	0x8410	unit	-	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr11.5	name	Manufacturer's use			Effective method	Effective immediately	data range	0~7
	Modbus address	0x8412	unit	-	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr11.6	name	Manufacturer's use			Effective method	Effective immediately	data range	-2147483648~2147483647
	Modbus address	0x8414	unit	Pulse	Related modes	ALL	factory settings	0
Manufacturer's use								

serial number Pr11.7	name	Manufacturer's use			Effective method	Effective immediately	data range	0~6
	Modbus address	0x82FE	unit	-	Related modes	P	factory settings	0
Manufacturer's use								

serial number Pr11.8	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1
	Modbus address	0x8300	unit	-	Related modes	P	factory settings	0

serial	name	Manufacturer's use	Effective	Effective	data range	-2147483648

number Pr11.9				method	immediately		~2147483647
	Modbus address	0x8302	unit	ns	Related modes	P	factory settings	0
Manufacturer's use								

serial number Pr11.10	name	Manufacturer's use			Effective method	Effective immediately	data range	-2147483648 ~2147483647
	Modbus address	0x8304	unit	Pulse	Related modes	P	factory settings	0
Manufacturer's use								

serial number Pr11.11	name	Manufacturer's use			Effective method	Effective immediately	data range	-2147483648 ~2147483647
	Modbus address	0x8306	unit	Pulse	Related modes	P	factory settings	0
Manufacturer's use								

serial number Pr11.12	name	Manufacturer's use			Effective method	Effective immediately	data range	0~6
	Modbus address	0x8308	unit	-	Related modes	P	factory settings	0
Manufacturer's use								

serial number Pr11.13	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1
	Modbus address	0x830A	unit	-	Related modes	P	factory settings	0
Manufacturer's use								

serial number Pr11.14	name	Manufacturer's use			Effective method	Effective immediately	data range	-2147483648 ~2147483647
	Modbus address	0x830C	unit	ns	Related modes	P	factory settings	0
Manufacturer's use								

serial number Pr11.15	name	Manufacturer's use			Effective method	Effective immediately	data range	-2147483648 ~2147483647
	Modbus address	0x830E	unit	Pulse	Related modes	P	factory settings	0

Manufacturer's use

serial number	name	Manufacturer's use			Effective method	Effective immediately	data range	-2147483648 ~2147483647
Pr11.16	Modbus address	0x8310	unit	Pulse	Related modes	P	factory settings	0
Manufacturer's use								

serial number	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1
Pr11.17	Modbus address	0x82D4	unit	-	Related modes	P	factory settings	0
Manufacturer's use								

serial number	name	Manufacturer's use			Effective method	Effective immediately	data range	0~2147483647
Pr11.18	Modbus address	0x82D6	unit	Pulse	Related modes	P	factory settings	10000
Manufacturer's use								

serial number	name	Manufacturer's use			Effective method	Effective immediately	data range	0~6000
Pr11.19	Modbus address	0x82D8	unit	Rpm	Related modes	P	factory settings	200
Manufacturer's use								

serial number	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1000
Pr11.20	Modbus address	0x82DA	unit	ms/krpm	Related modes	P	factory settings	10
Manufacturer's use								

serial number	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1
Pr11.21	Modbus address	0x82DC	unit	-	Related modes	P	factory settings	1
Manufacturer's use								

10.13 Pr12 group parameters

serial number Pr12.0~pr12.9	name	Manufacturer's use			Effective method	Power on again	data range	90000~110000
	EtherCAT address	-	unit	0.001%	Related modes	ALL	factory settings	100000

serial number Pr12.10	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	0
Internal use, please do not set.								

serial number Pr12.11	name	Manufacturer's use			Effective method	Effective immediately	data range	5~50
	EtherCAT address	-	unit	0.1S	Related modes	ALL	factory settings	15
Internal use, please do not set.								

serial number Pr12.12	name	Manufacturer's use			Effective method	Power on again	data range	-32768~32767
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	0
Internal use, please do not set. 1: Open it								

serial number Pr12.13	name	Manufacturer's use			Effective method	Effective immediately	data range	0~1
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	0

serial number Pr12.14	name	Manufacturer's use			Effective method	Effective immediately	data range	0~2000
	EtherCAT address	-	unit	ms	Related modes	ALL	factory settings	600
Internal use, please do not set.								

serial number	name	Manufacturer's use	Effective method	Effective immediately	data range	0~1

Pr12.15	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	0
Internal use, please do not set.								

serial number Pr12.16	name	Manufacturer's use			Effective method	Effective immediately	data range	0~2147483647
	EtherCAT address	-	unit	-	Related modes	ALL	factory settings	0
Internal use, please do not set.								

10.14 Pr13 group parameters

10.15 Pr14 group parameters

10.16 Pr15 group parameters

serial number Pr15.0	name	Multi stage control mode			Effective method	Effective immediately	data range	0~1
	Modbus address	0x8200	unit	-	Related modes	P	factory settings	0
0: Relative position control 1: Absolute position control								

serial number Pr15.1	name	Multi level absolute control mode			Effective method	Effective immediately	data range	0~2
	Modbus address	0x8202	unit	-	Related modes	P	factory settings	0
0: Absolute positive 1: Absolute negative 2: The shortest path								

serial number Pr15.2	name	Multi level Modbus trigger			Effective method	Effective immediately	data range	0~1
	Modbus address	0x8204	unit	-	Related modes	P	factory settings	0
0: Do not trigger 1: Trigger multiple levels through Modbus or PC on the upper computer								

serial number Pr15.3	name	Multi segment position number			Effective method	Effective immediately	data range	0~31
	Modbus address	0x8206	unit	-	Related modes	P	factory settings	0
In Modubs control mode, set the multi segment position numbers that need to be moved								

serial number Pr15.4 ~Pr15.35	name	Multi level relative position 1 ~Multi level relative position 32			Effective method	Effective immediately	data range	-92233700000000000000 ~92233700000000000000
	Modbus address	0x8208 ~0x8246	unit	pulse	Related modes	P	factory settings	0
Multi level relative position setting value								

serial number Pr15.36 ~Pr15.67	name	Multi level absolute position 1 ~Multi level Jedi Position 32			Effective method	Effective immediately	data range	-92233700000000000000 ~92233700000000000000
	Modbus address	0x8248 ~0x8286	unit	pulse	Related modes	P	factory settings	0
Multi level absolute position setting value								

serial number Pr15.68 ~Pr15.99	name	Multi level speed 1 ~Multi level speed 32			Effective method	Effective immediately	data range	-20000 ~20000
	Modbus address	0x8288~0x82C6	unit	rpm	Related modes	P	factory settings	0
Multi level speed setting value								

serial number Pr15.100	name	Rotation value			Effective method	Effective immediately	data range	0~2147483647
	Modbus address	0x369A	unit	pulse	Related modes	P	factory settings	0
Set the motor rotation range, that is, when Pr0.15=4 when the rotary mode switch is turned on, and the motor position value reaches the set value of the rotary mode, the rotary position value will start cycling again from 0.Assuming that the rotation value is set to 10000 plus, the feedback position value of the rotation encoder								

will cycle from 0 to 10000. When the rotation range is set to 0, this function is invalid. Please set the "rotation mode" to ten times or more of the encoder; The rotation mode cannot be used simultaneously with trajectory shaping. Under normal operating conditions, the rotation value is equal to the encoder position feedback. This function DD takes the shortest absolute position path more frequently.

<table>
<tr><td rowspan="2">serial number Pr15.101</td><td>name</td><td colspan="3">Multi level relative position unit selection</td><td>Effective method</td><td>Effective immediately</td><td>data range</td><td>0~2</td></tr>
<tr><td>Modbus address</td><td>0x8726</td><td>unit</td><td>-</td><td>Related modes</td><td>P</td><td>factory settings</td><td>0</td></tr>
<tr><td colspan="9">0: The position unit is count;
1: The position unit is 0.001 °
2: The position unit is 0.001mm
In relative position control mode, when the position unit is set to count, the calculated data is not an integer. In case of loss of accuracy, please change the position unit.</td></tr>
</table>

11 Maintenance

11.1 Daily maintenance

Please perform regular maintenance and inspection on the drive and motor for safe use.

Precautions for maintenance and inspection

1. The power should be cut off by the operator themselves.During the power on process, do not approach the motor or the machine it drives in case of incorrect movements.

Within a short period of time after cutting off the power, the internal circuit remains in a high-voltage charging state.Cut off the power before checking the homework, and wait for more than 15 minutes to confirm that the charging light is off.

When conducting insulation resistance testing on the driver, please first disconnect all connections to the driver.Conducting insulation resistance testing in a connected state can cause driver malfunctions

4. Do not use gasoline, diluents, alcohol, acidic and alkaline cleaning agents to avoid discoloration or damage to the outer shell.

Check project and cycle

Normal usage conditions

The environmental conditions are an annual average ambient temperature of 30 °C, a load rate of less than 80%, and a daily operating time of less than 20 hours

Daily and regular inspections should be carried out according to the following items.

distinguish	inspection cycle	inspection items
routine inspection	daily	·Confirm the usage temperature, humidity, dust, foreign objects, etc ·Are there any abnormal vibrations or sounds ·Is the power supply voltage normal ·Is there any odor ·Is there fiber thread stuck to the ventilation opening ·Cleaning condition of the front part of the drive and connectors ·Is the wiring damaged ·Is there any looseness or misalignment in the connection parts with the device or equipment ·Is there any foreign object entering the load section
regular inspection	1 year	·Is there any looseness in the fastening parts ·Are there any signs of overheating ·Is the terminal block damaged ·Is the fastening part of the terminal block loose

11.2 Component Replacement

The time for component replacement varies depending on environmental conditions and usage methods.When an abnormality occurs, it needs to be replaced (repaired).

Prohibited	Please do not disassemble or repair except for our company

product	distinguish	Standard replacement period (time)	remark
drive	filter capacitor	About 5 years	The standard replacement cycle is for reference only. Even if the standard replacement cycle has not been reached, Once an abnormality occurs, it also needs to be replaced.
	cooling fan	2-3 years (10000 to 30000 hours)	
	aluminum electrolytic capacitor	About 5 years	
	Surge current protection relay	About 100000 times (The lifespan varies depending on the usage conditions)	
	Surge current suppression resistor	About 20000 times (The lifespan varies depending on the usage conditions)	
motor	bearing	18000 hours	
	oil seal	5000 hours	
	encoder	3-5 years (20000 to 30000 hours)	
	Absolute encoder battery	Please refer to section 9.2.1.4 on battery life	

11.3 Warranty Agreement

Warranty period:
The product quality warranty period is within 1 year and 6 months from the date of shipment.
Warranty coverage:

According to the requirements of this user manual and under normal use, if a malfunction occurs during the warranty period, it can be repaired free of charge.However, if the following situations occur, maintenance fees must be charged even within the warranty period.Other than this, no other express or implied warranties are made, including but not limited to warranties of merchantability and fitness for a particular purpose

(1) When damage occurs due to improper usage, as well as improper repair or modification.

(2) After arrival, if damaged due to falling or transportation.

(3) When damage occurs due to use outside the product specification requirements.

(4) When damage occurs due to fire, earthquake, lightning strike, wind disaster, chloride corrosion, abnormal voltage, and other natural disasters.

(5) When the machine is damaged or burned due to the intrusion of water, oil, dust, metal fragments, and other foreign objects.

(6) Except for parts with a recorded standard lifespan exceeding their respective service lives.

The warranty scope is limited to the main body of the purchased product, and damages caused by product malfunctions are not within the scope of compensation.